Cloud Insights documentation

Cloud Insights

NetApp
April 16, 2024

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Table of Contents

Cloud Insights documentation

NetApp Cloud Insights is a cloud infrastructure monitoring tool that gives you visibility into your complete infrastructure. With Cloud Insights, you can monitor, troubleshoot and optimize all your resources including your public clouds and your private data centers.

What can Cloud Insights do for me?

Cloud Insights provides hybrid multicloud monitoring, giving you full-stack observability of infrastructure and workloads.

- Data collectors for heterogeneous infrastructure and workloads, including Kubernetes
- Open Telegraf collector and open APIs for easy integration
- Comprehensive alerting and notifications
- Machine learning for intelligent insights
- Optimize resource utilization
- Built-in or customizable dashboards with advanced filters to minimize display noise to answer questions
- Discover the health of your ONTAP storage operations
- Protect your most valuable business asset – data - from ransomware or data destruction attack

Getting Started

- How do I **get started** with Cloud Insights?
- I'm signed up. Now what do I do?
  Acquiring Data
  Setting up users
- Awesome! What's Next?
  Preparing Assets: Annotating
  Finding the Assets You Want: Querying
  Seeing the Data You want: Dashboards
  Monitoring and Alerts
  Securing Data
- This is great stuff! I'm ready to **subscribe**.

What's New with Cloud Insights

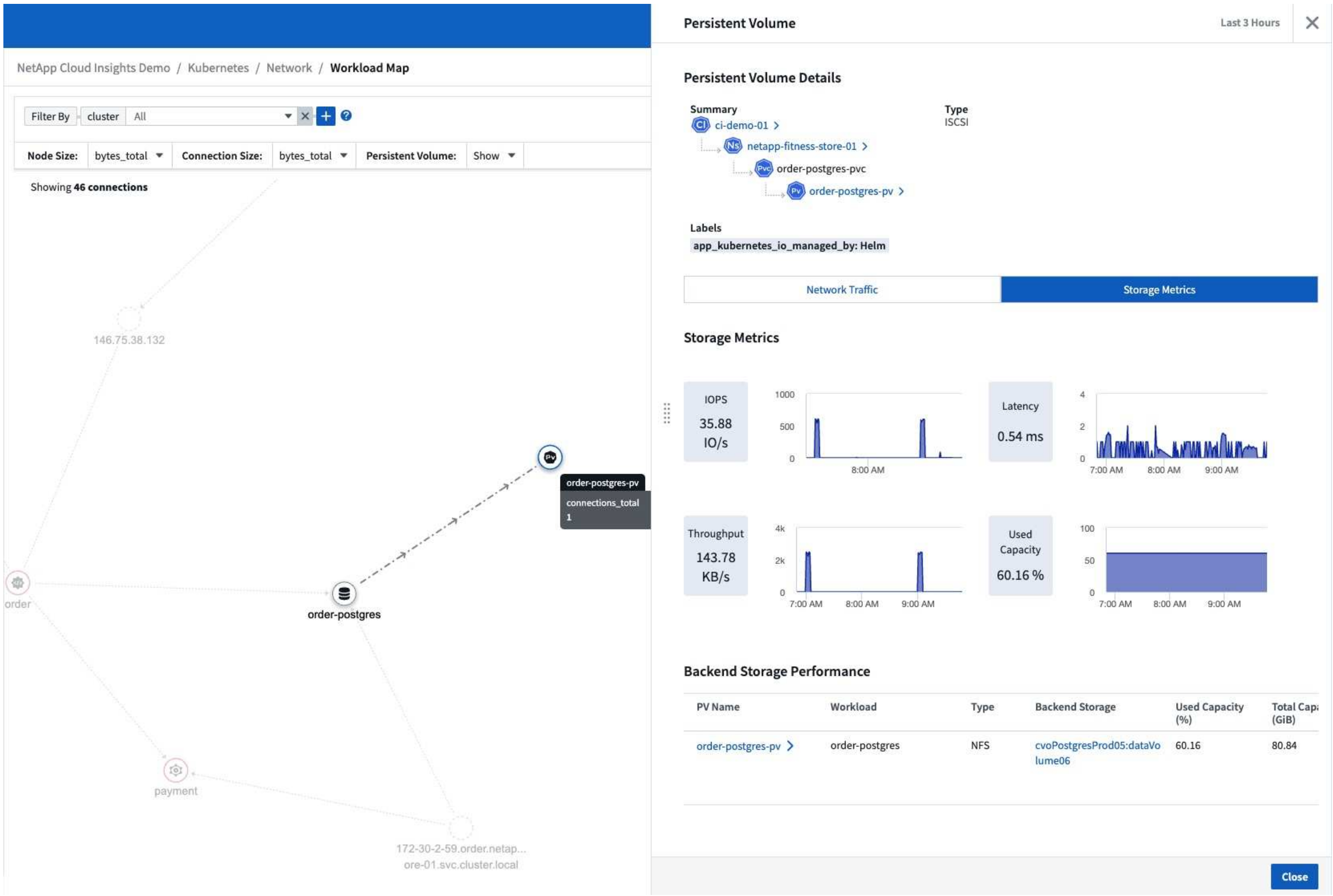
NetApp is continually improving and enhancing its products and services. Here are some of the latest features and functionalities available in the commercial Editions of Cloud Insights.

ⓘ Some of these features may not be available in Cloud Insights Federal Edition, or may be available with reduced functionality. Wherever possible, these differences are noted in the documentation.

April 2024

iSCSI SAN Support for Kubernetes Network Map

Identify Kubernetes underlying storage dependencies for NFS and now iSCSI.
Accelerate issue resolution by gaining insight into the Kubernetes application’s storage network activity and undelineated storage metrics. Understand how the Kubernetes application uses the storage infrastructure for chargeback and showback reporting.



Showing **46 connections**

order-postgres-pv
connections_total
1

Persistent Volume

Persistent Volume Details

Summary
ci-demo-01 >
netapp-fitness-store-01 >
order-postgres-pvc
order-postgres-pv >

Type
ISCSI

Labels
app_kubernetes_io_managed_by: Helm

Storage Metrics

IOPS
35.88 IO/s

Latency
0.54 ms

Throughput
143.78 KB/s

Used Capacity
60.16 %

Backend Storage Performance

PV Name	Workload	Type	Backend Storage	Used Capacity (%)	Total Capa (GiB)
order-postgres-pv >	order-postgres	NFS	cvoPostgresProd05:dataVolume06	60.16	80.84

Operating System support

The following operating systems are supported with Cloud Insights Acquisition Units, in addition to those already supported:

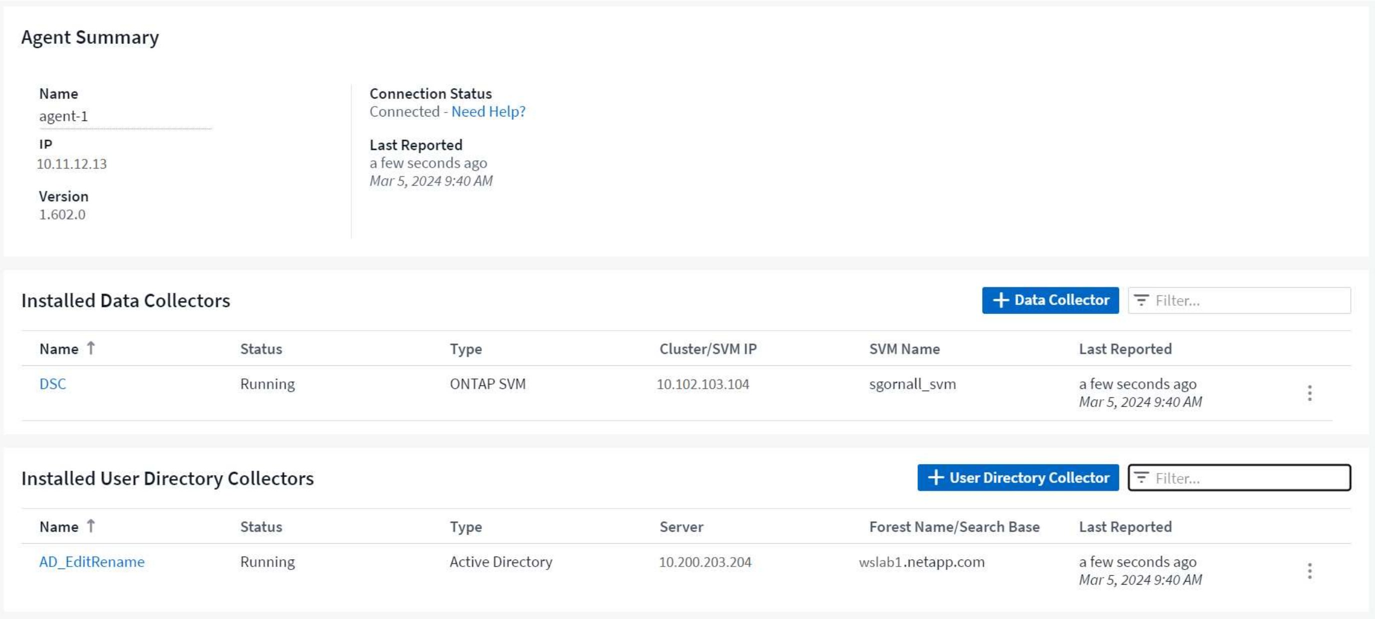
- Oracle Enterprise Linux 8.8

- Red Hat Enterprise Linux 8.8
- Rocky 9.3
- OpenSUSE Leap 15.1 through 15.5
- SUSE Enterprise Linux Server 15, 15 SP2 through 15 SP5

March 2024

Workload Security Agent Details

Each of your Workload Security Agents has its own landing page, where you can easily see summary information about the Agent as well as the installed Data and User Directory Collectors associated with that Agent.



Agent Summary

Name
agent-1

IP
10.11.12.13

Version
1.602.0

Connection Status
Connected - Need Help?

Last Reported
a few seconds ago
Mar 5, 2024 9:40 AM

Installed Data Collectors

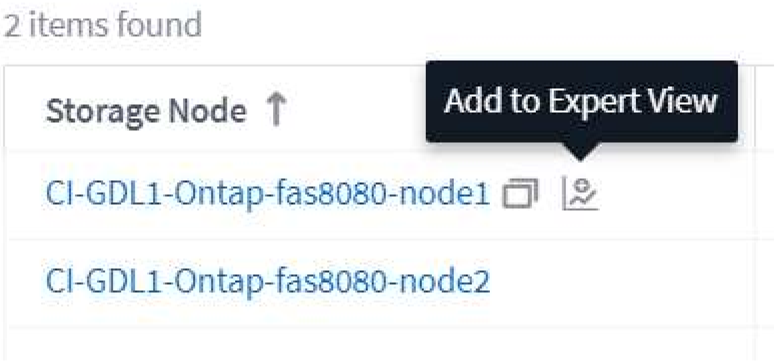
Name ↑	Status	Type	Cluster/SVM IP	SVM Name	Last Reported
DSC	Running	ONTAP SVM	10.102.103.104	sgornall_svm	a few seconds ago *Mar 5, 2024 9:40 AM*

Installed User Directory Collectors

Name ↑	Status	Type	Server	Forest Name/Search Base	Last Reported
AD_EditRename	Running	Active Directory	10.200.203.204	wslab1.netapp.com	a few seconds ago *Mar 5, 2024 9:40 AM*

Chart more data more quickly

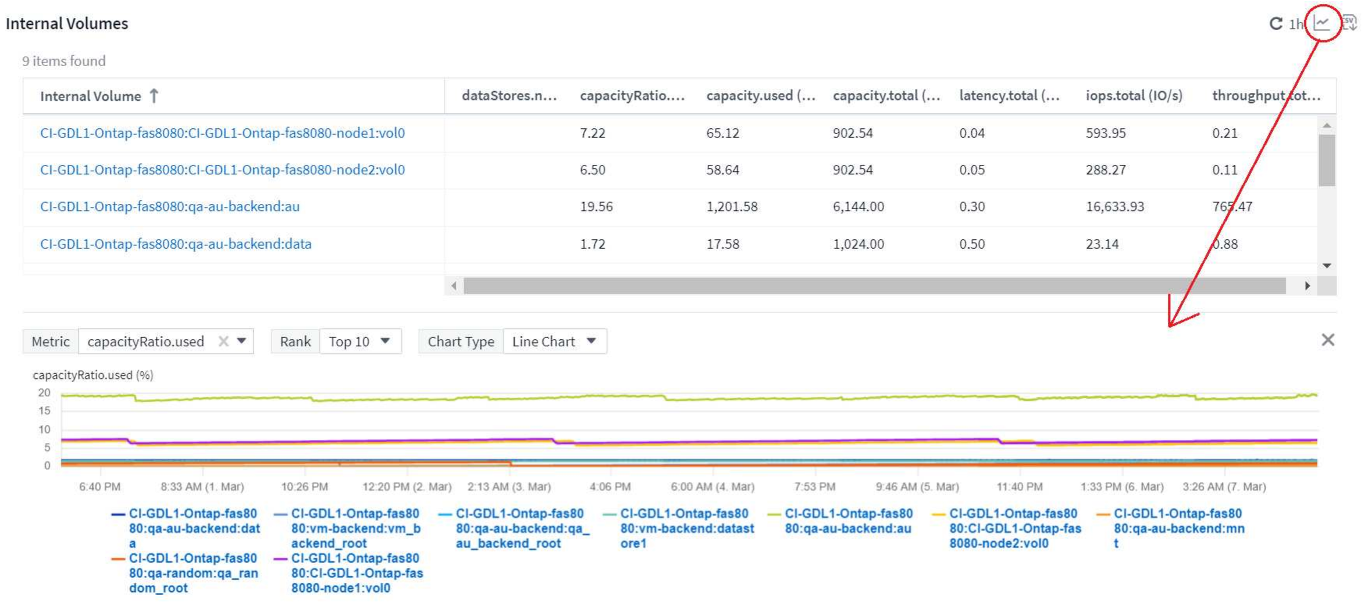
When analyzing data on an asset’s landing page, adding additional data to the Expert View charts is a snap. For each table on the landing page, if an object type has relevant data, hover over that object to display the "Add to Expert View" icon. Selecting this icon adds that object to the Additional Resources and displays it in the Expert View charts.



2 items found

Storage Node ↑
CI-GDL1-Ontap-fas8080-node1
CI-GDL1-Ontap-fas8080-node2

Or maybe you want to see a landing page table's data in its own chart. Simply select the *Show Chart* icon to open the chart below the table:


capacityRatio.used (%)
20
15
10
5
0
6:40 PM
8:33 AM (1. Mar)
10:26 PM
12:20 PM (2. Mar)
2:13 AM (3. Mar)
4:06 PM
6:00 AM (4. Mar)
7:53 PM
9:46 AM (5. Mar)
11:40 PM
1:33 PM (6. Mar)
3:26 AM (7. Mar)
CI-GDL1-Ontap-fas8080:qa-au-backend:data
CI-GDL1-Ontap-fas8080:vm-backend:vm_backend_root
CI-GDL1-Ontap-fas8080:qa-au-backend:qa_au_backend_root
CI-GDL1-Ontap-fas8080:vm-backend:datastore1
CI-GDL1-Ontap-fas8080:qa-au-backend:au
CI-GDL1-Ontap-fas8080:CI-GDL1-Ontap-fas8080-node2:vol0
CI-GDL1-Ontap-fas8080:qa-au-backend:mnt
CI-GDL1-Ontap-fas8080:qa-random:qa_random_root
CI-GDL1-Ontap-fas8080:CI-GDL1-Ontap-fas8080-node1:vol0

Internal Volumes

1h

9 items found

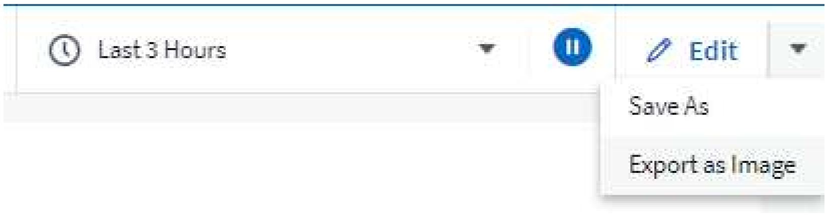
Internal Volume ↑	dataStores.n...	capacityRatio....	capacity.used (...	capacity.total (...	latency.total (...	iops.total (IO/s)	throughput.tot...
CI-GDL1-Ontap-fas8080:CI-GDL1-Ontap-fas8080-node1:vol0		7.22	65.12	902.54	0.04	593.95	0.21
CI-GDL1-Ontap-fas8080:CI-GDL1-Ontap-fas8080-node2:vol0		6.50	58.64	902.54	0.05	288.27	0.11
CI-GDL1-Ontap-fas8080:qa-au-backend:au		19.56	1,201.58	6,144.00	0.30	16,633.93	765.47
CI-GDL1-Ontap-fas8080:qa-au-backend:data		1.72	17.58	1,024.00	0.50	23.14	0.88

Metric: capacityRatio.used
Rank: Top 10
Chart Type: Line Chart

February 2024

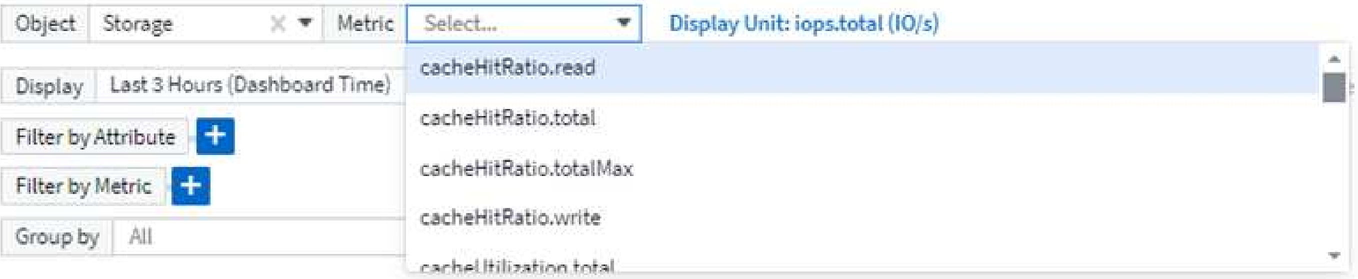
Usability Improvements

Save a **snapshot** of your current dashboard by selecting *Export as Image* from the right-corner drop-down. Cloud Insights creates a .PNG of the current widget states.



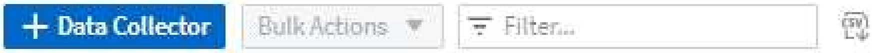
Last 3 Hours

Object and Metric selection is easier than ever for Widgets, Monitors, etc. Choose the object type you want, and then select a metric relevant to that object in the separate drop-down.

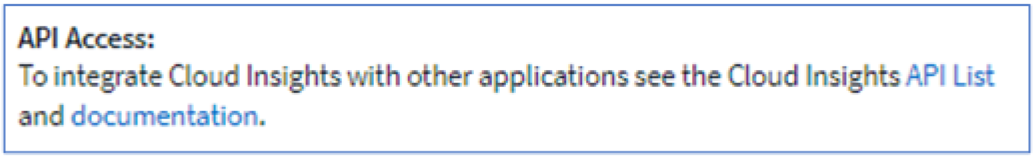


Object: Storage
Metric: Select...
Display Unit: iops.total (IO/s)
Display: Last 3 Hours (Dashboard Time)
Group by: All

Export Data Collector and Acquisition Unit lists to .CSV by selecting the icon at the top of those pages.

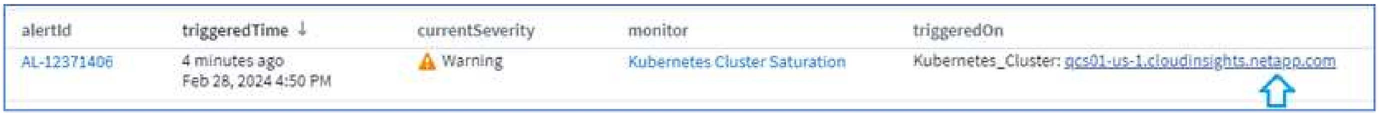


We’ve **re-organized the Help > Support** page so it’s easier to find what you’re looking for, and because you asked for them, we added direct links on this page to **API Swagger** and user documentation.



API Access:
To integrate Cloud Insights with other applications see the Cloud Insights API List and documentation.

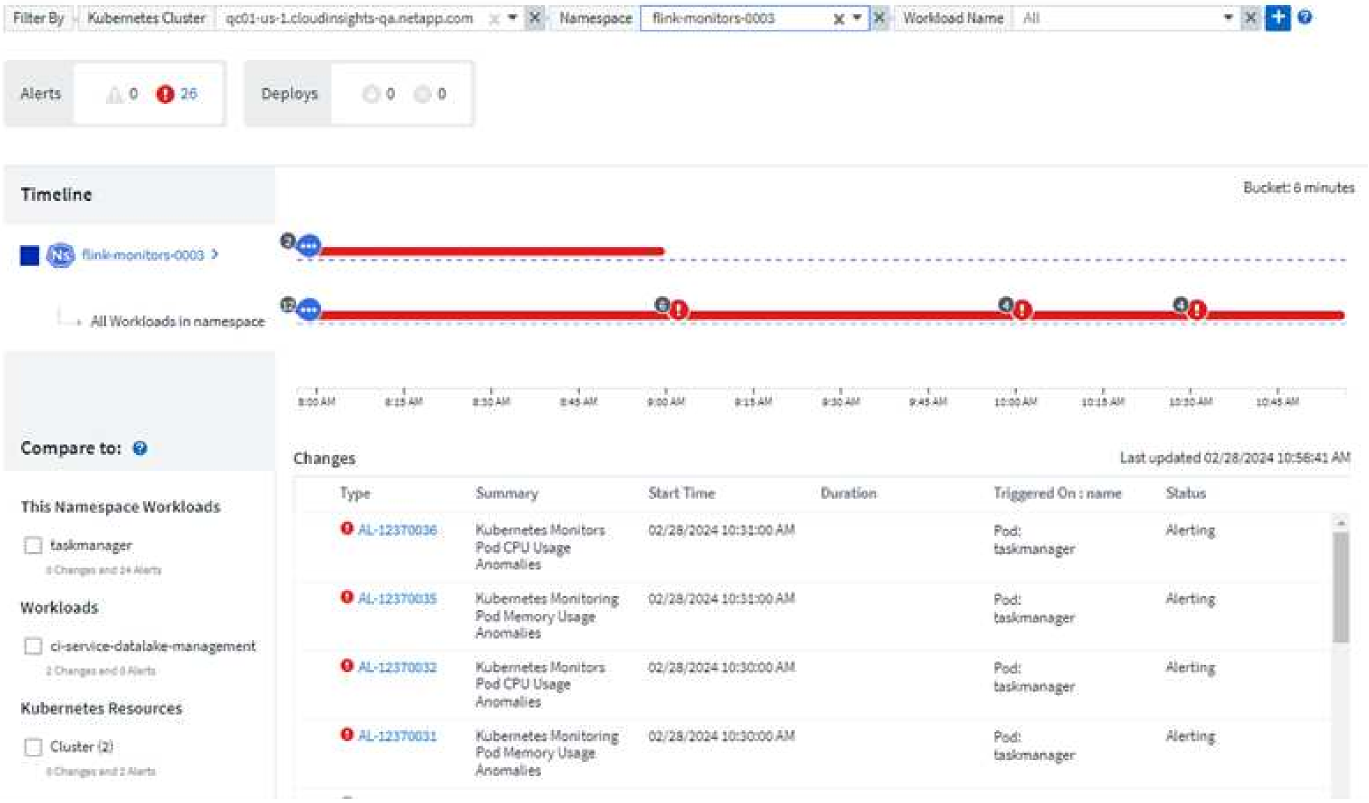
Links in the “triggeredOn” column on the Alerts list page will navigate to the appropriate Landing Page, if a Landing Page is available for that object.



alertId	triggeredTime ↓	currentSeverity	monitor	triggeredOn
AL-12371406	4 minutes ago Feb 28, 2024 4:50 PM	⚠ Warning	Kubernetes Cluster Saturation	Kubernetes_Cluster: gcs01-us-1.cloudinsights.netapp.com

See all changes in your namespace

Kubernetes Change Analysis now allows you to see a timeline of changes when selecting Cluster and Namespace. Previously, Workload must also have been selected. When filtering on Cluster and Namespace, the timeline of all workload changes in that namespace are shown on one line.



This Namespace Workloads

□ taskmanager
0 Changes and 24 Alerts

Workloads

□ ci-service-datalake-management
2 Changes and 0 Alerts

Kubernetes Resources

□ Cluster (2)
0 Changes and 2 Alerts

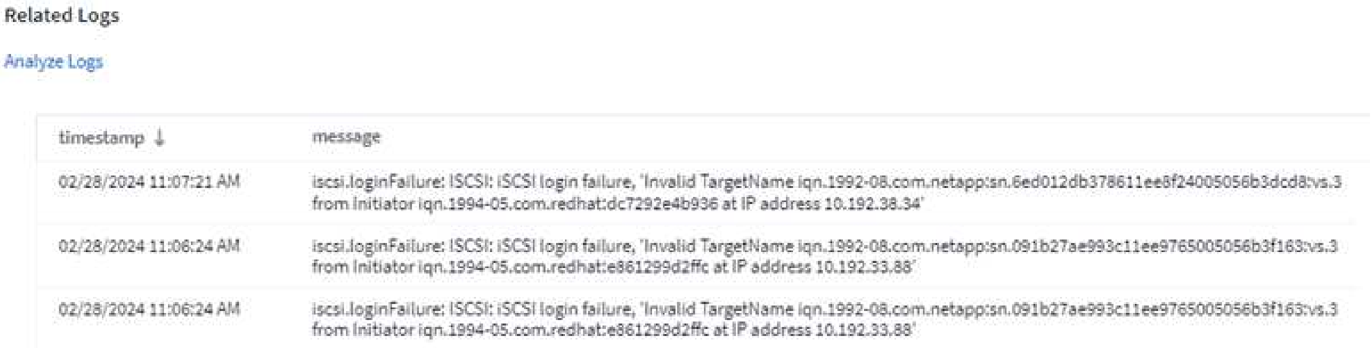
Changes

Last updated 02/28/2024 10:56:41 AM

Type	Summary	Start Time	Duration	Triggered On : name	Status
AL-12370036	Kubernetes Monitors Pod CPU Usage Anomalies	02/28/2024 10:31:00 AM		Pod: taskmanager	Alerting
AL-12370035	Kubernetes Monitoring Pod Memory Usage Anomalies	02/28/2024 10:31:00 AM		Pod: taskmanager	Alerting
AL-12370032	Kubernetes Monitors Pod CPU Usage Anomalies	02/28/2024 10:30:00 AM		Pod: taskmanager	Alerting
AL-12370031	Kubernetes Monitoring Pod Memory Usage Anomalies	02/28/2024 10:30:00 AM		Pod: taskmanager	Alerting

Related Logs for Alerts

When viewing a log alert, related log entries are shown in a new table. A log entry is related if it occurs in the same source and timeframe as the alert, and is subject to the same conditions. Select “Analyze Logs” to explore further.


Related Logs

Analyze Logs

timestamp ↓	message
02/28/2024 11:07:21 AM	iscsi.loginFailure: ISCSI: iSCSI login failure, 'Invalid TargetName iqn.1992-08.com.netapp:sn.6ed012db378611ee8f24005056b3dcd8:vs.3 from Initiator iqn.1994-05.com.redhat:dc7292e4b936 at IP address 10.192.38.34'
02/28/2024 11:06:24 AM	iscsi.loginFailure: ISCSI: iSCSI login failure, 'Invalid TargetName iqn.1992-08.com.netapp:sn.091b27ae993c11ee9765005056b3f163:vs.3 from Initiator iqn.1994-05.com.redhat:e861299d2ffc at IP address 10.192.33.88'
02/28/2024 11:06:24 AM	iscsi.loginFailure: ISCSI: iSCSI login failure, 'Invalid TargetName iqn.1992-08.com.netapp:sn.091b27ae993c11ee9765005056b3f163:vs.3 from Initiator iqn.1994-05.com.redhat:e861299d2ffc at IP address 10.192.33.88'

Collect ONTAP Switch Data

Cloud Insights can collect data from the ONTAP system’s back-end switches; simply enable the collection in the data collector’s *Advanced Configuration* section, and ensure the ONTAP system is configured to provide switch information and has the appropriate permissions set.

Workload Security Data Collector API

In large environments, you can automate Workload Security collector creation using the new Data Collectors API. Navigate to **Admin > API Access > API Documentation** and select the *Workload Security* API type to learn more.

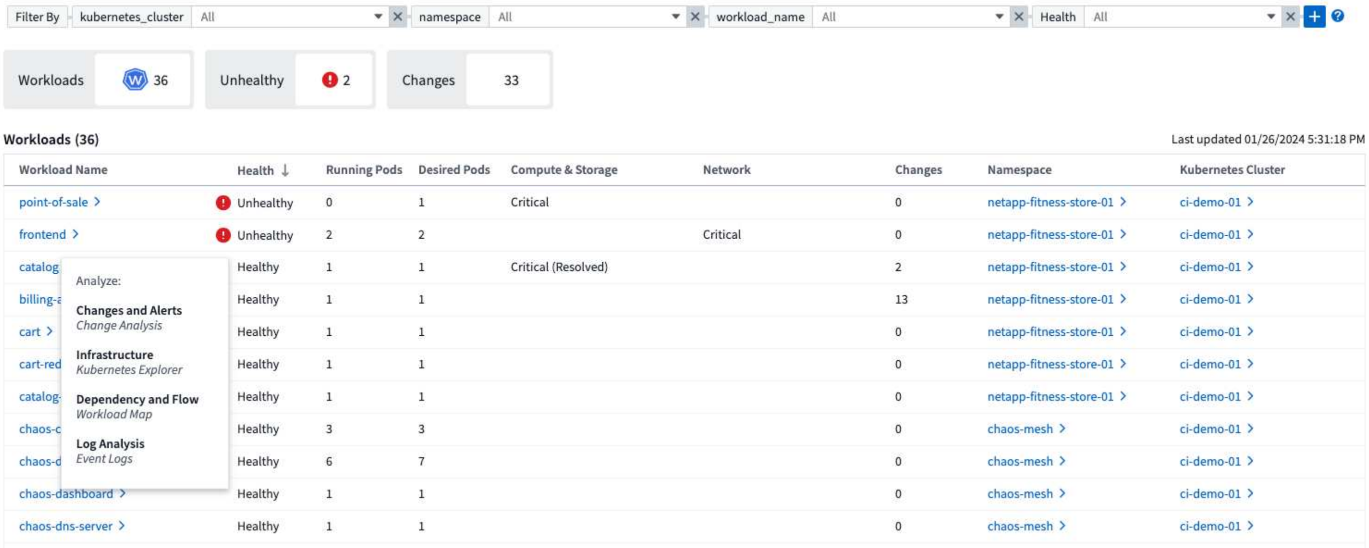
January 2024

Try Cloud Insights Features you haven’t used yet

In addition to your initial trial of Cloud Insights, you may also take advantage of Module Trials. For example, if you are subscribed to Cloud Insights and have been monitoring storage and virtual machines, when you add Kubernetes to your environment, you will automatically enter into a 30-day trial of Kubernetes Observability. Kubernetes Observability managed unit usage will not count against your subscribed entitlement until after the trial period ends.

How healthy are my workloads?

Workload health is available at a glance on the **Kubernetes > Explore > Workloads** page, so you can quickly see which workloads are performing well and which may need some help. Easily identify if the health issue is related to infrastructure, network, or configuration changes, and drill down to analyze the root cause.



Filter By: kubernetes_cluster All | namespace All | workload_name All | Health All

Workloads 36 | Unhealthy 2 | Changes 33

Workloads (36)

Last updated 01/26/2024 5:31:18 PM

Workload Name	Health ↓	Running Pods	Desired Pods	Compute & Storage	Network	Changes	Namespace	Kubernetes Cluster
point-of-sale >	Unhealthy	0	1	Critical		0	netapp-fitness-store-01 >	ci-demo-01 >
frontend >	Unhealthy	2	2		Critical	0	netapp-fitness-store-01 >	ci-demo-01 >
catalog	Healthy	1	1	Critical (Resolved)		2	netapp-fitness-store-01 >	ci-demo-01 >
billing-a	Healthy	1	1			13	netapp-fitness-store-01 >	ci-demo-01 >
cart >	Healthy	1	1			0	netapp-fitness-store-01 >	ci-demo-01 >
cart-red	Healthy	1	1			0	netapp-fitness-store-01 >	ci-demo-01 >
catalog-	Healthy	1	1			0	netapp-fitness-store-01 >	ci-demo-01 >
chaos-c	Healthy	3	3			0	chaos-mesh >	ci-demo-01 >
chaos-d	Healthy	6	7			0	chaos-mesh >	ci-demo-01 >
chaos-dashboard >	Healthy	1	1			0	chaos-mesh >	ci-demo-01 >
chaos-dns-server >	Healthy	1	1			0	chaos-mesh >	ci-demo-01 >

Data Collector Updates

Data Domain Identification

The Data Domain collector has been improved to better identify HA systems for durability across failover events This change will cause a **one time** re-identification of Data Domain appliances in HA systems, which will subsequently cause any annotations on those assets to be removed (because these arrays will be re-identified). You will need to re-attach annotations to your Data Domain objects.

Enhanced Ransomware Detection ML Algorithm

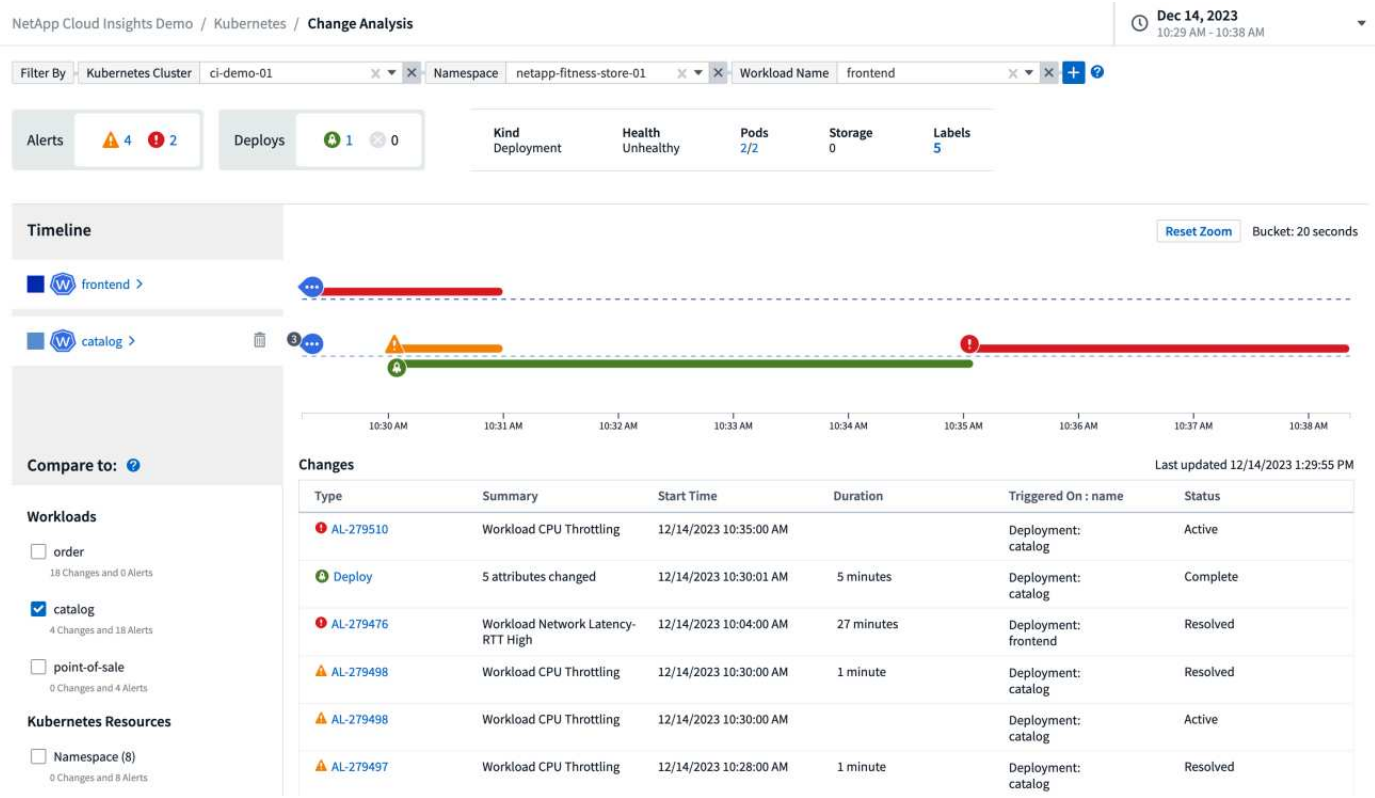
Workload Security includes a new 2nd-generation ransomware detection ML algorithm to detect the most sophisticated attacks faster and more accurately.

"Seasonality" of behaviors: weekend behavior may follow different patterns from weekday, or morning behavior from afternoon. Workload Security algorithms take this seasonality into account.

December 2023

Change Analytics at a glance

Kubernetes Change Analytics provide you with an all-in-one view of recent changes to your Kubernetes environment. Alerts and deployment status are at your fingertips. With Change Analytics, you can track every deployment and configuration change, and correlate it with the health and performance of K8s services, infrastructure, and clusters.



NetApp Cloud Insights Demo / Kubernetes / Change Analysis

Dec 14, 2023
10:29 AM - 10:38 AM

Filter By | Kubernetes Cluster: ci-demo-01 | Namespace: netapp-fitness-store-01 | Workload Name: frontend

Alerts: ⚠ 4 ● 2

Deploys: ● 1 ○ 0

Kind	Health	Pods	Storage	Labels
Deployment	Unhealthy	2/2	0	5

Compare to:

Workloads

□ order
18 Changes and 0 Alerts

☑ catalog
4 Changes and 18 Alerts

□ point-of-sale
0 Changes and 4 Alerts

Kubernetes Resources

□ Namespace (8)
0 Changes and 8 Alerts

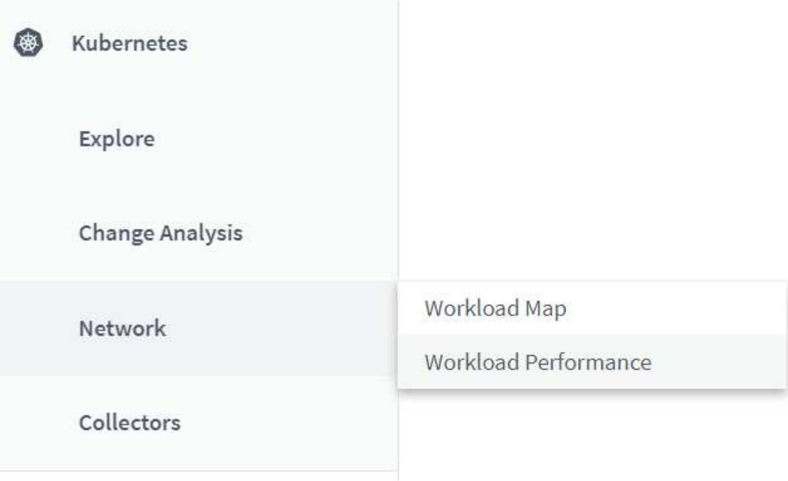
Changes

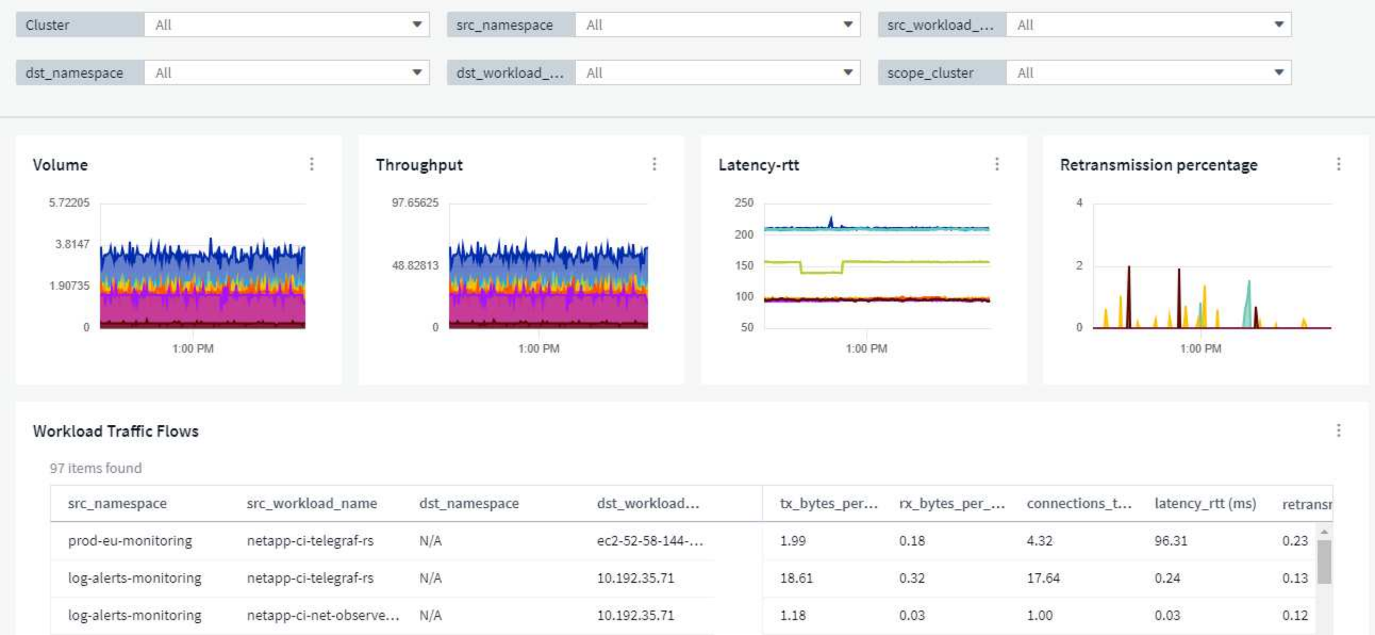
Last updated 12/14/2023 1:29:55 PM

Type	Summary	Start Time	Duration	Triggered On : name	Status
● AL-279510	Workload CPU Throttling	12/14/2023 10:35:00 AM		Deployment: catalog	Active
● Deploy	5 attributes changed	12/14/2023 10:30:01 AM	5 minutes	Deployment: catalog	Complete
● AL-279476	Workload Network Latency-RTT High	12/14/2023 10:04:00 AM	27 minutes	Deployment: frontend	Resolved
⚠ AL-279498	Workload CPU Throttling	12/14/2023 10:30:00 AM	1 minute	Deployment: catalog	Resolved
⚠ AL-279498	Workload CPU Throttling	12/14/2023 10:30:00 AM		Deployment: catalog	Active
⚠ AL-279497	Workload CPU Throttling	12/14/2023 10:28:00 AM	1 minute	Deployment: catalog	Resolved

Kubernetes Workload Performance Dashboard

Workload performance is available at a glance in the comprehensive Kubernetes Workload Performance dashboard. Quickly view graphs of Volume, Throughput, Latency, and Retransmission trends, as well as a table of workload traffic for each namespace in your environment. Filters allow easy focus into areas of interest.





Cluster All
src_namespace All
src_workload_... All
dst_namespace All
dst_workload_... All
scope_cluster All

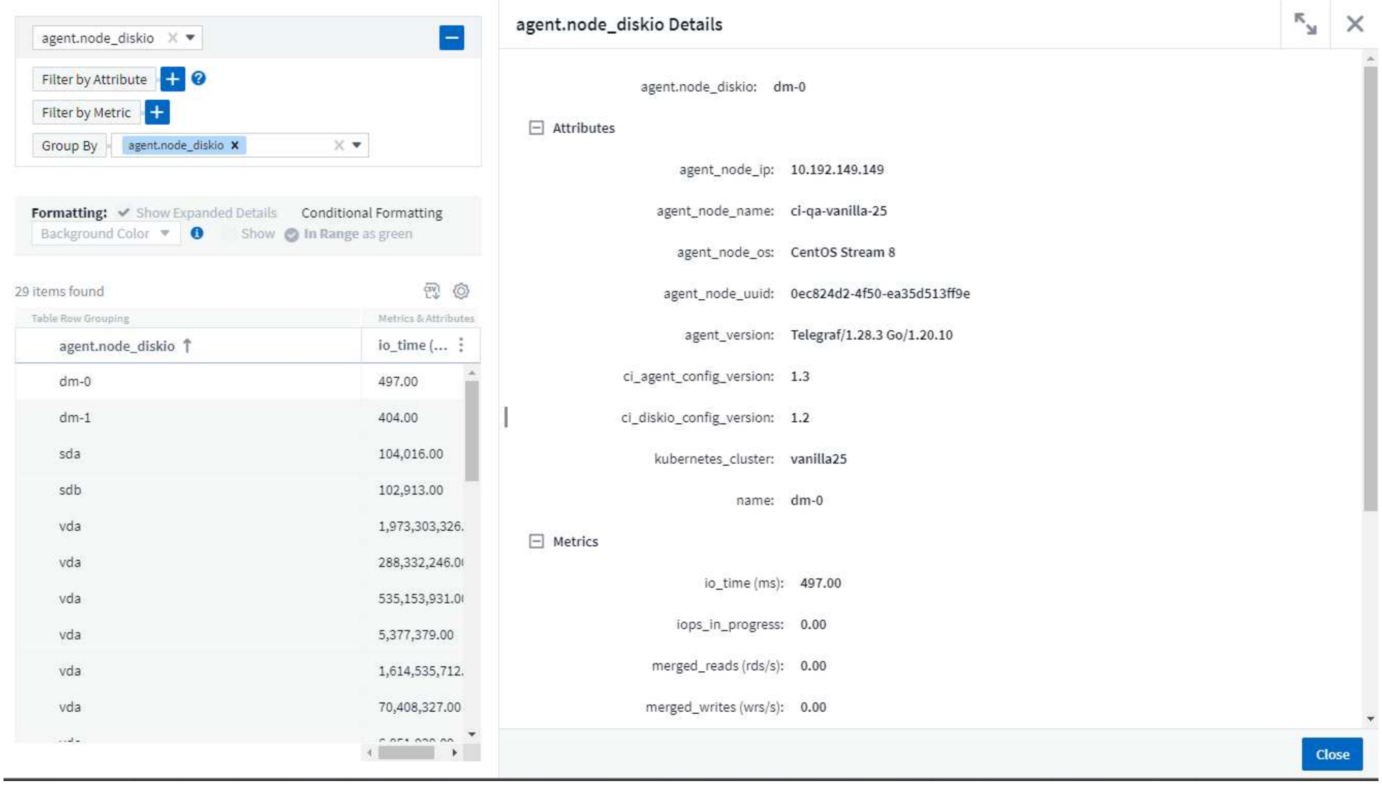
Workload Traffic Flows

97 items found

src_namespace	src_workload_name	dst_namespace	dst_workload...	tx_bytes_per...	rx_bytes_per_...	connections_t...	latency_rtt (ms)	retransı
prod-eu-monitoring	netapp-ci-telegraf-rs	N/A	ec2-52-58-144-...	1.99	0.18	4.32	96.31	0.23
log-alerts-monitoring	netapp-ci-telegraf-rs	N/A	10.192.35.71	18.61	0.32	17.64	0.24	0.13
log-alerts-monitoring	netapp-ci-net-observe...	N/A	10.192.35.71	1.18	0.03	1.00	0.03	0.12

Query Details on one screen

In a query, selecting a row opens a side panel showing attribute, annotation, and metric details for the selected row, providing helpful information without needing to drill into the object’s landing page. Links in the row or side panel allow for easy navigation.



29 items found

agent.node_diskio ↑	io_time (...
dm-0	497.00
dm-1	404.00
sda	104,016.00
sdb	102,913.00
vda	1,973,303,326.
vda	288,332,246.0
vda	535,153,931.0
vda	5,377,379.00
vda	1,614,535,712.
vda	70,408,327.00

agent.node_diskio Details

agent.node_diskio: dm-0

Attributes

agent_node_ip: 10.192.149.149

agent_node_name: ci-qa-vanilla-25

agent_node_os: CentOS Stream 8

agent_node_uuid: 0ec824d2-4f50-ea35d513ff9e

agent_version: Telegraf/1.28.3 Go/1.20.10

ci_agent_config_version: 1.3

ci_diskio_config_version: 1.2

kubernetes_cluster: vanilla25

name: dm-0

Metrics

io_time (ms): 497.00

iops_in_progress: 0.00

merged_reads (rds/s): 0.00

merged_writes (wrs/s): 0.00

Data Collector updates:

- **Brocade FOS REST**: This collector is moved out of "Preview" and is now generally available. Some things to note:
  - FOS introduced their REST API with FOS 8.2. But some features like routing only received REST API capabilities with 9.0.
  - If you have a fabric consisting of mixed FOS assets 8.2 higher, as well as some < 8.2, the Cloud Insights FOS REST collector will fail to discover those older assets. You can edit the FOS REST collector and build a comma-delimited list of the IPv4 address of those devices for exclusion from that collector.
- **SELinux**: Cloud Insights includes enhancements to the Linux Acquisition Unit initial installation to ensure robustness of operation within Linux environments with SELinux enforcement enabled. These enhancements only impact *new* AU deployments; if you have any SELinux issues relating to AU upgrades, contact NetApp Support to remediate your SELinux configuration.

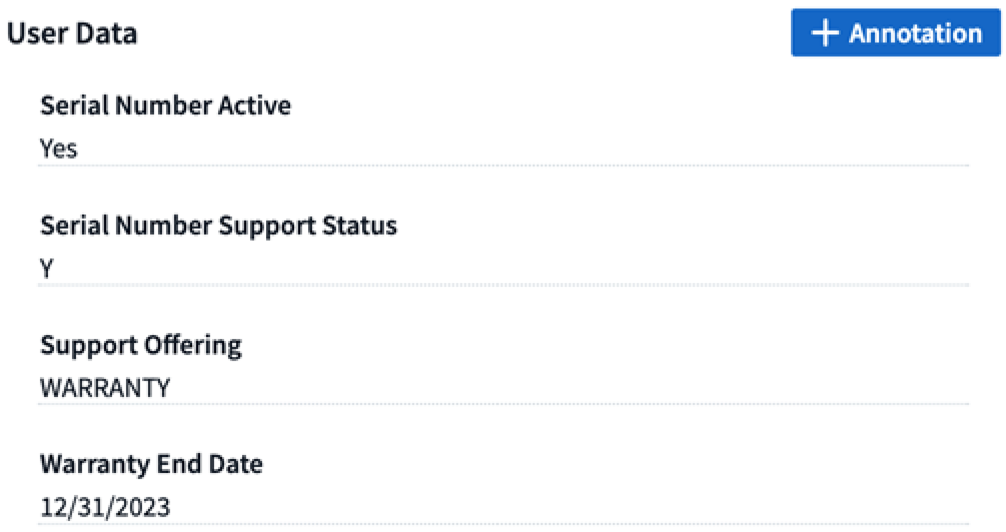
November 2023

Workload Security: Pause/Resume a Collector

In Workload Security, you can Pause a Data Collector if the collector is in *Running* state. Open the "three dots" menu for the collector and select PAUSE. While the collector is paused, no data is gathered from ONTAP, and no data is sent from the collector to ONTAP. Select Resume to begin collecting again.

Storage Node Support Information

On a storage node landing page, the *User Data* section provides at-a-glance information about your support offering, current status, support status, and warranty end date. Note that Cloud Insights currently only auto-publishes this information for NetApp devices. Note also that these support fields are annotations, so they can be used in queries and dashboards.



User Data

+ Annotation

Serial Number Active
Yes

Serial Number Support Status
Y

Support Offering
WARRANTY

Warranty End Date
12/31/2023

Map VMWare tags to Cloud Insights annotations

The VMWare data collector allows you to populate Cloud Insights text annotations with same-name tags that are configured on VMWare.

Brocade CLI collector reliability enhancements for FOS 9.1.1c and higher firmware

On some Brocade Fibre Channel switches running 9.1.1c firmware, certain CLI commands' output may be prepended with the “motd” login banner text, or warnings for users to change default passwords. The Brocade CLI collector has been enhanced to ignore these two types of extraneous text.

Prior to this enhancement, only FOS 9.1.1c switches without Virtual Fabrics present were likely discoverable with this collector type.

October 2023

Enhanced Workload Security

Workload Security has been improved with the following:

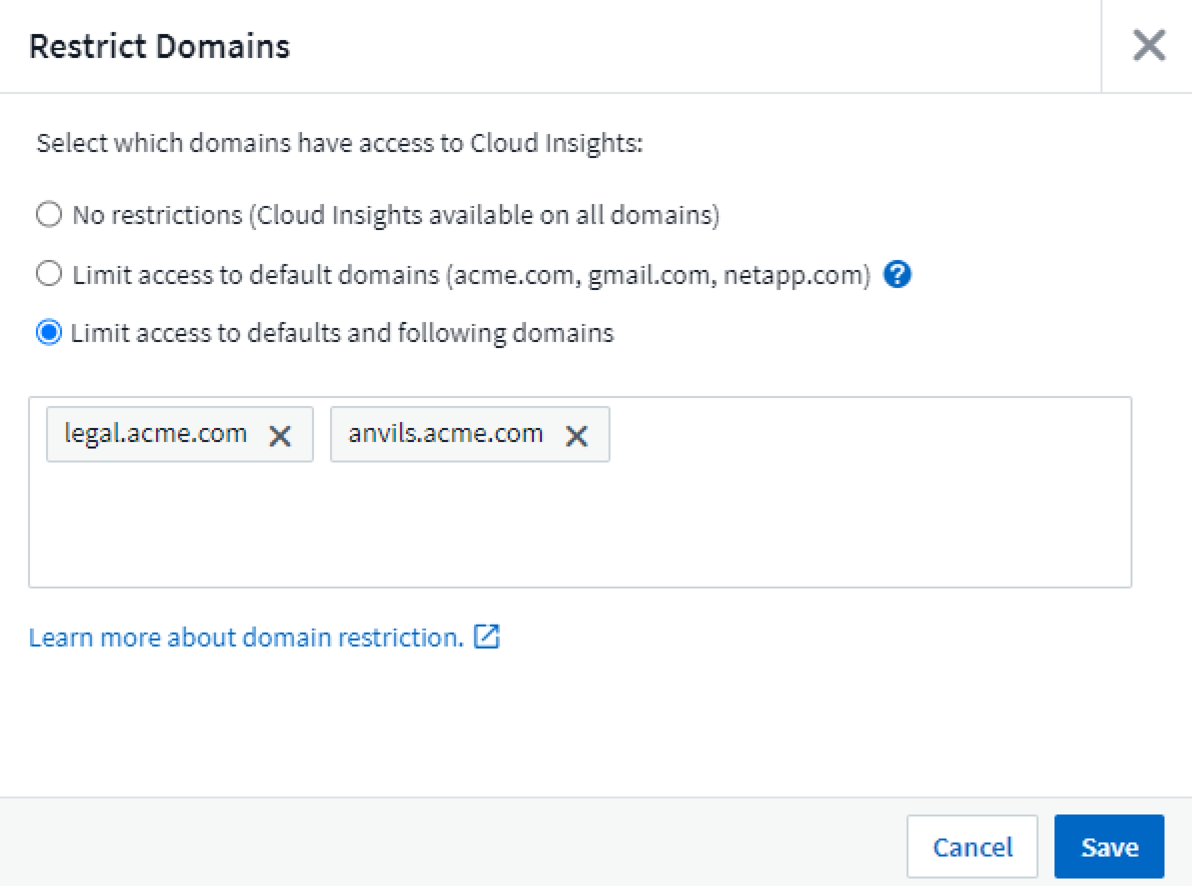
- **Access Denied**: Workload Security integrates with ONTAP to receive "Access Denied" events and provide an additional analytics and automatic responses layer.
- **Allowed File Types**: If a ransomware attack is detected for a known file extension, that file extension can be added to an allowed file types list to prevent unnecessary alerting.

Module Trials

In addition to your initial trial of Cloud Insights, you may also take advantage of Module Trials. For example, if you are already subscribed to Infrastructure Observability but are adding Kubernetes to your environment, you will automatically enter into a 30-day trial of Kubernetes Observability. You will only be charged for your Kubernetes Observability managed unit usage at the end of the trial period.

Restrict access to specified domains

Admins and Account Owners now have the ability to restrict Cloud Insights access to email domains they specify. Go to **Admin > User Management** and select the *Restrict Domains* button.



Restrict Domains

Select which domains have access to Cloud Insights:

○ No restrictions (Cloud Insights available on all domains)

○ Limit access to default domains (acme.com, gmail.com, netapp.com)

● Limit access to defaults and following domains

legal.acme.com ✕ anvils.acme.com ✕

Learn more about domain restriction.

Data Collector Updates

The following Data Collector/Acquisition Unit changes are in place:

- **Isilon / PowerScale REST**: Various new attributes and metrics have been added to Cloud Insights enhanced analytics capabilities under the *emc_isilon.node_pool.** name. These counters and attributes will empower users to build dashboards and monitors for *node_pool* capacity consumption; users with Isilon clusters built from dissimilar hardware node models will have multiple node pools, and understanding your HDD/SSD/total capacity consumption at a node pool level is useful for both monitoring and planning.
- **Rubrik** “Service account” authentication support: Cloud Insights' Rubrik collector now supports both traditional HTTP Basic Authentication (username and password), and Rubrik’s Service Account approach, which requires a username + secret + Organization ID.

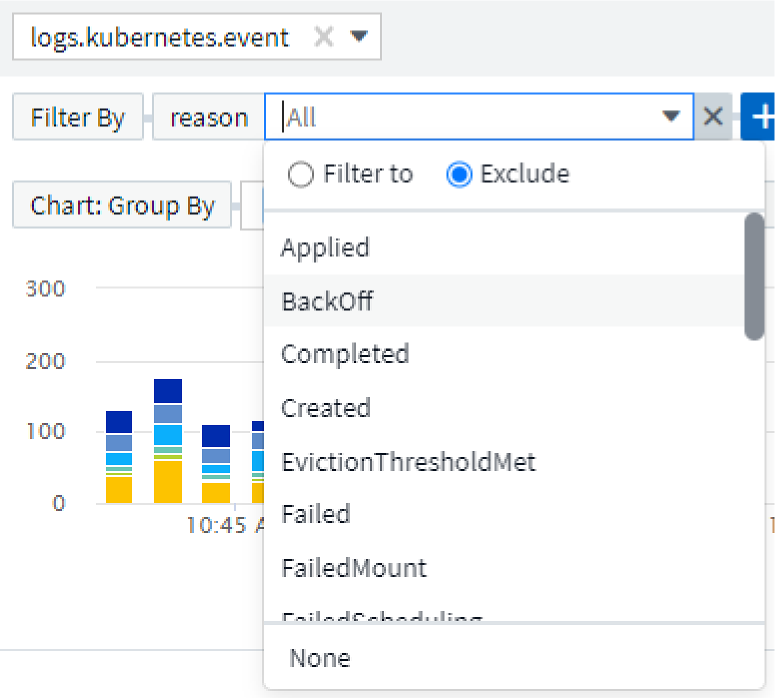
September 2023

Easily Find What You Want in the Logs

Log Query (**Observability > Log Queries > +New Log Query**) includes a number of enhancements to make log exploration easier and more informative.

Include/Exclude

When filtering for a value, you can easily choose whether to **Include** or **Exclude** results matching the filter. Selecting "Exclude" creates a "NOT <value>" filter. You can combine Include and Exclude values in a single filter.



Advanced Query

Advanced Querying gives you the opportunity to create "free form" filters, combining or excluding values using AND, NOT, OR, wildcards, etc.

The "Filter By" and Advanced Query are "AND"ed together to form a single query. The results are displayed in the results list and the chart.

Grouping in the Chart

When you select a log attribute to **Group By**, the list and chart show the results of the current filter. In the chart, columns grouped into colors. Hovering over a column in the chart will display details about the specific entries, similar to the overall information shown when you expand the chart Legend. In the legend, you can also choose to set an Include or Exclude filter for a specific grouping.

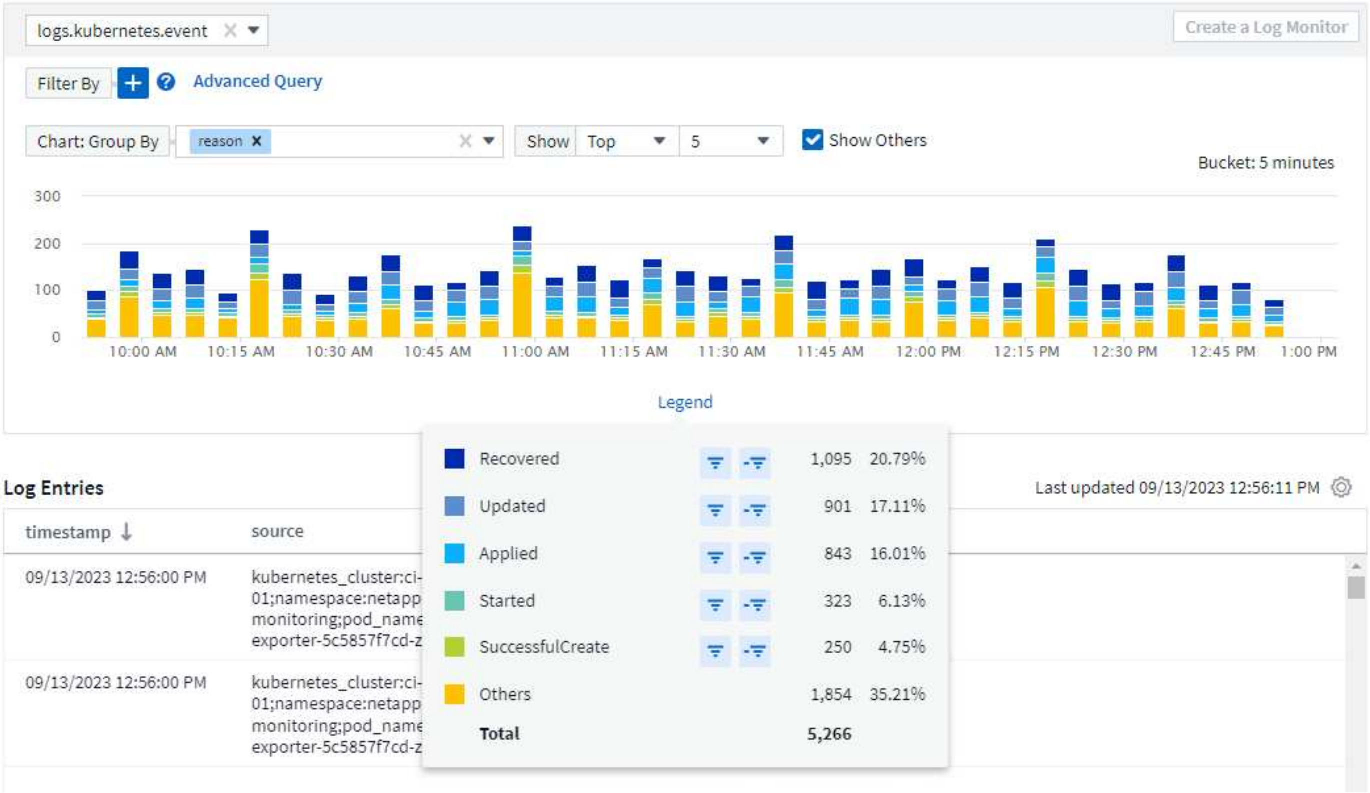


Chart: Group By reason

Show Top 5

☑ Show Others

Bucket: 5 minutes

Recovered		1,095	20.79%
Updated		901	17.11%
Applied		843	16.01%
Started		323	6.13%
SuccessfulCreate		250	4.75%
Others		1,854	35.21%
Total		**5,266**	

Log Entries

Last updated 09/13/2023 12:56:11 PM

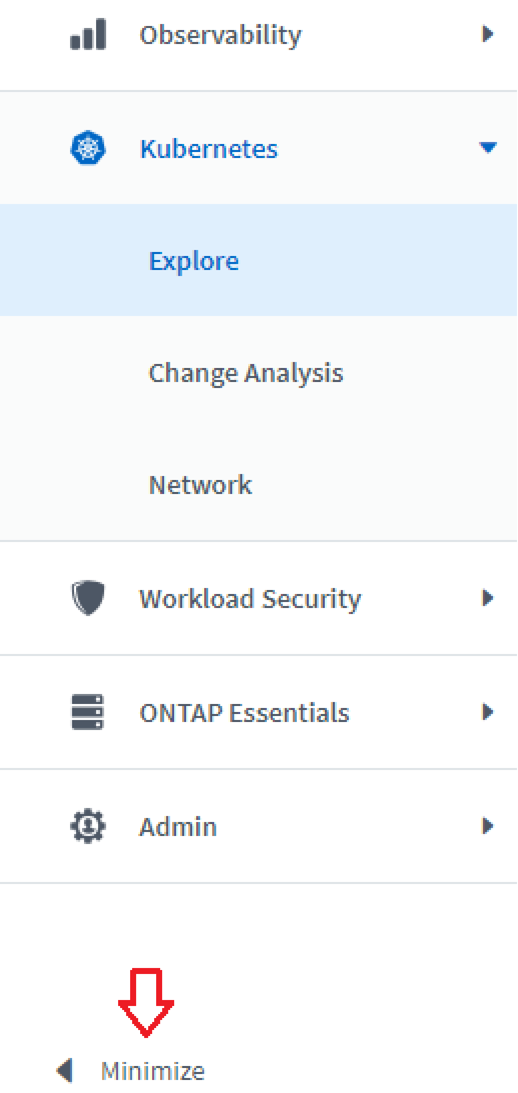
timestamp ↓	source
09/13/2023 12:56:00 PM	kubernetes_cluster:ci-01;namespace:netapp monitoring;pod_name exporter-5c5857f7cd-z
09/13/2023 12:56:00 PM	kubernetes_cluster:ci-01;namespace:netapp monitoring;pod_name exporter-5c5857f7cd-z

"Floating" Log Detail Panel

When exploring logs using the Log Query, selecting an entry in the list opens a detail panel for that entry. You can now choose to display that slideout panel "Floating" (i.e. displayed over the rest of the screen) or 'In Page" (i.e. displayed as its own frame within the page). To switch between these views, select the "In Page / Floating" button in the upper-right corner of the panel.

Collapse the Menu

You can collapse the left-side Cloud Insights navigation menu by selecting the "Minimize" button below the menu. While the menu is minimized, hover over an icon to see which section it opens; selecting the icon opens the menu and takes you directly to that section.



Data Collector Improvements

Cloud Insights has made it easier to show and find data collector information:

- **Processing of data collector lists** is more efficient, which means the time it takes to display and navigate these lists is greatly reduced. If you have a large environment with many data collectors, you will see a significant improvement when listing your data collectors.
- The **Data Collector Support Matrix** has moved from a .PDF file to an .HTML-based page, quicker to navigate and easier to maintain. Check out the new Matrix here: https://docs.netapp.com/us-en/cloudinsights/reference_data_collector_support_matrix.html

August 2023

Collecting Isilon/PowerScale Logs and Advanced Analytics Data

The Isilon REST and PowerScale REST collectors contain the following improvements:

- Isilon log events are available for use in queries and alerts
- Isilon Advanced Analytic attributes are available for use in queries, dashboards, and alerts:
    - emc_isilon.cluster
    - emc_isilon.node
    - emc_isilon.node_disk
    - emc_isilon.net_iface

These are enabled by default for users of the Isilon REST and/or PowerScale REST collectors. NetApp strongly encourages users of the Isilon CLI-based collector to migrate to the new REST API-based collector to receive enhancements such as the above.

Improved Workload Map

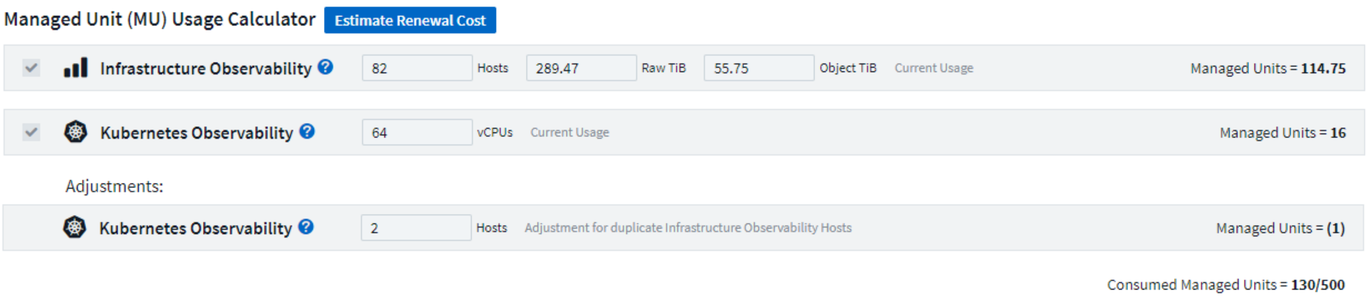
The workload map is more usable and less noisy; it groups all similar external services into one node if they communicate with the same workloads, reducing the complexity of the graph and making it easier to understand how services are interconnected.

Choosing a grouped node will display a detailed table with the network traffic metrics for each external service relevant to that node.

Kubernetes Managed Unit usage adjustment

In the event of a compute resource in your Kubernetes cluster environment being counted by both the NetApp Kubernetes Monitoring Operator and an underlying infrastructure data collector (for example, VMware), your usage of these resources will be adjusted to ensure the most efficient counting of managed units. You can view the Kubernetes MU adjustments on the Admin > Subscription page, in both the Summary and Usage tabs.

Summary tab:



Managed Unit (MU) Usage Calculator **Estimate Renewal Cost**

☑ Infrastructure Observability: 82 Hosts, 289.47 Raw TiB, 55.75 Object TiB, Current Usage — Managed Units = **114.75**

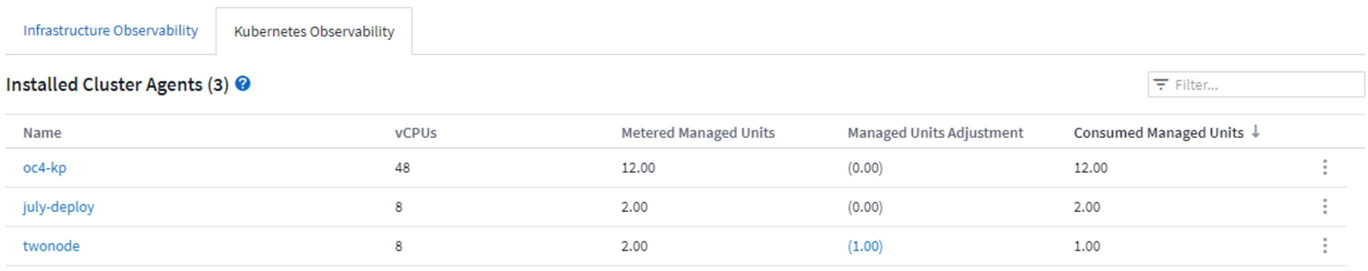
☑ Kubernetes Observability: 64 vCPUs, Current Usage — Managed Units = **16**

Adjustments:

Kubernetes Observability: 2 Hosts, Adjustment for duplicate Infrastructure Observability Hosts — Managed Units = **(1)**

Consumed Managed Units = **130/500**

Usage tab:



Installed Cluster Agents (3)

Name	vCPUs	Metered Managed Units	Managed Units Adjustment	Consumed Managed Units ↓
oc4-kp	48	12.00	(0.00)	12.00
july-deploy	8	2.00	(0.00)	2.00
twonode	8	2.00	(1.00)	1.00

Collector/Acquisition changes:

The following Data Collector/Acquisition Unit changes are in place:

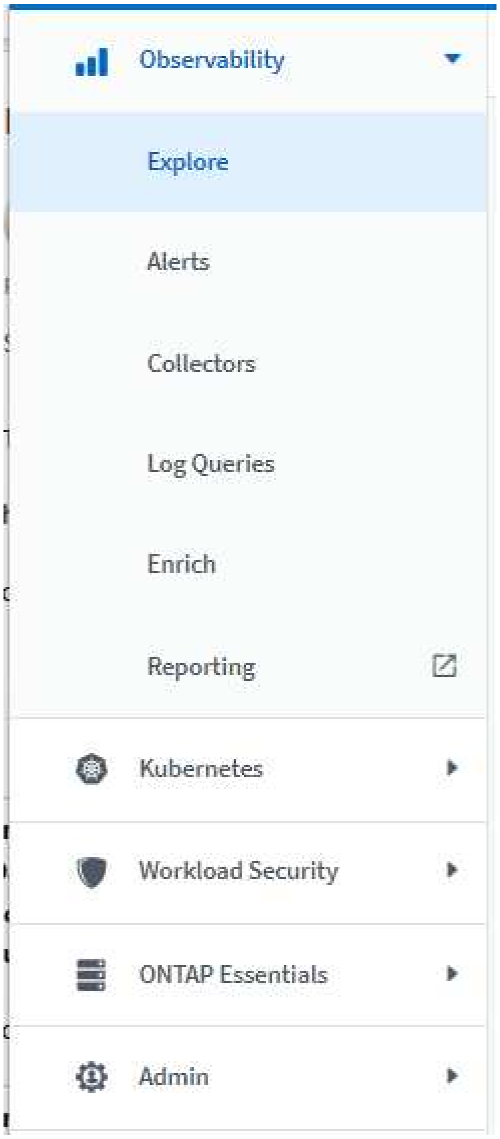
- Acquisition Units now support RHEL 8.7.

Improved Menus

We have updated the left hand navigation menu to better support our customers' workflows. New top level items such as *Kubernetes* provide accelerated access to what the customer needs, and a consolidated administrators console supports the tenant owner role.

Here are some additional examples of the changes:

- The top level *Observability* menu showcases data discovery, alerting and log queries
- ‘API Access’ functionality for Observability and Workload Security are under one menu
- Likewise for Observability and Workload Security ‘Notifications’ functionality, also now under one menu



Here is a brief list of the features you can find under each menu:

Observability:

- Explore (Dashboards, Metric Queries, Infrastructure Insights)

- Alerts (Monitors and Alerting)
- Collectors (Data Collectors and Acquisition Units)
- Log Queries
- Enrich (Annotations and Annotation Rules, Applications, Device Resolution)
- Reporting

Kubernetes:

- Cluster Exploration and Network Map

Workload Security:

- Alerts
- Forensics
- Collectors
- Policies

ONTAP Essentials:

- Data Protection
- Security
- Alerts
- Infrastructure
- Networking
- Workloads
  *VMware

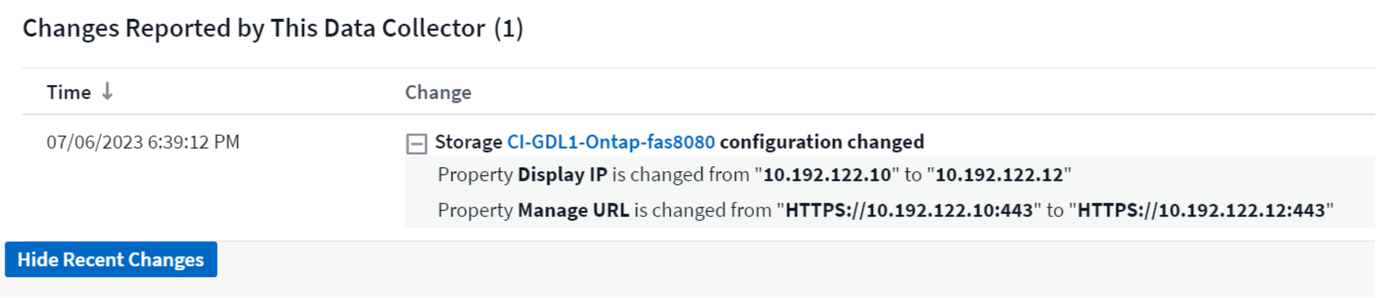
Admin:

- API Access
- Auditing
- Notifications
- Subscription Information
- User Management

July 2023

Show Recent Changes

Data Collector landing pages now include a list of recent changes. Simply click the "Recent Changes" button at the bottom of any data collector landing page to display recent data collector changes.



Changes Reported by This Data Collector (1)

Time ↓	Change
07/06/2023 6:39:12 PM	⊟ Storage CI-GDL1-Ontap-fas8080 configuration changed Property **Display IP** is changed from "**10.192.122.10**" to "**10.192.122.12**" Property **Manage URL** is changed from "**HTTPS://10.192.122.10:443**" to "**HTTPS://10.192.122.12:443**"

Operator Improvements

The following improvements have been made to Kubernetes Operator deployment:

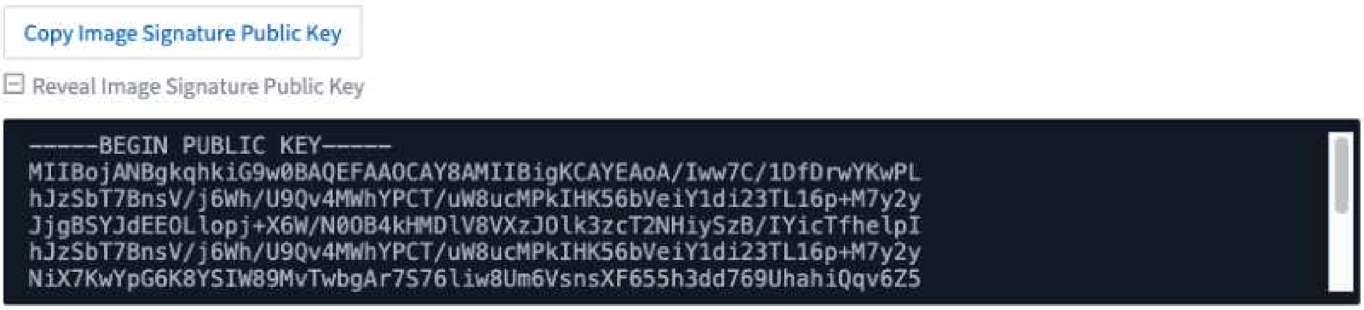
- Option to bypass docker metric collection
- Ability to add and customize tolerations to telegraf Daemonsets and Replicasets

Insight: Reclaim Cold Storage

The Reclaim ONTAP Cold Storage Insight now supports FlexGroups, and is now available to all customers.

Operator Image Signature

For customers who use a private repository for their NetApp Kubernetes Monitoring Operator, you can now copy the Image Signature Public Key during Operator installation, allowing you to confirm authenticity of the downloaded software. Select the *Copy Image Signature Public Key* button during the optional step to *Upload the operator image to your private repository*.



Copy Image Signature Public Key
⊟ Reveal Image Signature Public Key

```
-----BEGIN PUBLIC KEY-----
MIIBojANBgkqhkiG9w0BAQEFAAOCAY8AMIIBigKCAYEAoA/Iww7C/1DfDrwYKwPL
hJzSbT7BnsV/j6Wh/U9Qv4MWhYPCT/uW8ucMPkIHK56bVeiY1di23TL16p+M7y2y
JjgBSYJdEEOLlopj+X6W/N0OB4kHMDlV8VXzJOlk3zcT2NHiySzB/IYicTfhelpI
hJzSbT7BnsV/j6Wh/U9Qv4MWhYPCT/uW8ucMPkIHK56bVeiY1di23TL16p+M7y2y
NiX7KwYpG6K8YSIW89MvTwbgAr7S76liw8Um6VsnsXF655h3dd769UhahiQqv6Z5
```

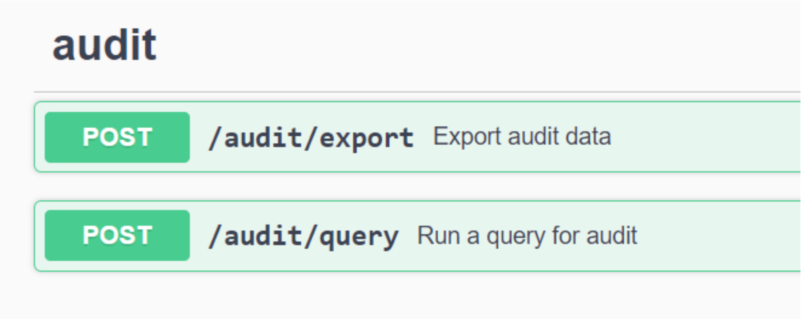
Aggregation, Conditional Formatting, and more for Queries

Aggregation, Unit Selection, Conditional Formatting, and Column Renaming are among the most useful features of a dashboard table widget, and now those same features are available for Queries.

These features are available now for integration-type data (Kubernetes, ONTAP Advanced Metrics, etc.), and will be coming soon for Infrastructure objects (storage, volume, switch, etc.).

API for Audit

You can now use an API to query or export Audited events. Go to Admin > API Access and select the *API Documentation* link for information.



audit
POST /audit/export Export audit data
POST /audit/query Run a query for audit

Data Collector: Trident Economy

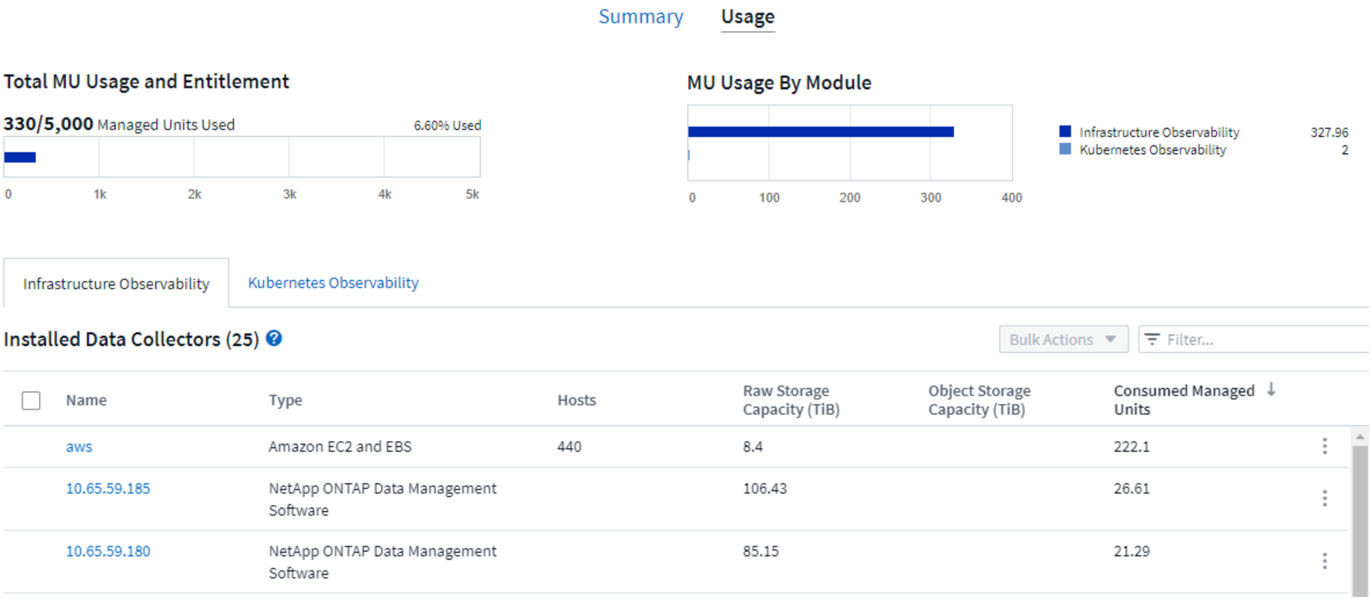
Cloud Insights now supports the Trident Economy Driver, realizing these benefits:

- Get visibility into pod-to-ONTAP Qtree mapping and performance metrics.
- Provide seamless troubleshooting and easy navigation from Kubernetes pods to backend storage
- Proactively detect backend performance issues with monitors

June 2023

Check out your Usage

Beginning in June, 2023, Cloud Insights provides a breakdown of Managed Unit usage based on Feature Set. Now you can quickly view and monitor managed unit (MU) usage for your Infrastructure as well as MU usage tied to Kubernetes.



Summary
Usage
Total MU Usage and Entitlement
330/5,000 Managed Units Used
6.60% Used
0
1k
2k
3k
4k
5k
MU Usage By Module
0
100
200
300
400
Infrastructure Observability 327.96
Kubernetes Observability 2
Infrastructure Observability
Kubernetes Observability
Installed Data Collectors (25)
Bulk Actions
Filter...

□	Name	Type	Hosts	Raw Storage Capacity (TiB)	Object Storage Capacity (TiB)	Consumed Managed Units ↓
	aws	Amazon EC2 and EBS	440	8.4		222.1
	10.65.59.185	NetApp ONTAP Data Management Software		106.43		26.61
	10.65.59.180	NetApp ONTAP Data Management Software		85.15		21.29

Kubernetes Network Monitoring and Map is available for all

The *Kubernetes Network Performance and Map* simplifies troubleshooting by mapping dependencies between Kubernetes workloads, providing real-time visibility into Kubernetes network performance latencies and anomalies to identify performance issues before they affect users. Many customers found it helpful during

Preview, and now it’s available for everyone to enjoy.

Collector/Acquisition changes:

The following Data Collector/Acquisition Unit changes are in place:

- Data Domain and Cohesity MUs are metered at 40 TiB : 1 MU.
- Acquisition Units now support RHEL and Rocky 9.0 and 9.1.

New ONTAP Essentials dashboards

The following ONTAP Essentials dashboards have been available in Preview environments, and now they are available for everyone:

- Security Dashboard
- Data Protection Dashboard (includes Local and Remote Protection overviews)

Additional System Monitors

The following System Monitors are included with Cloud Insights:

- Storage VM FCP Service Unavailable
- Storage VM iSCSI Service Unavailable

May 2023

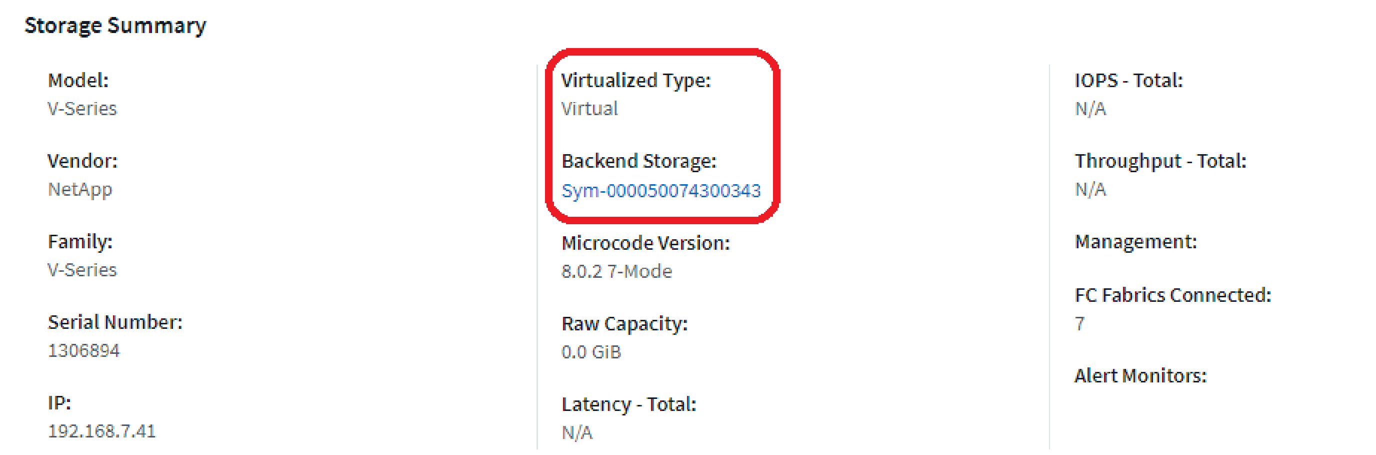
Improved Kubernetes Monitoring Operator Installation

Installation and configuration of the NetApp Kubernetes Monitoring Operator is easier than ever with the following improvements:

- Environment configuration settings are held in a single, self-documented config file.
- Step-by step instructions for uploading Kubernetes Monitoring Operator images to your private repository.
- Simple to upgrade with a single command to upgrade your Kubernetes Monitoring while keeping custom configurations.
- More secured: API keys are securely managing secrets.
- Easy to integrate and deploy with your CI/CD automation tools.

Storage Virtualization

Cloud Insights can differentiate between a storage array having local storage or virtualization of other storage arrays. This gives you the ability to relate cost and distinguish performance from the front-end all the way to the back-end of your infrastructure.



Storage Summary

Model:
V-Series

Vendor:
NetApp

Family:
V-Series

Serial Number:
1306894

IP:
192.168.7.41

Virtualized Type:
Virtual

Backend Storage:
Sym-000050074300343

Microcode Version:
8.0.2 7-Mode

Raw Capacity:
0.0 GiB

Latency - Total:
N/A

IOPS - Total:
N/A

Throughput - Total:
N/A

Management:

FC Fabrics Connected:
7

Alert Monitors:

New Webhook Parameters

When creating a Webhook notification, you can now include these parameters in your webhook definition:

- %%TriggeredOnKeys%%
- %%TriggeredOnValues%%

Reporting on Kubernetes data

Kubernetes data collected by Cloud Insights—including Persistent Volumes (PV), PVC, Workloads, Clusters, and Namespaces—is now available for use in Reporting, enabling chargeback, trending, forecasting, TTF calculations, and other business reporting on metrics for Kubernetes.

Default ONTAP System Monitors Enabled for New Customers

Many ONTAP System Monitors are enabled (i.e. *Resumed*) by default in new Cloud Insights environments. Previously, most monitors defaulted to *Paused* state. Because business needs vary from company to company, we always recommend taking a look at the system monitors in your environment and pausing or resuming each based on your alerting needs.

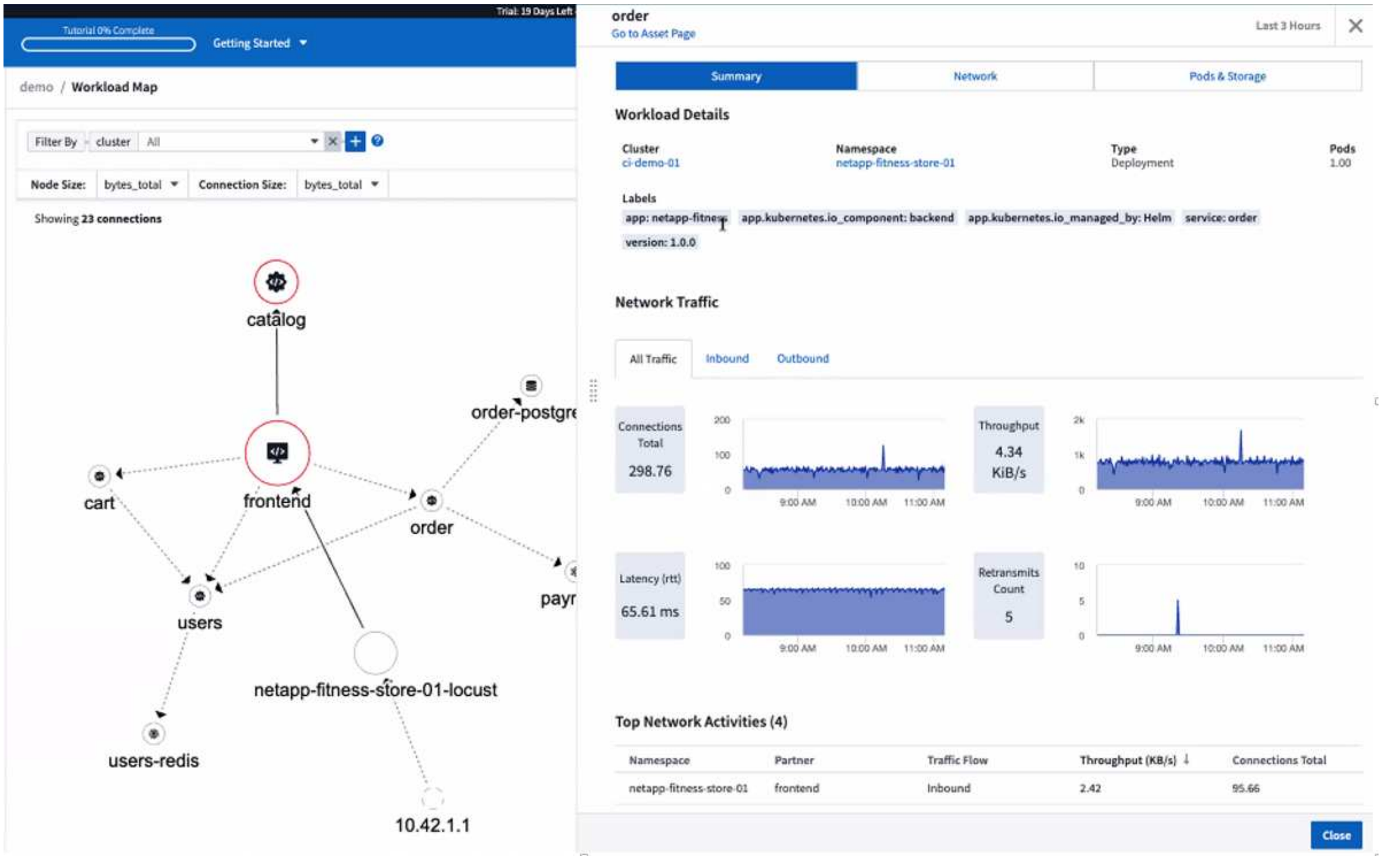
April 2023

Kubernetes Performance Monitoring and Map

The *Kubernetes Network Performance and Map* feature simplifies troubleshooting by mapping dependencies between Kubernetes workloads. It provides real-time visibility into Kubernetes network performance latencies and anomalies to identify performance issues before they affect users.
This capability helps organizations reduce overall costs by analyzing and auditing Kubernetes traffic flows.

Key Features:
• The Workload Map presents Kubernetes workload dependencies and flows and highlights network and performance issues.
• Monitor network traffic between Kubernetes pods, workloads, and nodes; identifies the source of traffic and latency problems.
• Reduce overall costs by analyzing ingress, egress, cross-region, and cross-zone network traffic.

Workload Map showing "Slideout" details:



order
Go to Asset Page

Workload Details

Cluster	Namespace	Type	Pods
ci-demo-01	netapp-fitness-store-01	Deployment	1.00

Labels

app: netapp-fitness app.kubernetes.io_component: backend app.kubernetes.io_managed_by: Helm service: order version: 1.0.0

Network Traffic

Connections Total 298.76

Throughput 4.34 KiB/s

Latency (rtt) 65.61 ms

Retransmits Count 5

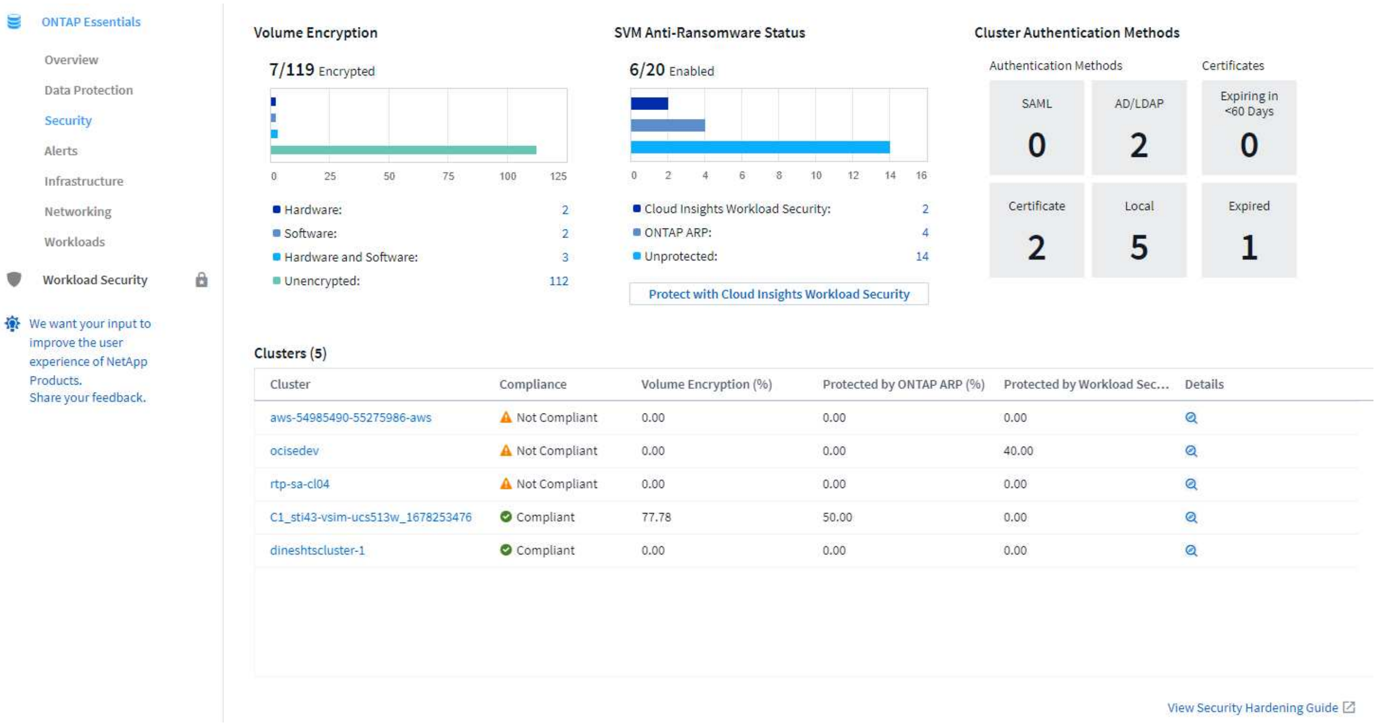
Top Network Activities (4)

Namespace	Partner	Traffic Flow	Throughput (KB/s) ↓	Connections Total
netapp-fitness-store-01	frontend	Inbound	2.42	95.66

Kubernetes Performance Monitoring and Map is available as a Preview feature.

ONTAP Essentials Security Dashboard

The Security Dashboard gives you an instant view of your current security situation, showing charts for hardware and software volume encryption, anti-ransomware status, and cluster authentication methods. The Security Dashboard is available as a Preview feature.



Volume Encryption

7/119 Encrypted

- Hardware: 2
- Software: 2
- Hardware and Software: 3
- Unencrypted: 112

SVM Anti-Ransomware Status

6/20 Enabled

- Cloud Insights Workload Security: 2
- ONTAP ARP: 4
- Unprotected: 14

Cluster Authentication Methods

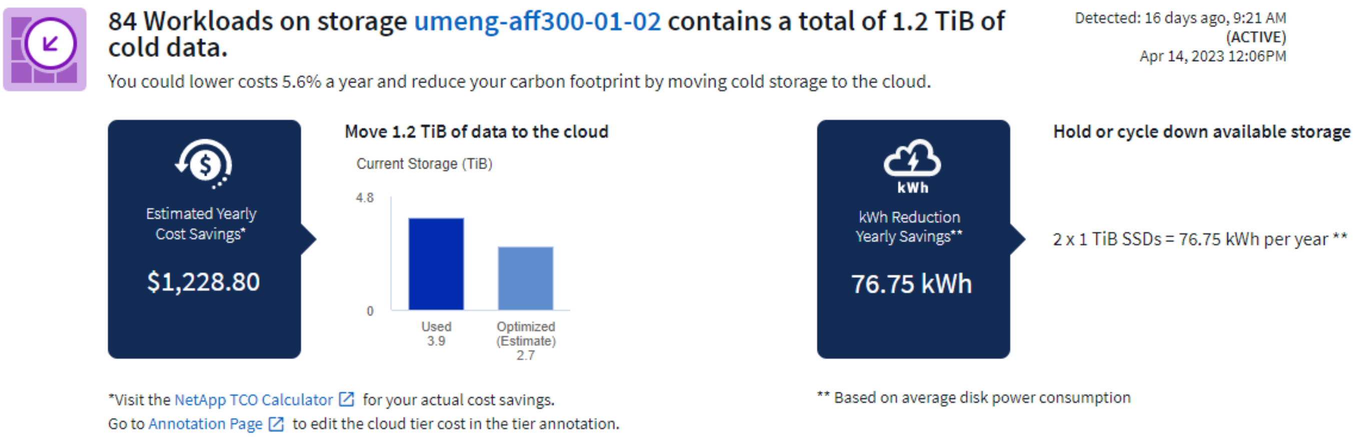
Authentication Methods		Certificates
SAML 0	AD/LDAP 2	Expiring in <60 Days 0
Certificate 2	Local 5	Expired 1

Clusters (5)

Cluster	Compliance	Volume Encryption (%)	Protected by ONTAP ARP (%)	Protected by Workload Sec...	Details
aws-54985490-55275986-aws	⚠ Not Compliant	0.00	0.00	0.00	🔍
ocisedev	⚠ Not Compliant	0.00	0.00	40.00	🔍
rtp-sa-cl04	⚠ Not Compliant	0.00	0.00	0.00	🔍
C1_sti43-vsim-ucs513w_1678253476	✓ Compliant	77.78	50.00	0.00	🔍
dineshtscluster-1	✓ Compliant	0.00	0.00	0.00	🔍

Reclaim ONTAP Cold Storage

The *Reclaim ONTAP Cold Storage* Insight provides data about cold capacity, potential cost/power savings, and recommended action items for volumes on ONTAP systems.


Move 1.2 TiB of data to the cloud
Current Storage (TiB)
4.8
0
Used
3.9
Optimized
(Estimate)
2.7
kWh
Hold or cycle down available storage

84 Workloads on storage umeng-aff300-01-02 contains a total of 1.2 TiB of cold data.

You could lower costs 5.6% a year and reduce your carbon footprint by moving cold storage to the cloud.

Detected: 16 days ago, 9:21 AM
(ACTIVE)
Apr 14, 2023 12:06PM

Estimated Yearly Cost Savings*
$1,228.80

kWh Reduction Yearly Savings**
76.75 kWh

2 x 1 TiB SSDs = 76.75 kWh per year **

*Visit the NetApp TCO Calculator for your actual cost savings.
Go to Annotation Page to edit the cloud tier cost in the tier annotation.

** Based on average disk power consumption

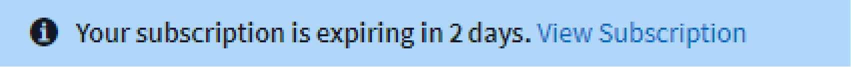
With this Insight, you can answer such questions as:

- What amount of cold data on a storage cluster are sitting on (a) high-cost SSD disks, (b) HDD disks, and (c) virtual disks?
- What workloads are the highest contributors in regards of the non-optimized storage?
- What is the duration (in days) the data has been cold on a given workload?

Reclaim ONTAP Cold Storage is considered a *Preview* feature and is therefore subject to change.

Subscription Notification also controls banner messages

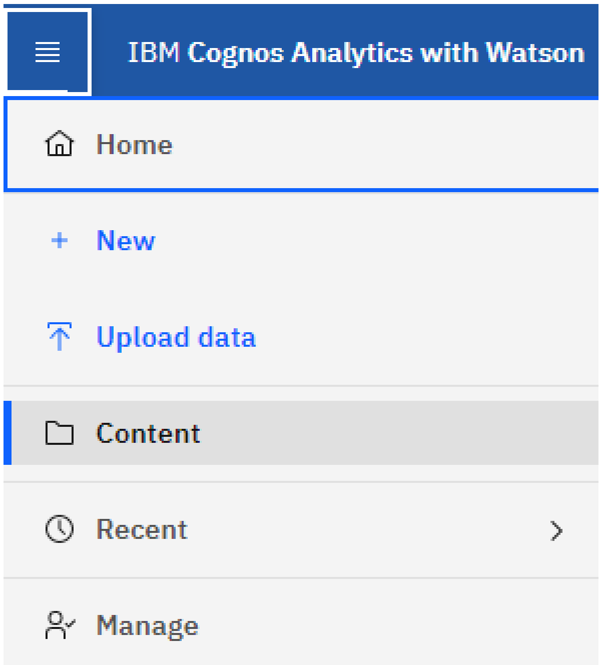
Setting recipients for Subscription Notifications (Admin > Notifications) now also controls who will see subscription-related in-product banner notifications.



Your subscription is expiring in 2 days. View Subscription

Reporting has a new look

You will notice that Cloud Insights Reporting screens have a new look, and that some of the menu navigation have changed. These screens and navigation changes have been updated in the current Reporting Documentation.



Monitors Paused by Default

For new Cloud Insights environments, be aware that system-defined monitors do not send alert notifications by default. You will need to enable notifications for any monitor that you want alerting you, by adding one or more delivery methods for the monitor.
For existing Cloud Insights environments, the default *global* notification recipient list has been removed for any system-defined monitors currently in *Paused* state. User-defined notifications remain unchanged, as do notification settings for currently active system-defined monitors.

Looking for the API Metering tab?

API Metering has moved from the Subscription page to the **Admin > API Access** page.

March 2023

Cloud Connection for ONTAP 9.9+ deprecated

The Cloud Connection for ONTAP 9.9+ data collector is being deprecated. Starting April 4, 2023, Cloud Connection data collectors in your environment will no longer collect data, and will instead present an error when polling. The Cloud Connection data collector will be removed altogether from Cloud Insights in a subsequent update.

Prior to April 4, 2023, it is mandatory to configure a new NetApp ONTAP Data Management Software data collector for any ONTAP systems currently collected by Cloud Connection. Learn More.

January 2023

New Log Monitors

We've added almost two dozen additional system monitors to alert for broken interconnect links, heartbeat problems, and more. Additionally, three new Data Protection log monitors have been added, to alert on SnapMirror Auto Resync, MetroCluster Mirroring, and FabricPool Mirror Resync changes.

Note that some of these monitors will be *enabled* by default; you must *pause* them if you do not wish to alert on them. Also note that these monitors are not configured to deliver notifications; you must configure notification recipients on these monitors if you want to send alerts via email or webhook.

.CSV Export for all Dashboard Table Widgets

Ensuring accessibility to your data is essential, so we've made .CSV export [.csv export icon] available for all metric queries, dashboard table widgets, and object landing pages, regardless of the type of data (asset or integration) you're querying.

Data customizations like column selection, renaming columns, and unit conversions are also now included in the new export functionality.

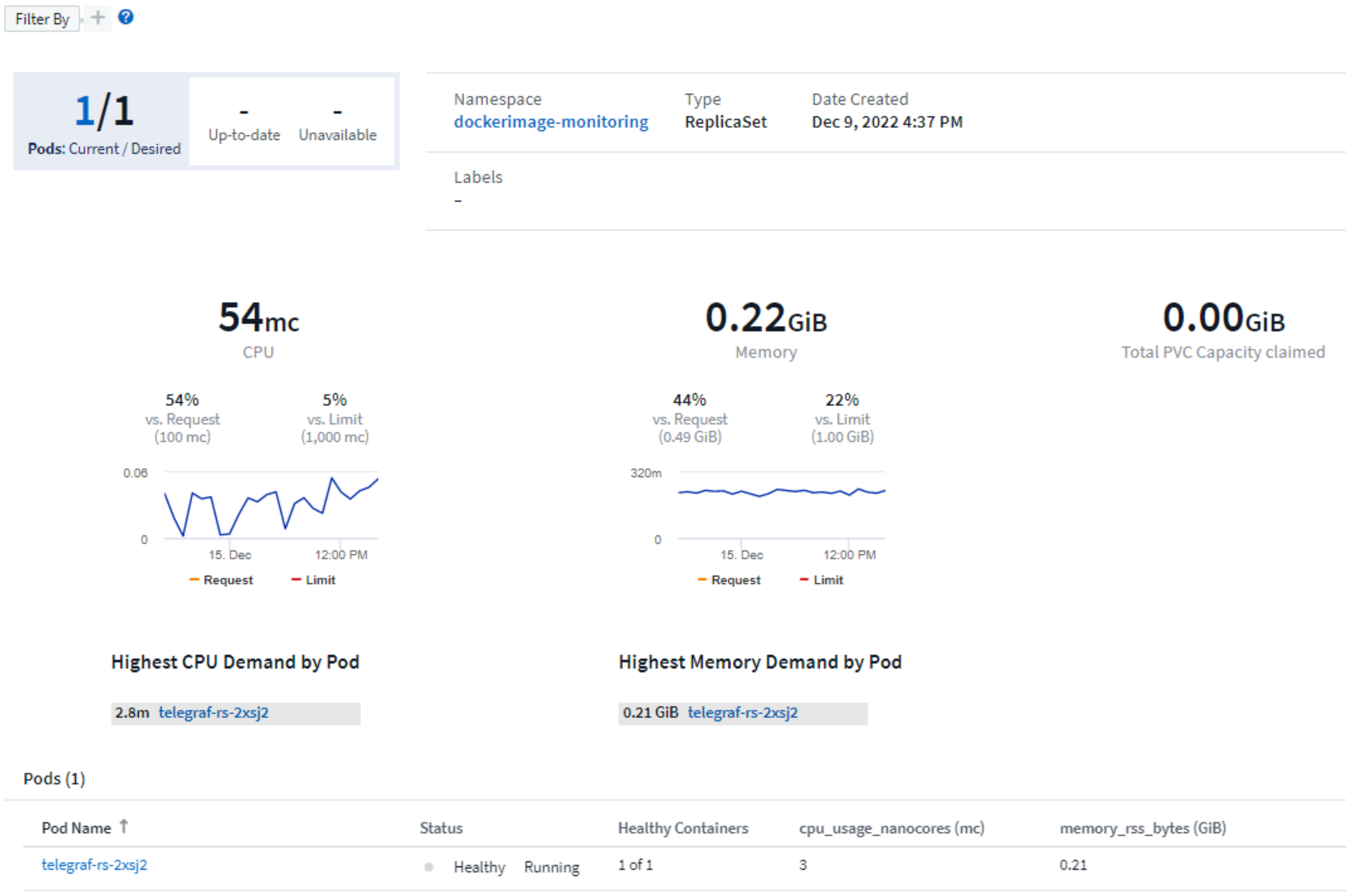
December 2022

Explore Ransomware Protection and other security features during Cloud Insights Trial

Starting today, signing up for a new Trial of Cloud Insights allows you to explore Security features such as Ransomware detection and automated user-blocking response policy. If you haven't signed up for your Trial, do it today!

Kubernetes Workloads have their own landing page

Workloads are a key part of your Kubernetes environment, so Cloud Insights now provides landing pages for those workloads. From here, you can view, explore, and troubleshoot issues that affect your Kubernetes workloads.



1/1
Pods: Current / Desired

- Up-to-date
- Unavailable

Namespace: dockerimage-monitoring
Type: ReplicaSet
Date Created: Dec 9, 2022 4:37 PM

Labels: -

54mc CPU — 54% vs. Request (100 mc); 5% vs. Limit (1,000 mc)

0.22GiB Memory — 44% vs. Request (0.49 GiB); 22% vs. Limit (1.00 GiB)

0.00GiB Total PVC Capacity claimed

Highest CPU Demand by Pod
2.8m telegraf-rs-2xsj2

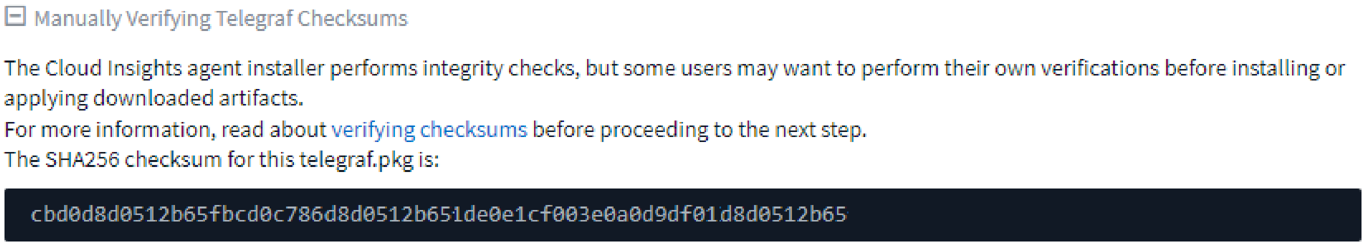
Highest Memory Demand by Pod
0.21 GiB telegraf-rs-2xsj2

Pods (1)

Pod Name ↑	Status	Healthy Containers	cpu_usage_nanocores (mc)	memory_rss_bytes (GiB)
telegraf-rs-2xsj2	● Healthy Running	1 of 1	3	0.21

Check your Checksums

You asked us to provide you with checksum values during installation of the agent for Windows and Linux and we think that’s a great idea. So here they are:



⊟ Manually Verifying Telegraf Checksums

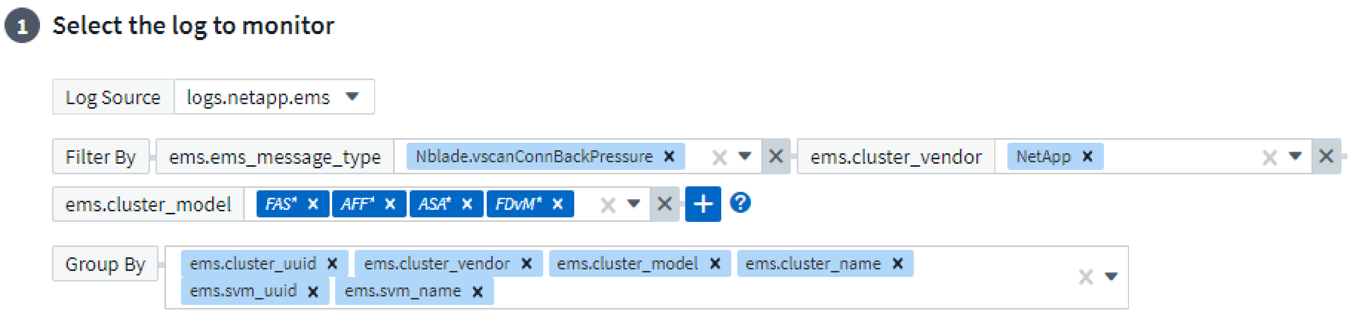
The Cloud Insights agent installer performs integrity checks, but some users may want to perform their own verifications before installing or applying downloaded artifacts.
For more information, read about verifying checksums before proceeding to the next step.
The SHA256 checksum for this telegraf.pkg is:

```
cbd0d8d0512b65fbcd0c786d8d0512b651de0e1cf003e0a0d9df01d8d0512b65
```

Log Alerting Improvements

Group By

When creating or editing a Log Monitor, you can now set "Group By" attributes to allow for more focused alerting. Look for the "Group By" attributes below the "filter" settings in your monitor definition.



1 Select the log to monitor

Log Source: logs.netapp.ems

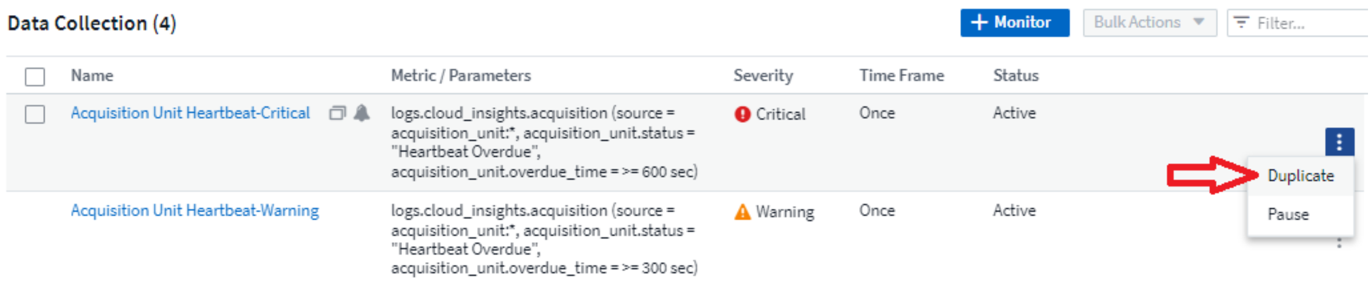
Filter By: ems.ems_message_type: Nblade.vscanConnBackPressure; ems.cluster_vendor: NetApp; ems.cluster_model: FAS*, AFF*, ASA*, FDvM*

Group By: ems.cluster_uuid, ems.cluster_vendor, ems.cluster_model, ems.cluster_name, ems.svm_uuid, ems.svm_name

This change brings Metric Monitors and Log Monitors into feature parity by normalizing the “Group By” aspect of Monitor Definitions. This parity will allow customers to clone/duplicate **all** system-defined default Monitors for further customization.

Duplicating

You can now clone (duplicate) the Change Log, Kubernetes Log, and Data Collector Log monitors. This creates a new custom log monitor that you can modify to your specific definitions.



Data Collection (4)

	Name	Metric / Parameters	Severity	Time Frame	Status
□	Acquisition Unit Heartbeat-Critical	logs.cloud_insights.acquisition (source = acquisition_unit:*, acquisition_unit.status = "Heartbeat Overdue", acquisition_unit.overdue_time = >= 600 sec)	Critical	Once	Active
	Acquisition Unit Heartbeat-Warning	logs.cloud_insights.acquisition (source = acquisition_unit:*, acquisition_unit.status = "Heartbeat Overdue", acquisition_unit.overdue_time = >= 300 sec)	Warning	Once	Active

11 New Default ONTAP Monitors covering SnapMirror for Business Continuity

We’ve added almost a dozen new system monitors for SnapMirror for Business Continuity (SMBC), which alert on changes to SMBC certificates and ONTAP Mediators.

November 2022

More than 40 new Security, Data Collection, and CVO monitors!

We’ve added dozens of new system-defined monitors to alert you to potential issues with Cloud Volumes, Security, and Data Protection. Read more about these monitors here.

October 2022

Better and more accurate Ransomware detection with ONTAP Autonomous Ransomware Protection integration

Cloud Secure improves ransomware detection through integration with ONTAP Autonomous Ransomware Protection (ARP).

Cloud Secure receives ONTAP ARP events on potential volume file encryption activity, and

- Correlates volume encryption events with user activity to identify who is causing the damage,
- Implements automatic response policies to block the attack,
- Identifies which files were affected, helping to recover faster and conduct data breach investigations.

September 2022

Monitors available in Basic Edition

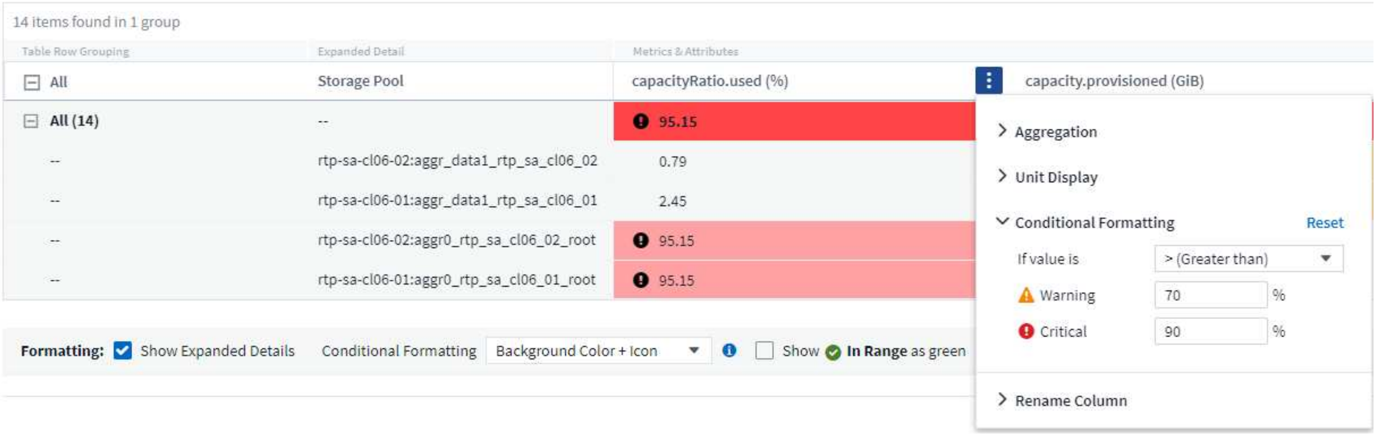
ONTAP Default monitors now available to use in Cloud Insights Basic Edition. This includes more than 70 infrastructure monitors and 30 workload examples.

ONTAP Power and StorageGRID dashboards

The dashboard gallery includes a new dashboard for ONTAP Power and Temperature as well as four dashboards for StorageGRID. If your environment is collecting ONTAP power metrics and/or StorageGRID data, import these dashboards by selecting **+From Gallery**.

At-a-glance threshold visibility in tables

Conditional Formatting allows you to set and highlight Warning-level and Critical-level thresholds in table widgets, bringing instant visibility to outliers and exceptional data points.



14 items found in 1 group

Table Row Grouping	Expanded Detail	Metrics & Attributes	
⊟ All	Storage Pool	capacityRatio.used (%)	capacity.provisioned (GiB)
⊟ All (14)	--	❗ 95.15	
--	rtp-sa-cl06-02:aggr_data1_rtp_sa_cl06_02	0.79	
--	rtp-sa-cl06-01:aggr_data1_rtp_sa_cl06_01	2.45	
--	rtp-sa-cl06-02:aggr0_rtp_sa_cl06_02_root	❗ 95.15	
--	rtp-sa-cl06-01:aggr0_rtp_sa_cl06_01_root	❗ 95.15	

Formatting: ☑ Show Expanded Details Conditional Formatting Background Color + Icon □ Show ✓ **In Range** as green

Conditional Formatting Reset

If value is > (Greater than)

⚠ Warning 70 %

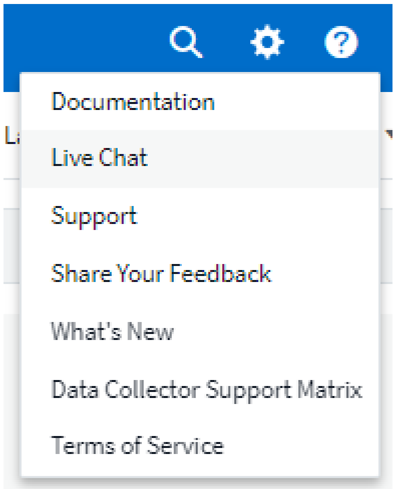
❗ Critical 90 %

Security Monitor

Cloud Insights can alert you when it detects that FIPS mode is disabled on the ONTAP system. Read more about System Monitors, and watch this space for more Security Monitors, coming soon!

Chat from Anywhere

Chat with a NetApp Support specialist from any Cloud Insights screen by selecting the new **Help > Live Chat** link. Help is available from the "?" icon in the upper right of the screen.



More visible Insights

If your environment is experiencing an Insight such as *Shared resources Under Stress* or *Kubernetes Namespaces Running Out of Space*, asset landing pages for resources affected now include links to the Insight itself, providing quicker exploration and troubleshooting.

New Data Collectors

- Amazon S3 (available in Preview)
- Brocade FOS 9.0.x
- Dell/EMC PowerStore 3.0.0.0

Other Data Collector Updates

All data sources are now optimized to resume performance polling after Acquisition Unit updates and/or patches.

Operating System support

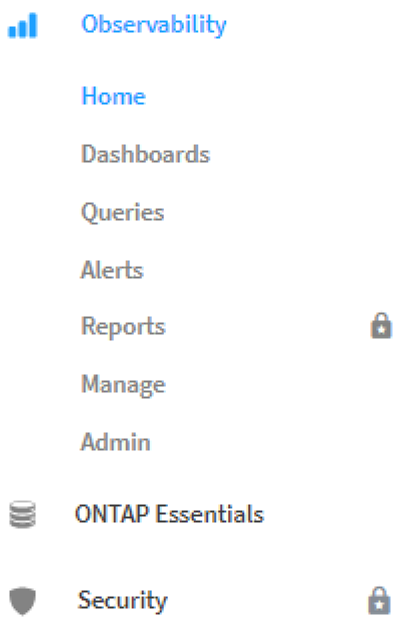
The following operating systems are supported with Cloud Insights Acquisition Units, in addition to those already supported:

- Red Hat Enterprise Linux 8.5, 8.6

August 2022

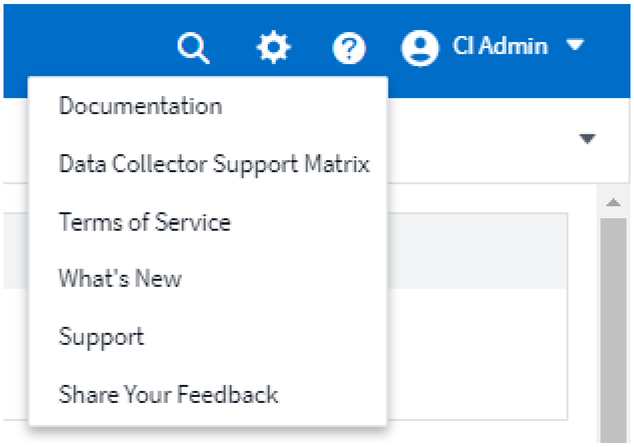
Cloud Insights has a new look!

Starting this month, "Monitor and Optimize" has been renamed **Observability**. You'll find all your favorite features like Dashboards, Queries, Alerts, and Reporting here. In addition, look for Cloud Secure under the new **Security** menu. Note that only the menus have changed; feature functionality remains the same.



Looking for the **Help** menu?

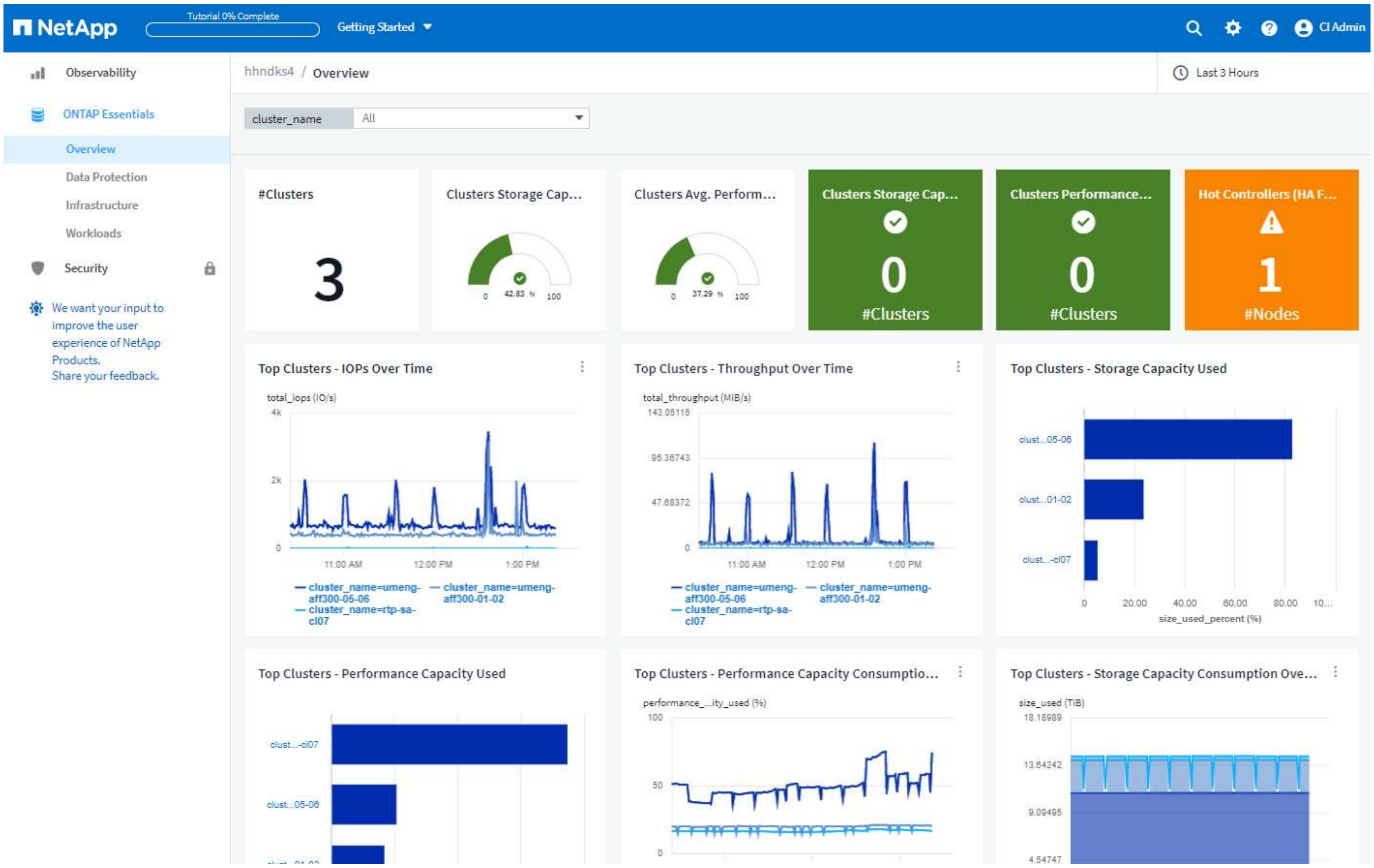
Help now lives in the upper right of the screen.



Not sure where to start? Check out ONTAP Essentials!

ONTAP Essentials is a set of dashboards and workflows that provide detailed views into your NetApp ONTAP inventories, workloads, and data protection, including days-to-full predictions for storage capacity and performance. You can even see if any controllers are running at high utilization. ONTAP Essentials is your ideal place for all of your NetApp ONTAP monitoring needs!

ONTAP Essentials—available in all Editions—is designed to be intuitive to existing ONTAP operators and administrators, easing the transition from ActiveIQ Unified Manager to service-based management tools.

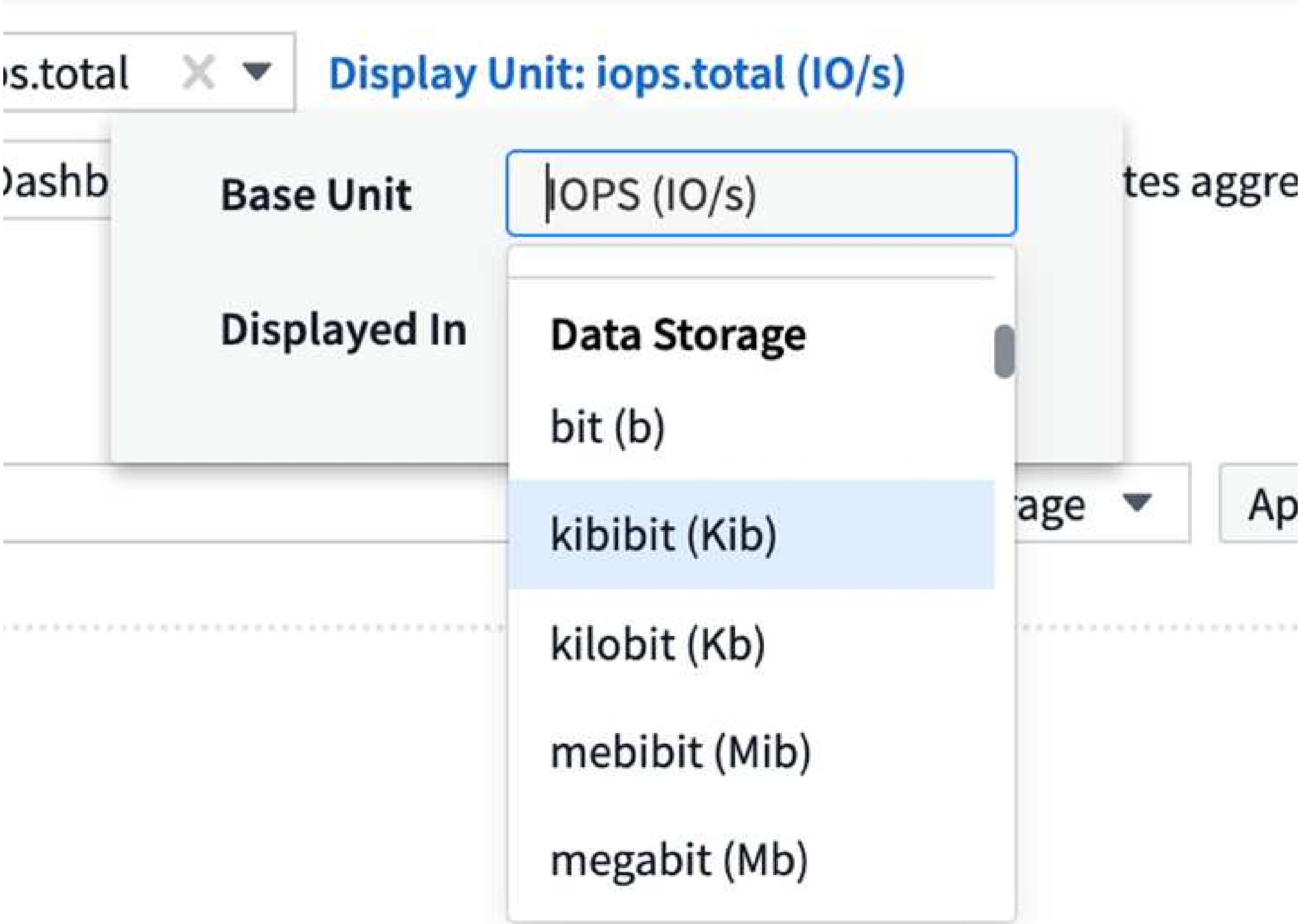


cluster_name: All

We want your input to improve the user experience of NetApp Products. Share your feedback.

Storage Data families are merged

You asked for it, and now you’ve got it. Storage base-2 and base-10 data units are now combined into one family, from bits and bytes to tebibits and terabytes, making it easier to display data your way on your dashboards. Data Rates are also now one big family of their own.



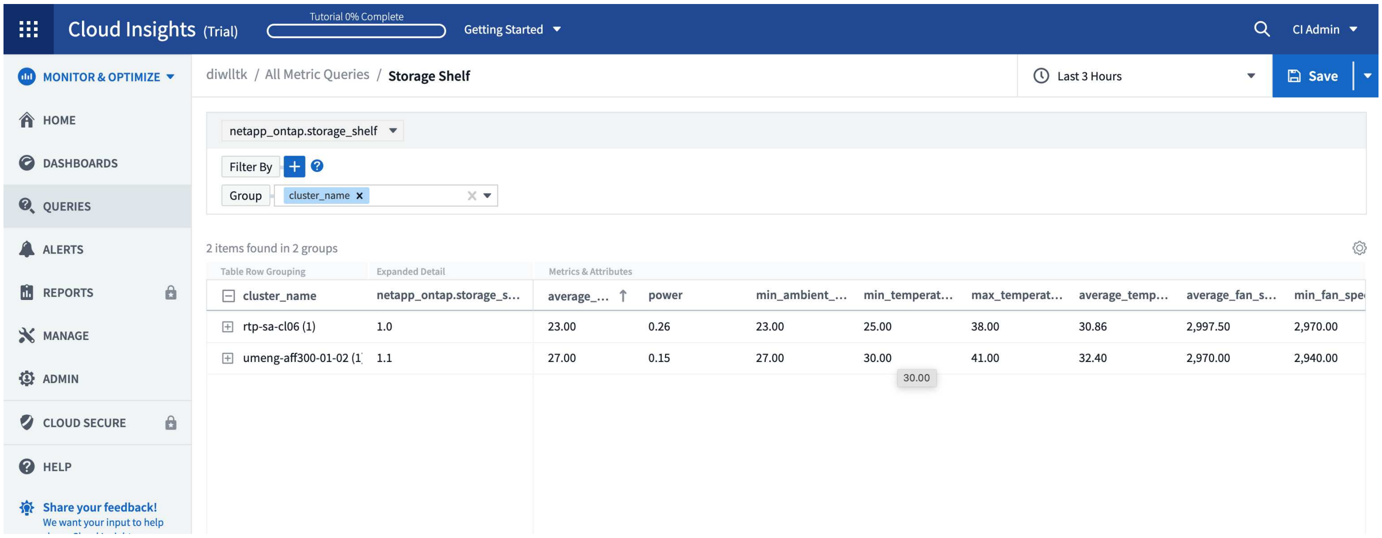
Display Unit: iops.total (IO/s)

Base Unit: IOPS (IO/s)

Displayed In

How much power is my storage using?

Display and monitor your ONTAP storage shelf and node power consumption, temperature, and fan speed, using the netapp_ontap.storage_shelf, netapp_ontap.system_node and netapp_ontap.cluster (power consumption only) metrics.



netapp_ontap.storage_shelf

Filter By

Group: cluster_name

2 items found in 2 groups

Table Row Grouping	Expanded Detail	Metrics & Attributes							
cluster_name	netapp_ontap.storage_s...	average_...	power	min_ambient_...	min_temperat...	max_temperat...	average_temp...	average_fan_s...	min_fan_spe
rtp-sa-cl06 (1)	1.0	23.00	0.26	23.00	25.00	38.00	30.86	2,997.50	2,970.00
umeng-aff300-01-02 (1	1.1	27.00	0.15	27.00	30.00	41.00	32.40	2,970.00	2,940.00

Features graduated from Preview

The following features have moved out of Preview and are now available to all customers:

Feature	Description
Kubernetes Namespaces Running out of Space	The *Kubernetes Namespaces Running Out of Space* Insight gives you a view into workloads on your Kubernetes namespaces that are at risk of running out of space, with an estimate for the number of days remaining before each space becomes full. Read More
Shared Resource Under Stress	The *Shared Resource Under Stress* insight uses AI/ML to automatically identify where resource contention is causing performance degradation in your environment, highlights any workloads impacted by it, and provides recommended actions to remediate, letting you solve performance issues more quickly. Read More
Cloud Secure – Block user access on attack	Greater protection for your business-critical data with the ability to block user access when an attack is detected. Access can be blocked automatically, using Automated Response Policies, or manually from the alert or user details pages. Read More

How’s my data collection health?

Cloud Insights provides two new heartbeat monitors for your Acquisition Units, as well as two monitors to alert you to data collector failures. These can be used to alert you quickly to data collection issues.

The following monitors are now available in the *Data Collection* monitor group:

- Acquisition Unit Heartbeat-Critical
- Acquisition Unit Heartbeat-Warning
- Collector Failed
- Collector Warning

Note that these monitors are in *Paused* state by default. Activate them to be alerted about data collection issues.

Auto-Renewing API Tokens

API Access Tokens can now be set for auto-renewal. By enabling this feature, new/refreshed API Access Tokens will automatically be generated for expiring tokens. Cloud Insights agents using an expiring token will automatically be updated to use the corresponding new/refreshed API Access Token, allowing them to continue to operate seamlessly. Simply check the “Renew token automatically” box when creating your token. This feature is currently supported on Cloud Insights agents running on the Kubernetes platform with the latest NetApp Kubernetes Monitoring Operator.

Basic Edition gives you more than before

Your trial is ending but you're not yet sure whether a subscription is right for you? Basic Edition has always given you a chance to continue using Cloud Insights with your current ONTAP data collector, but now you can continue capturing VMWare version, topology, and IOPS/Throughput/Latency data as well. NetApp customers with premium support on their storage systems will also be entitled to support for Cloud Insights.

Ready to learn more?

Check out the **Learning Center** section of the Help > Support page for links to NetApp University Cloud Insights course offerings!

Operating System support

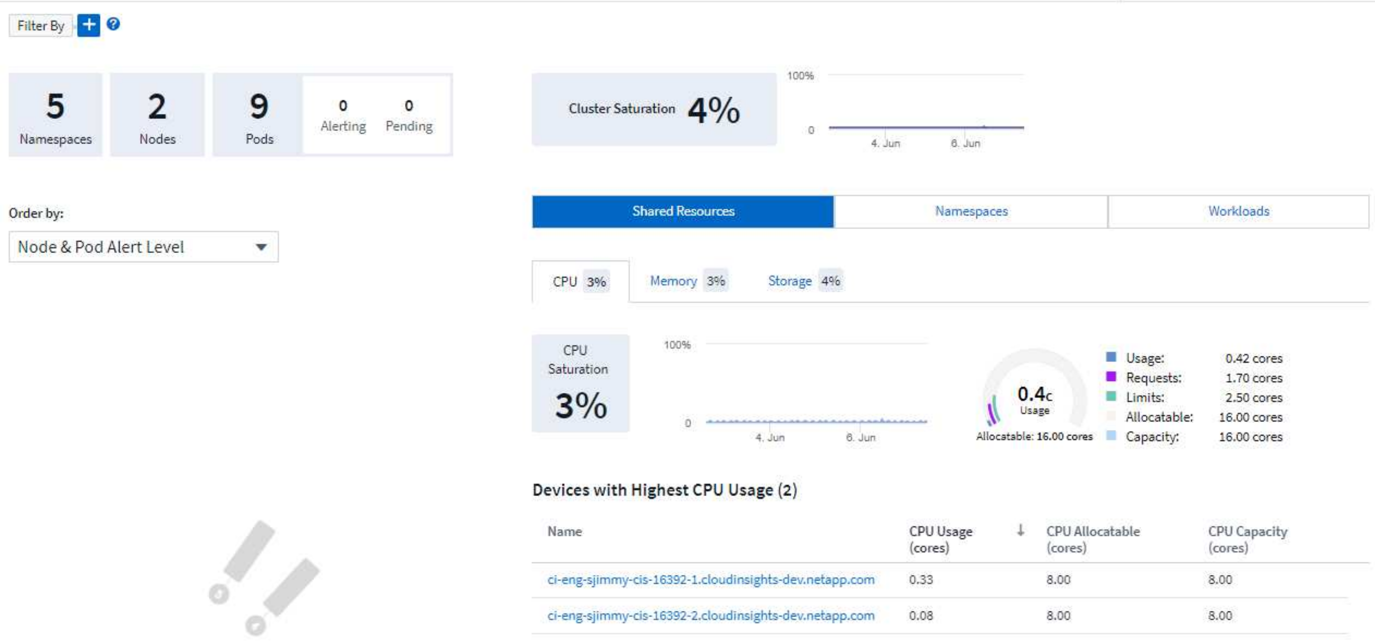
The following operating system is supported with Cloud Insights Acquisition Units, in addition to those already supported:

- Windows 11

June 2022

Kubernetes cluster saturation and other details

Cloud Insights makes it easier than ever to explore your Kubernetes environment, with an improved cluster detail page that provides Saturation details as well as a cleaner view into Namespaces and Workloads.

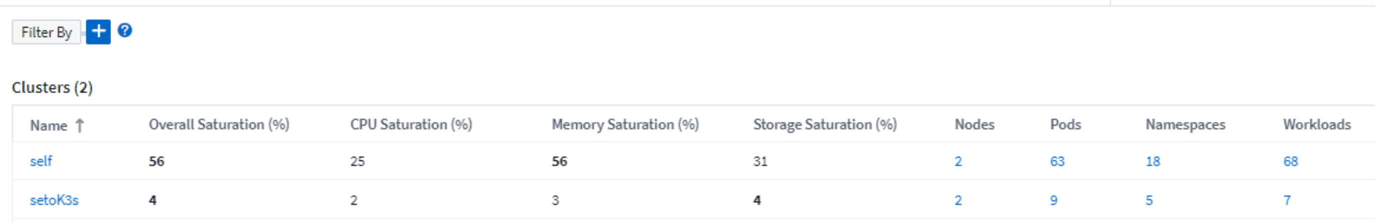


🟦 Usage:	0.42 cores
🟪 Requests:	1.70 cores
🟩 Limits:	2.50 cores
Allocatable:	16.00 cores
🟦 Capacity:	16.00 cores

Devices with Highest CPU Usage (2)

Name	CPU Usage (cores) ↓	CPU Allocatable (cores)	CPU Capacity (cores)
ci-eng-sjimmy-cis-16392-1.cloudinsights-dev.netapp.com	0.33	8.00	8.00
ci-eng-sjimmy-cis-16392-2.cloudinsights-dev.netapp.com	0.08	8.00	8.00

The Cluster list page also gives you a quick view of saturation, in addition to Node, Pod, Namespace, and Workload counts:

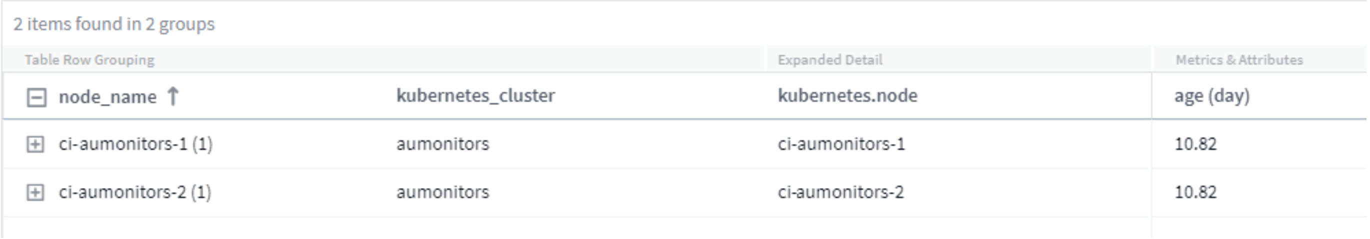


Clusters (2)

Name ↑	Overall Saturation (%)	CPU Saturation (%)	Memory Saturation (%)	Storage Saturation (%)	Nodes	Pods	Namespaces	Workloads
self	56	25	56	31	2	63	18	68
setoK3s	4	2	3	4	2	9	5	7

How old is your Kubernetes cluster?

Is your cluster just starting in the world, or has it experienced a long digital life? *Age* has been added as a time metric collected for Kubernetes Nodes.

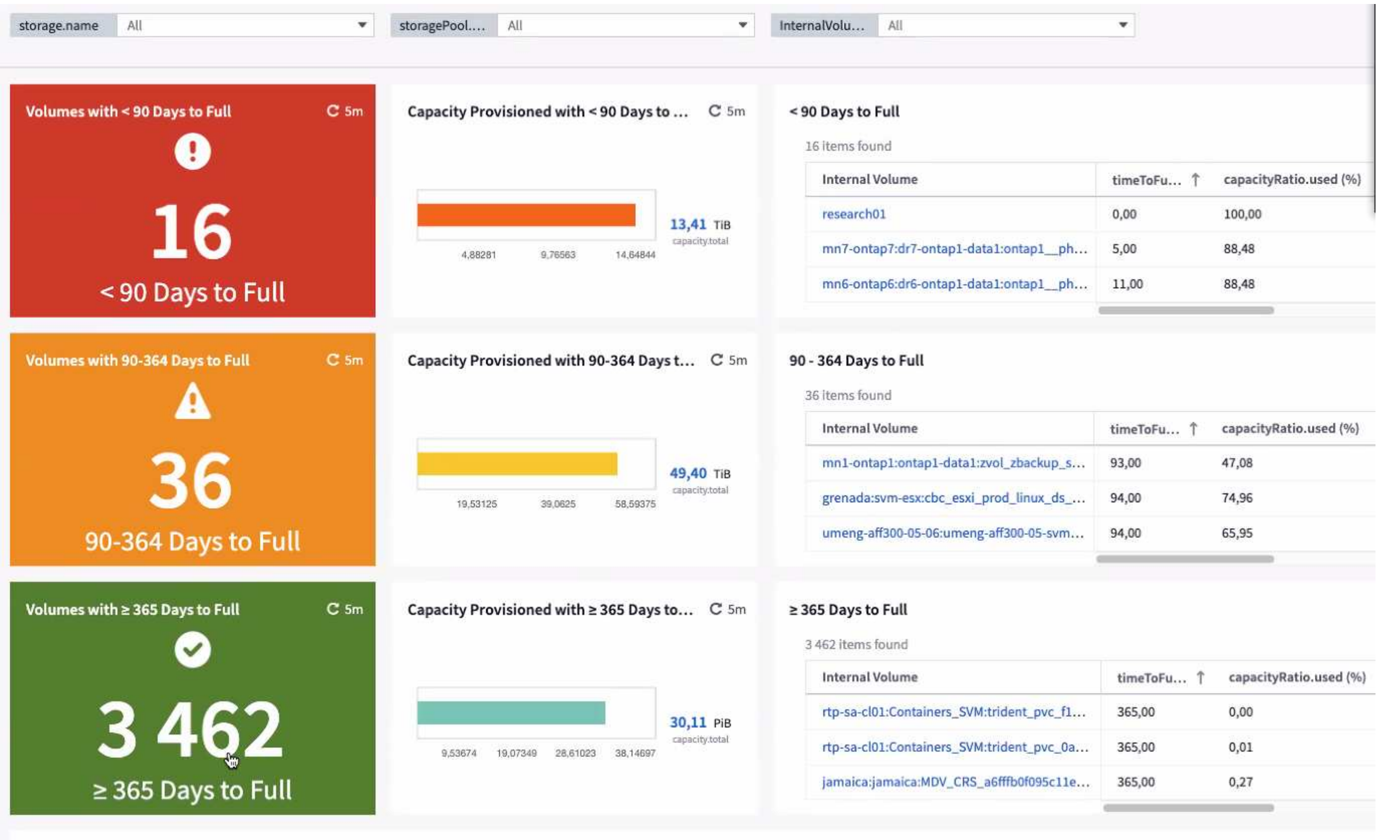


2 items found in 2 groups

Table Row Grouping		Expanded Detail	Metrics & Attributes
⊟ node_name ↑	kubernetes_cluster	kubernetes.node	age (day)
⊞ ci-aumonitors-1 (1)	aumonitors	ci-aumonitors-1	10.82
⊞ ci-aumonitors-2 (1)	aumonitors	ci-aumonitors-2	10.82

Capacity Time-to-Full forecasting

Cloud Insights provides a dashboard to forecast the number of days until capacity runs out for each Internal Volume monitored. These values can help to significantly reduce the risk of an outage.



< 90 Days to Full

16 items found

Internal Volume	timeToFu... ↑	capacityRatio.used (%)
research01	0,00	100,00
mn7-ontap7:dr7-ontap1-data1:ontap1__ph...	5,00	88,48
mn6-ontap6:dr6-ontap1-data1:ontap1__ph...	11,00	88,48

90 - 364 Days to Full

36 items found

Internal Volume	timeToFu... ↑	capacityRatio.used (%)
mn1-ontap1:ontap1-data1:zvol_zbackup_s...	93,00	47,08
grenada:svm-esx:cbc_esxi_prod_linux_ds_...	94,00	74,96
umeng-aff300-05-06:umeng-aff300-05-svm...	94,00	65,95

≥ 365 Days to Full

3 462 items found

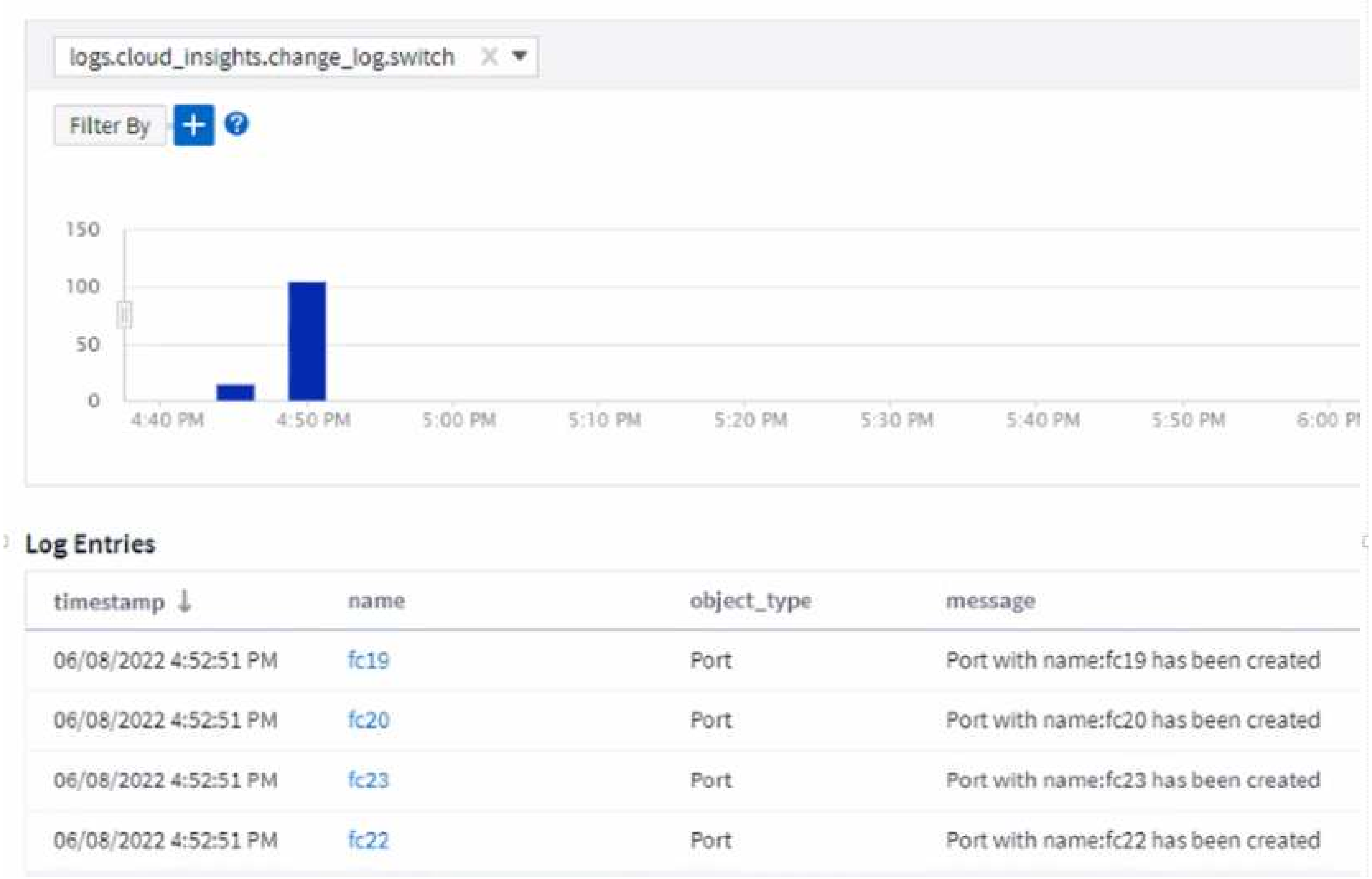
Internal Volume	timeToFu... ↑	capacityRatio.used (%)
rtp-sa-cl01:Containers_SVM:trident_pvc_f1...	365,00	0,00
rtp-sa-cl01:Containers_SVM:trident_pvc_0a...	365,00	0,01
jamaica:jamaica:MDV_CRS_a6fffb0f095c11e...	365,00	0,27

TTF counters are also available for Storage, Storage Pool, and Volume. Keep watching this space for additional dashboards for these objects.

Note that Time-to-Full forecasting is moving out of *Preview* and will be rolled out to all customers.

What’s changed in my environment?

ONTAP change log entries can be viewed in the log explorer.



Log Entries

timestamp ↓	name	object_type	message
06/08/2022 4:52:51 PM	fc19	Port	Port with name:fc19 has been created
06/08/2022 4:52:51 PM	fc20	Port	Port with name:fc20 has been created
06/08/2022 4:52:51 PM	fc23	Port	Port with name:fc23 has been created
06/08/2022 4:52:51 PM	fc22	Port	Port with name:fc22 has been created

Operating System support

The following operating systems are supported with Cloud Insights Acquisition Units, in addition to those already supported:

- CentOS Stream 9
- Windows 2022

Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version **1.22.3**, with performance and security improvements.
Users wishing to update can refer to the appropriate upgrade section of the Agent Installation documentation.
Previous versions of the agent will continue to function with no user action required.

Preview Features

Cloud Insights regularly highlights a number of exciting new preview features. If you are interested in previewing one or more of these features, contact your NetApp Sales Team for more information.

Feature	Description
Kubernetes Namespaces Running out of Space	The *Kubernetes Namespaces Running Out of Space* Insight gives you a view into workloads on your Kubernetes namespaces that are at risk of running out of space, with an estimate for the number of days remaining before each space becomes full. Read More
Cloud Secure – block user access on attack	Greater protection for your business-critical data with the ability to block user access when an attack is detected. Access can be blocked automatically, using Automated Response Policies or manually from the alert or user details pages. Read More
Shared Resource Under Stress	The *Shared Resource Under Stress* insight uses AI/ML to automatically identify where resource contention is causing performance degradation in your environment, highlights any workloads impacted by it, and provides recommended actions to remediate, letting you solve performance issues more quickly. Read More

May 2022

Chat live with NetApp Support

You can now chat live with NetApp Support personnel! On the Help > Support page, simply click the Chat icon or click *Chat* in the "Contact Us" section to start a chat session. Chat support is available US weekdays for Standard and Premium Edition users.

Kubernetes Operator

We've made it easier to get you up and running with Cloud Insights' advanced Kubernetes monitoring and cluster explorer.

The NetApp Kubernetes Monitoring Operator (NKMO) is the preferred method for installing Kubernetes for Cloud Insights Insights, for more flexible configuration of monitoring in fewer steps, as well as enhanced opportunities for monitoring other software running in the K8s cluster.

Click the link above for more information and pre-requisites

Manage Users and Invites with API

You can now manage users and invites using Cloud Insights' powerful API. Read more in the API Swagger Documentation.

Data Collection Alerts

Don’t miss out on critical metrics due to a failed collector!

It’s easier than ever to keep track of your data collectors with new alerts for data collector and acquisition unit failures.
Note that these Monitors are *Paused* by default. To enable, navigate to your monitors page and locate and resume “Acquisition Unit Shutdown” and “Collector Failed”

Alert on ONTAP storage changes

Don’t let unexpected storage changes lead to outages!

You can now configure Cloud Insights to alert when modification or removal of FlexVols, nodes and SVMs are detected on ONTAP systems.

Preview Features

Cloud Insights regularly highlights a number of exciting new preview features. If you are interested in previewing one or more of these features, contact your NetApp Sales Team for more information.

Feature	Description
Kubernetes Namespaces Running out of Space	The *Kubernetes Namespaces Running Out of Space* Insight gives you a view into workloads on your Kubernetes namespaces that are at risk of running out of space, with an estimate for the number of days remaining before each space becomes full. Read More
Internal Volume and Volume Capacity Time-to-Full forecasting	Cloud Insights is able to prognose the number of days until capacity runs out for each Internal Volume and Volume monitored. This value can help to significantly reduce the risk of an outage.
Cloud Secure – block user access on attack	Greater protection for your business-critical data with the ability to block user access when an attack is detected. Access can be blocked automatically, using Automated Response Policies or manually from the alert or user details pages. Read More
Shared Resource Under Stress	The *Shared Resource Under Stress* insight uses AI/ML to automatically identify where resource contention is causing performance degradation in your environment, highlights any workloads impacted by it, and provides recommended actions to remediate, letting you solve performance issues more quickly. Read More

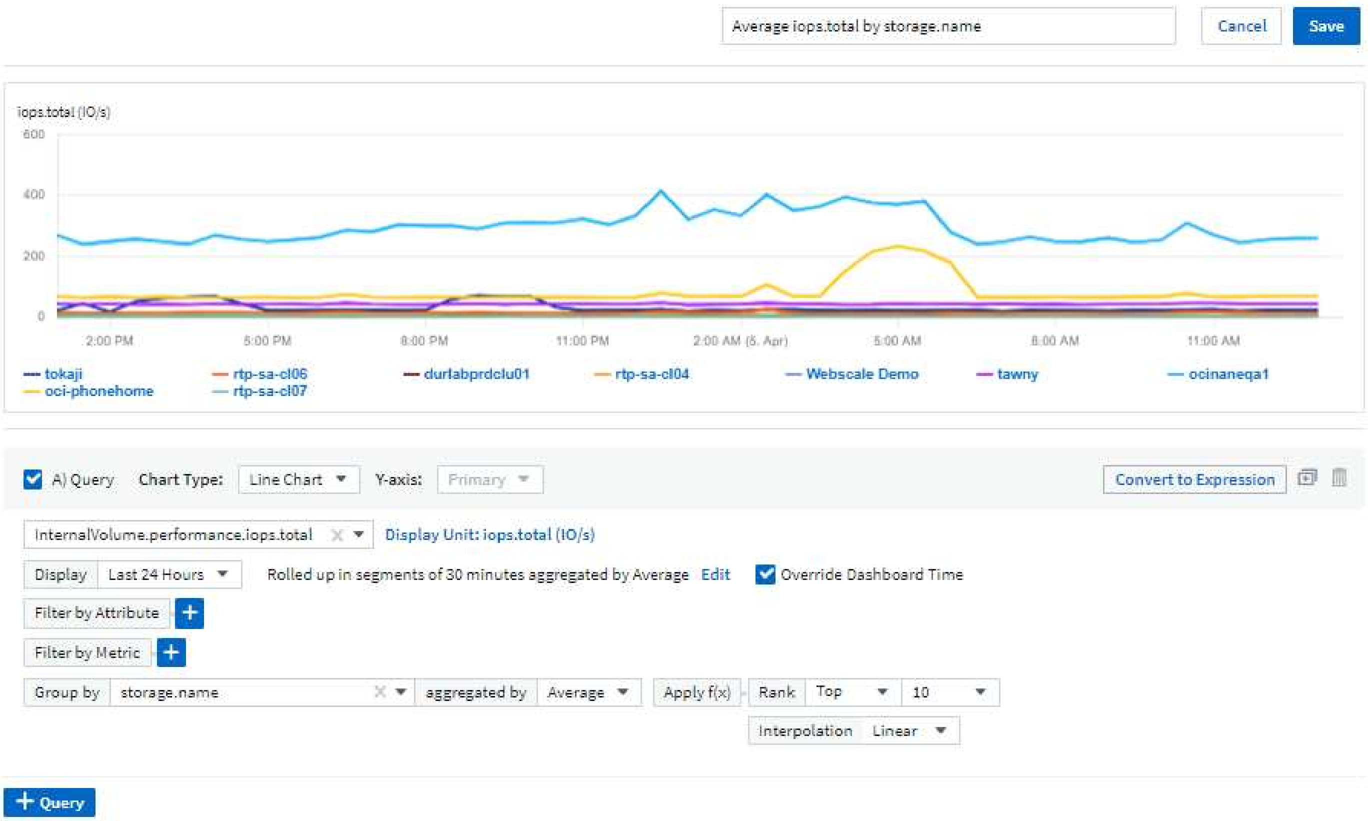
April 2022

Share your Feedback!

We want your input to help shape Cloud Insights. Earn points and prizes by participating in NetApp's **Insights to Action** program. Sign up now!

Updated Dashboard Editor

We've overhauled our dashboard creation tools to make it easier for you to visualize your data even more quickly. Navigate to the "Dashboards" page of Cloud Insights to edit an existing dashboard, add one from our dashboard gallery, or create a new dashboard of your own to check it out.



☑ A) Query Chart Type: Line Chart Y-axis: Primary

InternalVolume.performance.iops.total Display Unit: iops.total (IO/s)

Display Last 24 Hours Rolled up in segments of 30 minutes aggregated by Average Edit ☑ Override Dashboard Time

Filter by Attribute +

Filter by Metric +

Group by storage.name aggregated by Average Apply f(x) Rank Top 10

Interpolation Linear

A new Count aggregation method has also been introduced. When grouping data in bar chart, column chart, and pie chart widgets, you can quickly and easily show the number of relevant objects for the selected metric.

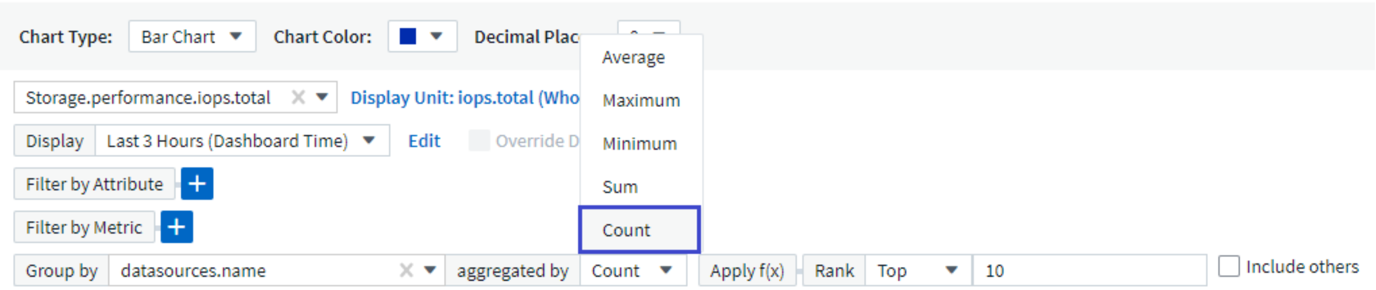


Chart Type: Bar Chart Chart Color: Decimal Plac

Storage.performance.iops.total Display Unit: iops.total (Who

Display Last 3 Hours (Dashboard Time) Edit □ Override D

Filter by Attribute +

Filter by Metric +

Group by datasources.name aggregated by Count Apply f(x) Rank Top 10 □ Include others

Additionally, line charts now allow you to select one of three interpolation methods:

- None - No interpolation is done
- Linear - Interpolates a data point between the existing points
- Stair - Uses the previous data point as the interpolated data point

Enhanced Monitoring for Your Kubernetes Infrastructure

Cloud Insights keeps you on top of changes in your Kubernetes environment by alerting you when pods, daemonsets, and replicasets are created or removed, as well as when new deployments are created. Kubernetes monitors default to *paused* state, so you should enable only the specific ones you need.

Preview Features

Cloud Insights regularly highlights a number of exciting new preview features. If you are interested in previewing one or more of these features, contact your NetApp Sales Team for more information.

Feature	Description
Internal Volume and Volume Capacity Time-to-Full forecasting	Cloud Insights is able to prognose the number of days until capacity runs out for each Internal Volume and Volume monitored. This value can help to significantly reduce the risk of an outage.
Cloud Secure – block user access on attack	Greater protection for your business-critical data with the ability to block user access when an attack is detected. Access can be blocked automatically, using Automated Response Policies or manually from the alert or user details pages. Read More
Shared Resource Under Stress	The Shared Resource Under Stress insight uses AI/ML to automatically identify where resource contention is causing performance degradation in your environment, highlights any workloads impacted by it, and provides recommended actions to remediate, letting you solve performance issues more quickly. Read More

New Data Collector

- **Cohesity SmartFiles** - This REST API-based collector will acquire a Cohesity cluster, discovering the “Views” (as CI Internal Volumes), the various nodes, as well as collecting performance metrics.

Other Data Collector Updates

Collection and display of performance data has been improved on the following data collectors:

- Brocade CLI
- Dell/EMC VPlex, PowerStore, Isilon/PowerScale, VNX Block/Clariion CLI, XtremIO, Unity/VNXe
- Pure FlashArray

These performance enhancements are already available in all NetApp data collectors as well as VMware and

Cisco, and will be rolled out to all other data collectors over the next few months.

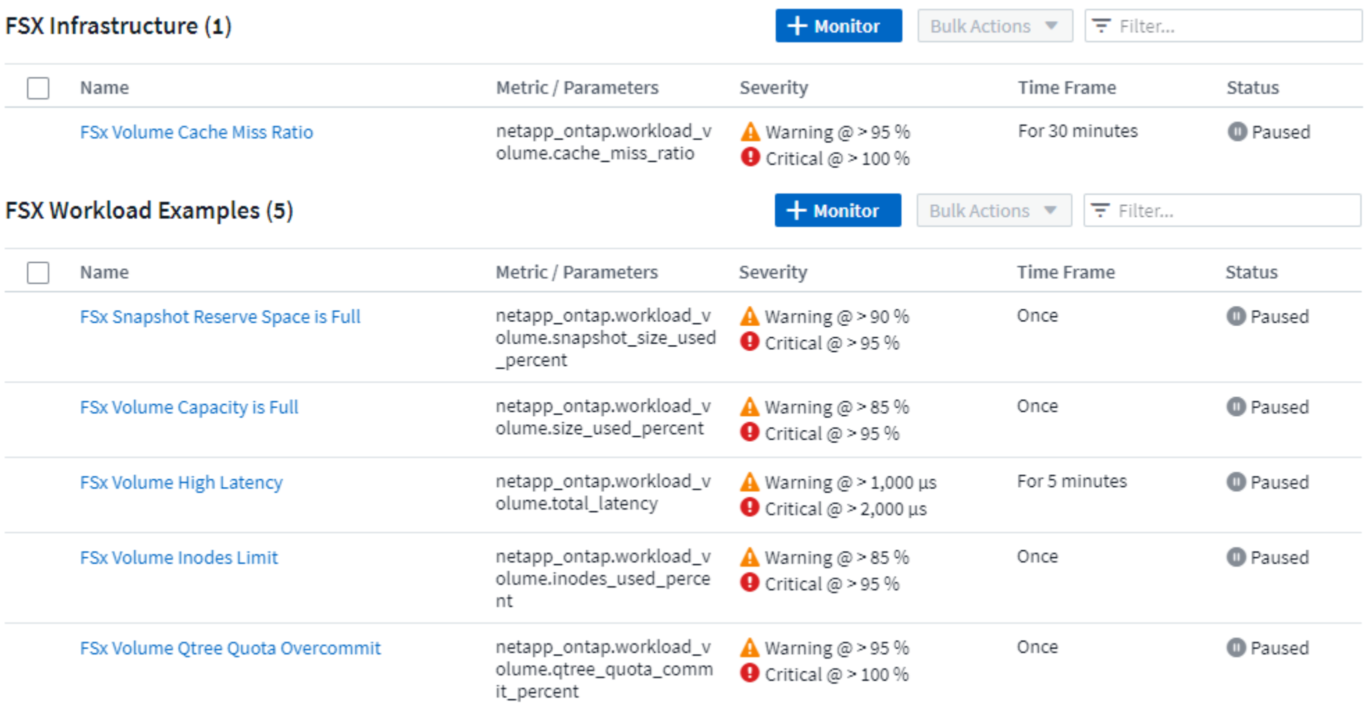
March 2022

Cloud Connection for ONTAP 9.9+

The NetApp Cloud Connection for ONTAP 9.9+ data collector eliminates the need to install an external acquisition unit, thereby simplifying troubleshooting, maintenance, and initial deployment.

New FSx for NetApp ONTAP Monitors

Monitoring your FSx for NetApp ONTAP environment is easy with new system-defined monitors for both infrastructure (metrics) and workloads (logs).



FSX Infrastructure (1)

□	Name	Metric / Parameters	Severity	Time Frame	Status
	FSx Volume Cache Miss Ratio	netapp_ontap.workload_volume.cache_miss_ratio	⚠ Warning @ > 95 % ❗ Critical @ > 100 %	For 30 minutes	⏸ Paused

FSX Workload Examples (5)

□	Name	Metric / Parameters	Severity	Time Frame	Status
	FSx Snapshot Reserve Space is Full	netapp_ontap.workload_volume.snapshot_size_used_percent	⚠ Warning @ > 90 % ❗ Critical @ > 95 %	Once	⏸ Paused
	FSx Volume Capacity is Full	netapp_ontap.workload_volume.size_used_percent	⚠ Warning @ > 85 % ❗ Critical @ > 95 %	Once	⏸ Paused
	FSx Volume High Latency	netapp_ontap.workload_volume.total_latency	⚠ Warning @ > 1,000 µs ❗ Critical @ > 2,000 µs	For 5 minutes	⏸ Paused
	FSx Volume Inodes Limit	netapp_ontap.workload_volume.inodes_used_percent	⚠ Warning @ > 85 % ❗ Critical @ > 95 %	Once	⏸ Paused
	FSx Volume Qtree Quota Overcommit	netapp_ontap.workload_volume.qtree_quota_commit_percent	⚠ Warning @ > 95 % ❗ Critical @ > 100 %	Once	⏸ Paused

New Cloud Secure features available to all

Your environment is more secure than ever with the following Cloud Secure features now generally available:

Feature	Description
Data Destruction – File Deletion attack detection	Detect abnormal large-scale file deletion activity, block malicious file access by malicious users, and take automatic snapshots with automatic response policies.
Separate notifications for Warnings and Alerts	Warning and Alert notifications can be sent to separate recipients, ensuring the right team can stay informed

Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version **1.21.2**, with performance and security improvements.
Users wishing to update can refer to the appropriate upgrade section of the Agent Installation documentation.
Previous versions of the agent will continue to function with no user action required.

Data Collector Updates

- The Broadcom Fibre Channel Switches data collector has been optimized to reduce the number of CLI commands issued with each inventory poll.

February 2022

Cloud Insights addresses Apache Log4j vulnerabilities

Customer security is a top priority at NetApp. Cloud Insights includes updates to its software libraries to address the recent Apache Log4j vulnerabilities.

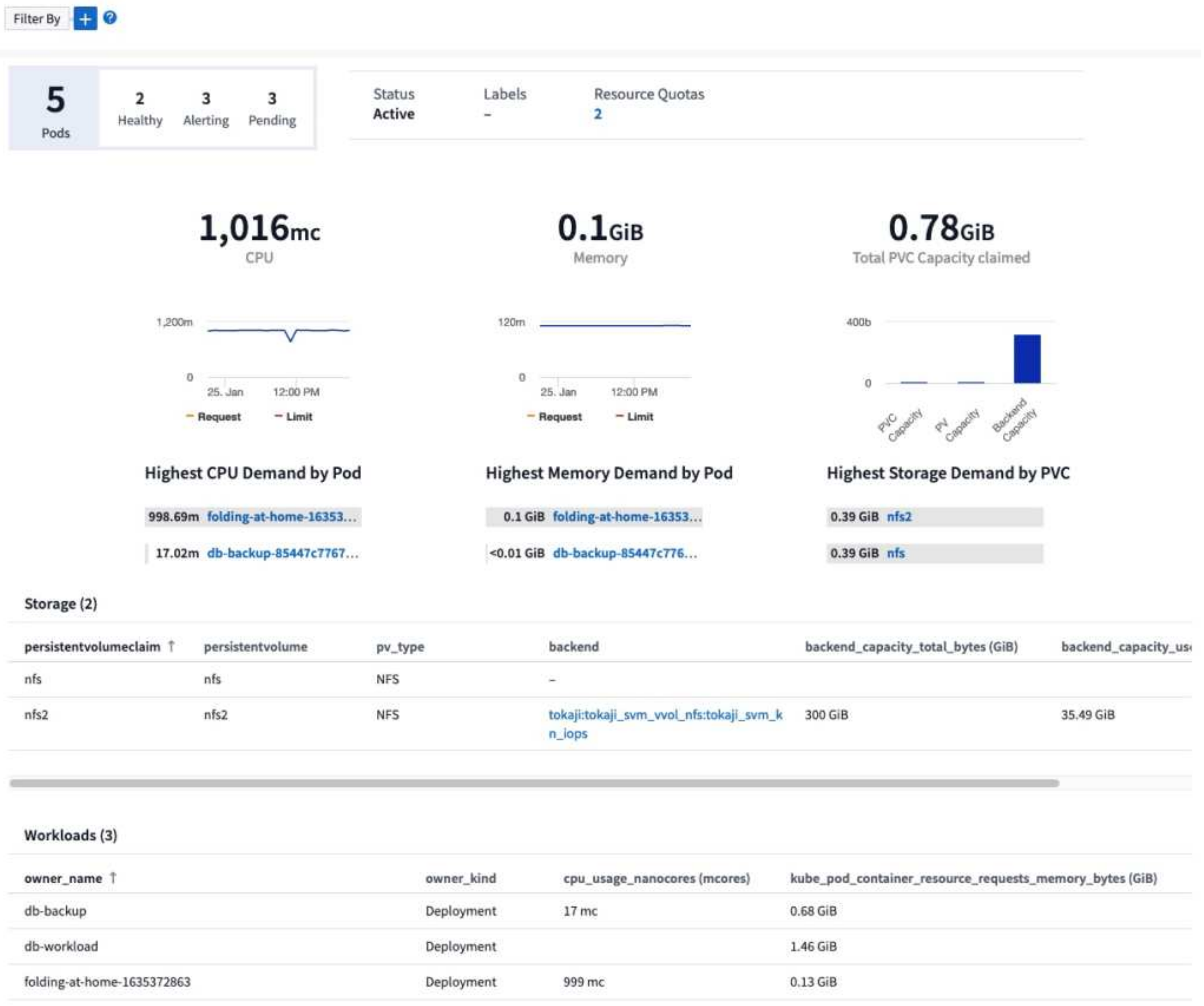
Please refer to the following on NetApp's Product Security Advisory website:

CVE-2021-44228
CVE-2021-45046
CVE-2021-45105

You can read more about these vulnerabilities and NetApp's response at the NetApp Newsroom.

Kubernetes Namespace Detail Page

Exploring your Kubernetes environment is now better than ever, with informative detail pages for your cluster's namespaces. The namespace detail page provides a summary of all the assets used by a namespace, including all the backend storage resources and their capacity utilizations.



5 Pods | 2 Healthy | 3 Alerting | 3 Pending

Status
Active

Labels
–

Resource Quotas
2

1,016mc
CPU

0.1GiB
Memory

0.78GiB
Total PVC Capacity claimed

Highest CPU Demand by Pod

998.69m folding-at-home-16353...
17.02m db-backup-85447c7767...

Highest Memory Demand by Pod

0.1 GiB folding-at-home-16353...
<0.01 GiB db-backup-85447c776...

Highest Storage Demand by PVC

0.39 GiB nfs2
0.39 GiB nfs

Storage (2)

persistentvolumeclaim ↑	persistentvolume	pv_type	backend	backend_capacity_total_bytes (GiB)	backend_capacity_us
nfs	nfs	NFS	–		
nfs2	nfs2	NFS	tokaji:tokaji_svm_vvol_nfs:tokaji_svm_kn_iops	300 GiB	35.49 GiB

Workloads (3)

owner_name ↑	owner_kind	cpu_usage_nanocores (mcores)	kube_pod_container_resource_requests_memory_bytes (GiB)
db-backup	Deployment	17 mc	0.68 GiB
db-workload	Deployment		1.46 GiB
folding-at-home-1635372863	Deployment	999 mc	0.13 GiB

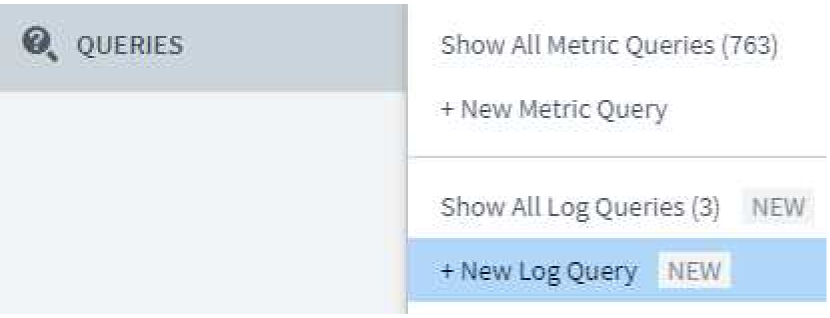
December 2021

Deeper integration for ONTAP systems

Simplify alerting for ONTAP hardware failures and more with new integration with NetApp Event Management System (EMS).
Explore and alert on low-level ONTAP messages in Cloud Insights to inform and improve troubleshooting workflows and further reduce reliance on ONTAP element management tooling.

Querying Logs

For ONTAP systems, Cloud Insights Queries include a powerful Log Explorer, allowing you to easily investigate and troubleshoot EMS log entries.



Data Collector-level notifications.

In addition to system-defined and custom-created Monitors for alerting, you can also set alert notifications for ONTAP data collectors, allowing you to specify recipients for collector-level alerts, independent of other monitor alerts.

Greater flexibility of Cloud Secure roles

Users can be granted access to Cloud Secure features based on roles set by an administrator:

Role	Cloud Secure Access
Administrator	Can perform all Cloud Secure functions, including those for Alerts, Forensics, data collectors, automated response policies, and APIs for Cloud Secure. An Administrator can also invite other users but can only assign Cloud Secure roles.
User	Can view and manage Alerts and view Forensics. User role can change alert status, add a note, take snapshots manually, and block user access.
Guest	Can view Alerts and Forensics. Guest role cannot change alert status, add a note, take snapshots manually, or block user access.

Operating System support

CentOS 8.x support is being replaced with **CentOS 8 Stream** support. CentOS 8.x will reach End-of-Life on December 31, 2021.

Data Collector Updates

A number of Cloud Insights data collector names have been added to reflect vendor changes:

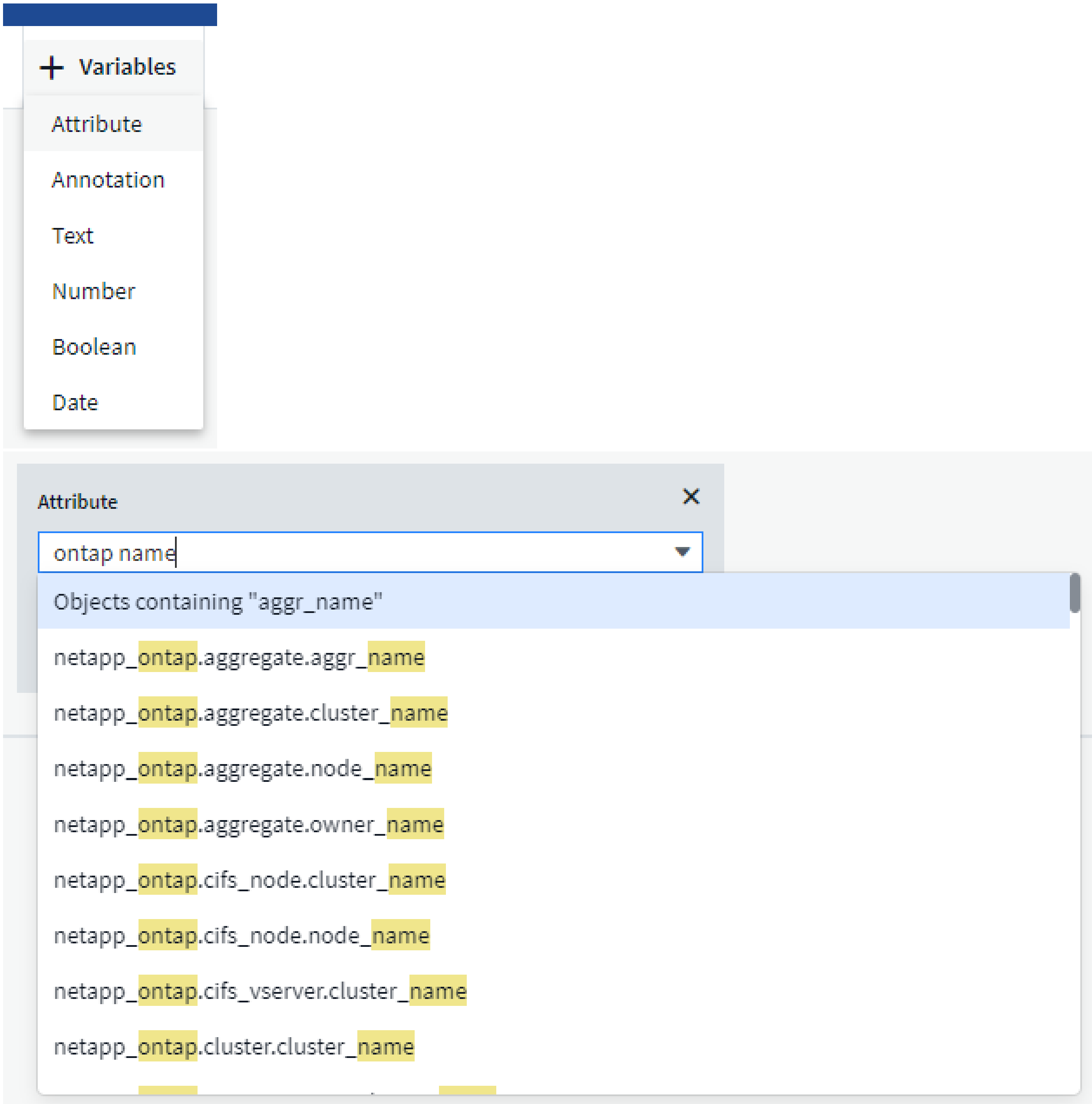
Vendor/Model	Previous Name
Dell EMC PowerScale	Isilon
HPE Alletra 9000 / Primera	3PAR
HPE Alletra 6000	Nimble

November 2021

Adaptive Dashboards

New variables for attributes and the ability to use variables in widgets.

Dashboards are now more powerful and flexible than ever. Build adaptive dashboards with attribute variables to quickly filter dashboards on the fly. Using these and other pre-existing variables you can now create one high level dashboard to see metrics for your entire environment, and seamlessly filter down by resource name, type, location, and more. Use number variables in widgets to associate raw metrics with costs, for example cost per GB for storage as a service.


+ Variables
Attribute
Annotation
Text
Number
Boolean
Date

Attribute

ontap name

Objects containing "aggr_name"
netapp_ontap.aggregate.aggr_name
netapp_ontap.aggregate.cluster_name
netapp_ontap.aggregate.node_name
netapp_ontap.aggregate.owner_name
netapp_ontap.cifs_node.cluster_name
netapp_ontap.cifs_node.node_name
netapp_ontap.cifs_vserver.cluster_name
netapp_ontap.cluster.cluster_name

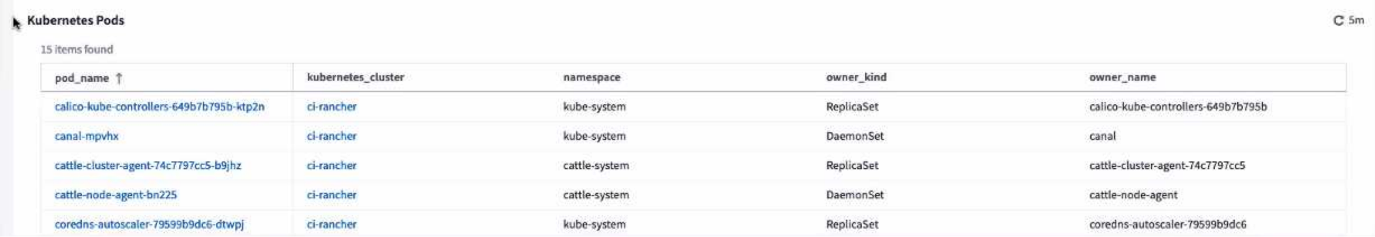
Access the Reporting Database via API

Enhanced capabilities for integration with third party reporting, ITSM, and automation tools: Cloud Insights' powerful API allows users to query the Cloud Insights Reporting database directly, without going through the

Cognos Reporting environment.

Pod tables on VM Landing Page

Seamless navigation between VMs and the Kubernetes Pods using them: for improved troubleshooting and performance headroom management, a table of associated Kubernetes Pods will now appear on VM landing pages.



Kubernetes Pods

15 items found

pod_name ↑	kubernetes_cluster	namespace	owner_kind	owner_name
calico-kube-controllers-649b7b795b-ktp2n	ci-rancher	kube-system	ReplicaSet	calico-kube-controllers-649b7b795b
canal-mpvhx	ci-rancher	kube-system	DaemonSet	canal
cattle-cluster-agent-74c7797cc5-b9jhz	ci-rancher	cattle-system	ReplicaSet	cattle-cluster-agent-74c7797cc5
cattle-node-agent-bn225	ci-rancher	cattle-system	DaemonSet	cattle-node-agent
coredns-autoscaler-79599b9dc6-dtwpj	ci-rancher	kube-system	ReplicaSet	coredns-autoscaler-79599b9dc6

Data Collector Updates

- ECS now reports firmware for storage and node
- Isilon has improved prompt detection
- Azure NetApp Files collects performance data more quickly
- StorageGRID now supports Single Sign-On (SSO)
- Brocade CLI properly reports model for X&-4

Additional Operating Systems supported

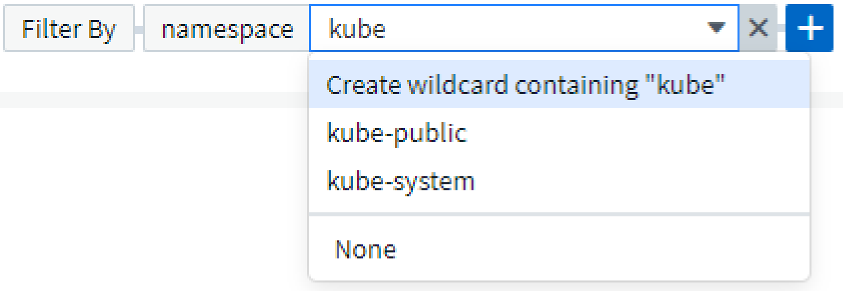
The Cloud Insights Acquisition Unit supports the following operating systems, in addition to those already supported:

- Centos (64-bit) 8.4
- Oracle Enterprise Linux (64-bit) 8.4
- Red Hat Enterprise Linux (64-bit) 8.4

October 2021

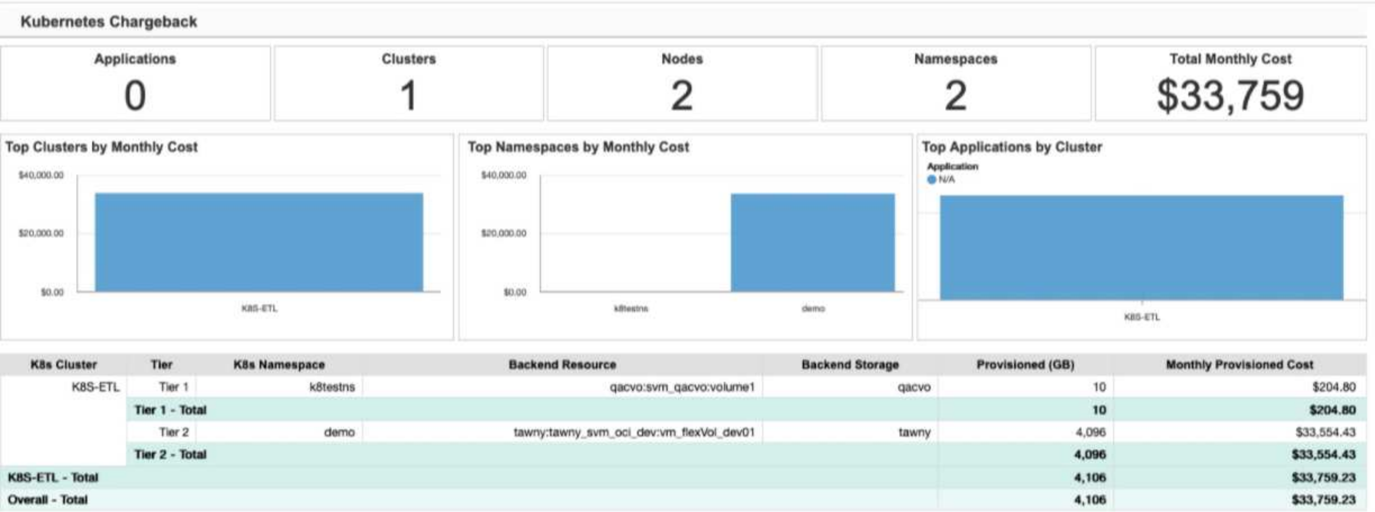
Filters on K8S Explorer pages

Kubernetes Explorer page filters give you focused control of the data displayed for your Kubernetes cluster, node, and pod exploration.



K8s Data for Reporting

Kubernetes data is now available for use in Reporting, allowing you to create chargeback or other reports. In order for Kubernetes chargeback data to be passed to Reporting, you must have an active connection to, and Cloud Insights must be receiving data from, your Kubernetes cluster as well as its back-end storage. If there is no data received from the back-end storage, Cloud Insights can not send Kubernetes object data to Reporting.

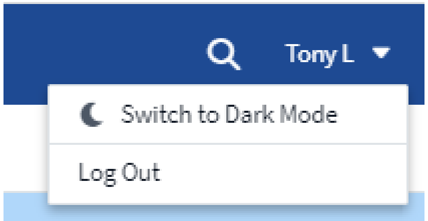

Kubernetes Chargeback

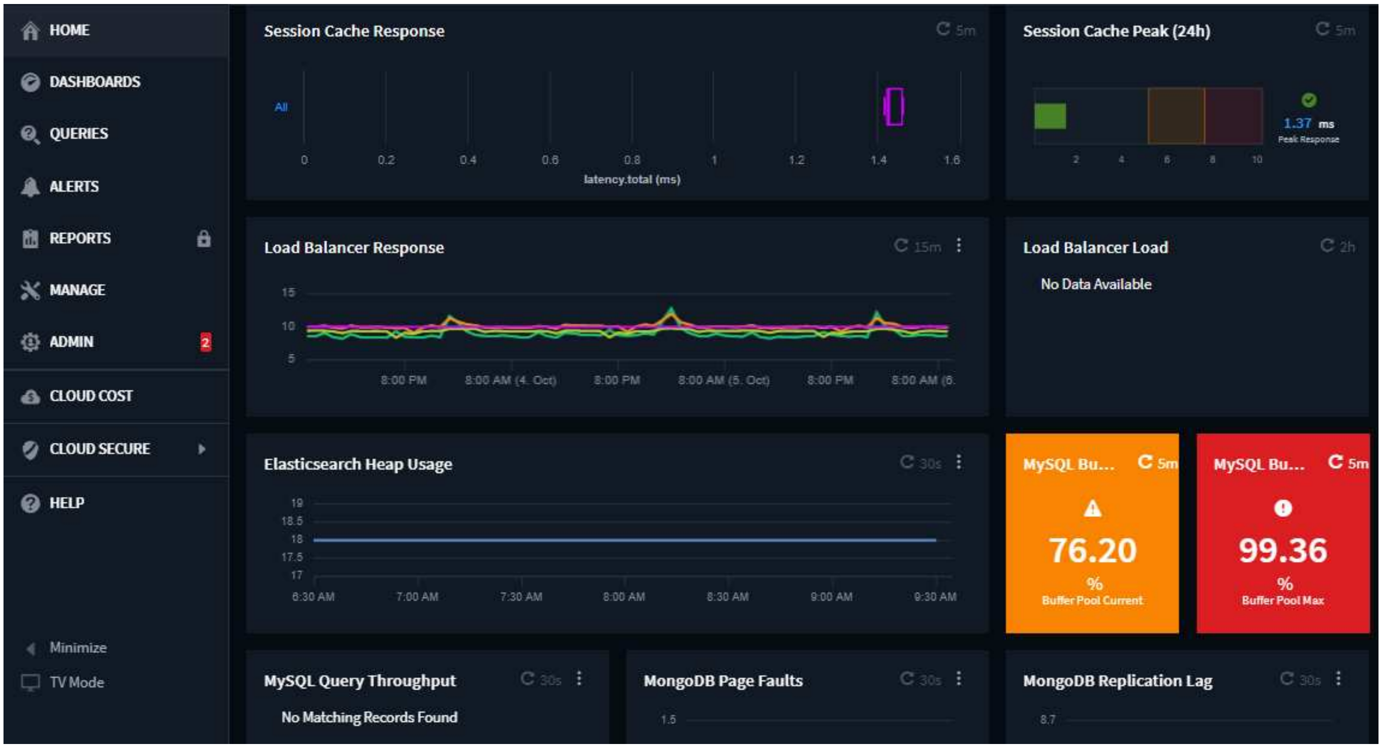
Applications	Clusters	Nodes	Namespaces	Total Monthly Cost
0	1	2	2	$33,759

K8s Cluster	Tier	K8s Namespace	Backend Resource	Backend Storage	Provisioned (GB)	Monthly Provisioned Cost
K8S-ETL	Tier 1	k8testns	qacvo:svm_qacvo:volume1	qacvo	10	$204.80
	Tier 1 - Total				**10**	**$204.80**
	Tier 2	demo	tawny:tawny_svm_oci_dev:vm_flexVol_dev01	tawny	4,096	$33,554.43
	Tier 2 - Total				**4,096**	**$33,554.43**
K8S-ETL - Total					**4,106**	**$33,759.23**
Overall - Total					**4,106**	**$33,759.23**

Dark Theme has arrived

Many of you asked for a dark theme, and Cloud Insights has answered. To switch between light and dark theme, click the drop-down next to your user name.





Data Collector Support

We’ve made some improvements in Cloud Insights Data Collectors. Here are some highlights:

- New collector for Amazon FSx for ONTAP

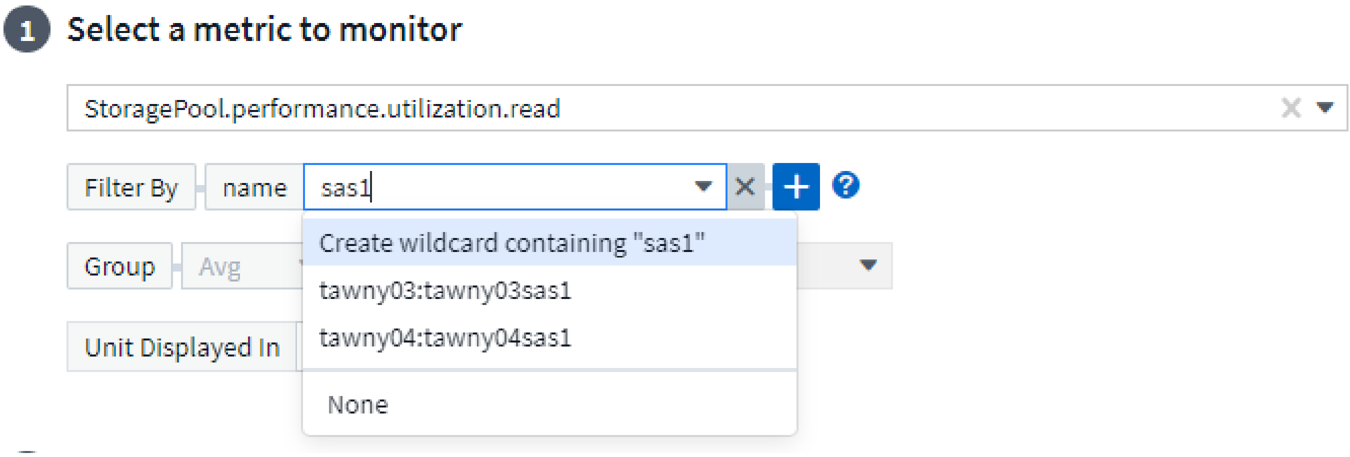
September 2021

Performance Policies are now Monitors

Monitors and Alerts have supplanted Performance Policies and Violations throughout Cloud Insights. Alerting with Monitors provides greater flexibility and insight into potential problems or trends in your environment.

Autocomplete Suggestions, Wildcards, and Expressions in Monitors

When creating a monitor for alerting, typing in a filter is now predictive, allowing you to easily search for and find the metrics or attributes for your monitor. Additionally, you are given the option to create a wildcard filter based on the text you type.



1 Select a metric to monitor

StoragePool.performance.utilization.read

Filter By name sas1

Create wildcard containing "sas1"

tawny03:tawny03sas1

tawny04:tawny04sas1

None

Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version **1.19.3**, with performance and security improvements.
Users wishing to update can refer to the appropriate upgrade section of the Agent Installation documentation. Previous versions of the agent will continue to function with no user action required.

Data Collector Support

We've made some improvements in Cloud Insights Data Collectors. Here are some highlights:

- Microsoft Hyper-V collector now uses PowerShell instead of WMI
- Azure VMs and VHD collector is now up to 10 times faster due to parallel calls
- HPE Nimble now supports federated and iSCSI configurations

And since we're always improving Data Collection, here are some other recent changes of note:

- New collector for EMC Powerstore
- New collector for Hitachi Ops Center
- New collector for Hitachi Content Platform
- Enhanced ONTAP collector to report Fabric Pools
- Enhanced ANF with Storage Pool and Volume performance
- Enhanced EMC ECS with Storage Nodes and Storage performance as well as the Object Count in buckets
- Enhanced EMC Isilon with Storage Node and Qtree metrics
- Enhanced EMC Symetrix with volume QOS limit metrics
- Enhanced IBM SVC and EMC PowerStore with Storage Nodes parent serial number

August 2021

New Audit Page User Interface

The Audit page provides a cleaner interface and now allows the export of audit events to .CSV file.

Enhanced User Role Management

Cloud Insights now allows even greater freedom for assigning user roles and access controls. Users can now be assigned granular permissions for monitoring, reporting, and Cloud Secure separately.

This means you can allow more users administrative access to monitoring, optimization, and reporting functions whilst restricting access to your sensitive Cloud Secure audit and activity data to only those that need it.

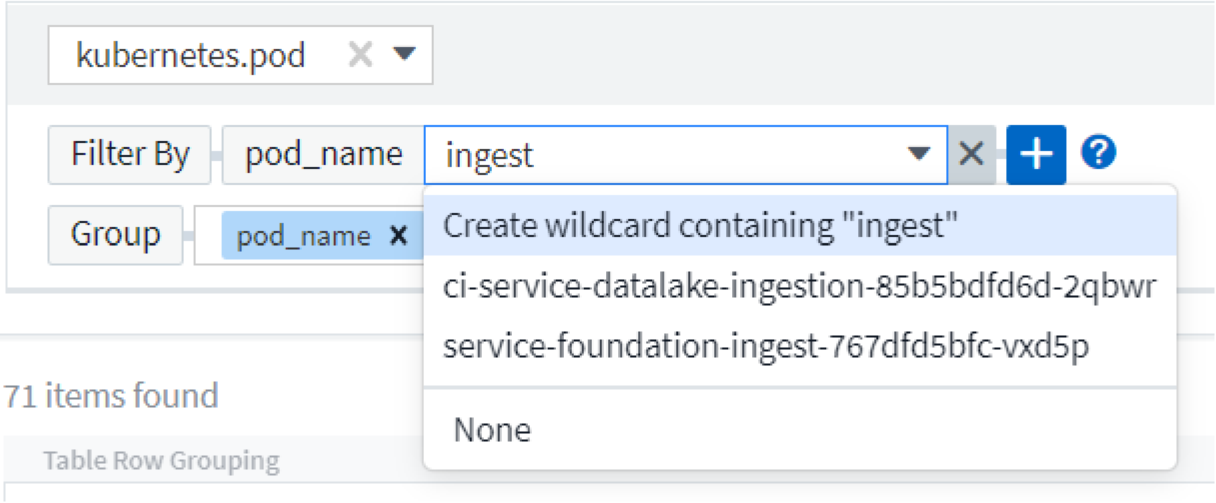
Find out more about the different levels of access in the Cloud Insights documentation.

June 2021

Autocomplete Suggestions, Wildcards, and Expressions in Filters

With this release of Cloud Insights, you no longer need to know all the possible names and values on which to filter in a query or widget. When filtering, you can simply start typing and Cloud insights will suggest values based on your text. No more looking up Application names or Kubernetes attributes ahead of time just to find the ones you want to show in your widget.

As you type in a filter, the filter displays a smart list of results from which you can choose, as well as the option to create a **wildcard filter** based on the current text. Selecting this option will return all results that match the wildcard expression. You can of course also select multiple individual values that you want added to the filter.


kubernetes.pod
Filter By
pod_name
ingest
Group
pod_name
Create wildcard containing "ingest"
ci-service-datalake-ingestion-85b5bdfd6d-2qbwr
service-foundation-ingest-767dfd5bfc-vxd5p
None
71 items found
Table Row Grouping

Additionally, you can create **expressions** in a filter using NOT or OR, or you can select the "None" option to filter for null values in the field.

Read more about filtering options in queries and widgets.

APIs available by Edition

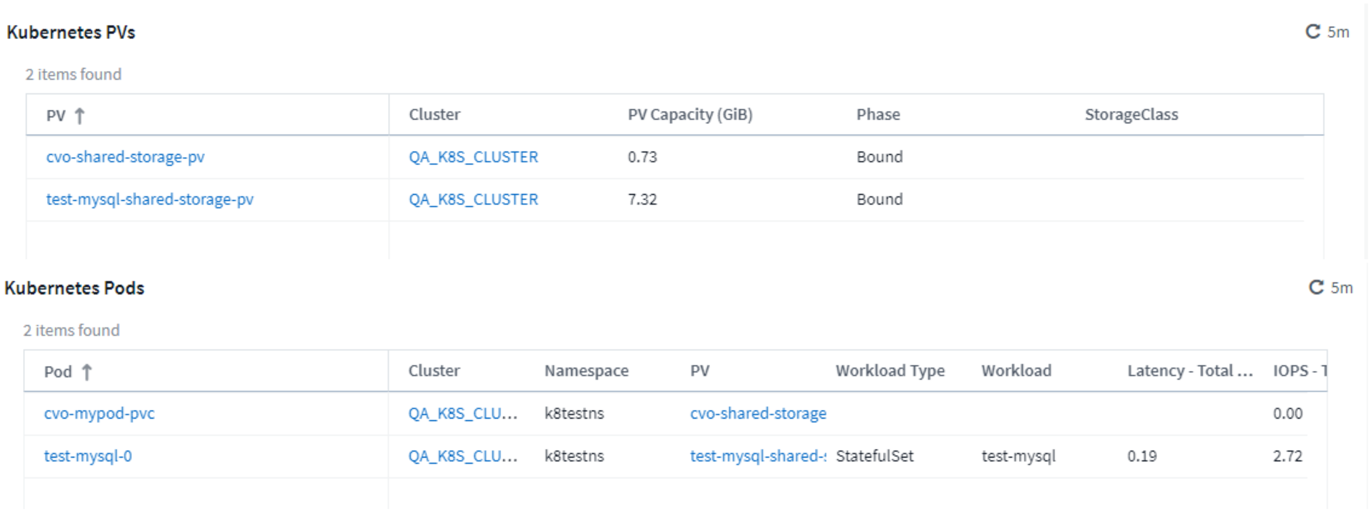
Cloud Insights' powerful APIs are more accessible than ever, with Alerts APIs now available in Standard and Premium Editions.
The following APIs are available for each Edition:

API Category	Basic	Standard	Premium
Acquisition Unit	✓	✓	✓
Data Collection	✓	✓	✓
Alerts		✓	✓
Assets		✓	✓
Data Ingestion		✓	✓

Kubernetes PV and Pod Visibility

Cloud Insights provides visibility into the back-end storage for your Kubernetes environments, giving you insight to your Kubernetes Pods and Persistent Volumes (PVs). You can now track PV counters such as IOPS, latency, and throughput from a single Pod's usage through a PV counter to a PV and all the way to the back-end storage device.

On a Volume or Internal Volume landing page, two new tables are displayed:



Kubernetes PVs

2 items found

PV ↑	Cluster	PV Capacity (GiB)	Phase	StorageClass
cvo-shared-storage-pv	QA_K8S_CLUSTER	0.73	Bound	
test-mysql-shared-storage-pv	QA_K8S_CLUSTER	7.32	Bound	

Kubernetes Pods

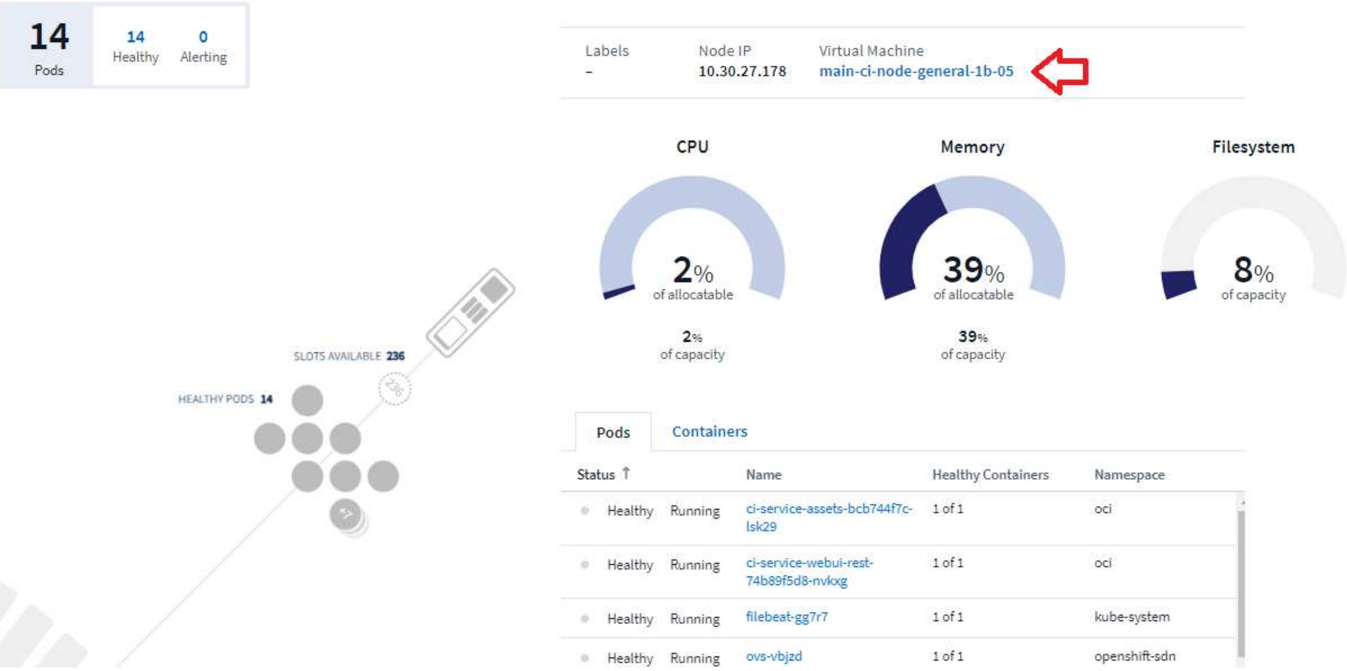
2 items found

Pod ↑	Cluster	Namespace	PV	Workload Type	Workload	Latency - Total ...	IOPS - T
cvo-mypod-pvc	QA_K8S_CLU...	k8testns	cvo-shared-storage				0.00
test-mysql-0	QA_K8S_CLU...	k8testns	test-mysql-shared-:	StatefulSet	test-mysql	0.19	2.72

Note that to take advantage of these new tables, it is recommended to uninstall your current Kubernetes agent, and install it fresh. You must also install Kube-State-Metrics version 2.1.0 or later.

Kubernetes Node to VM links

On a Kubernetes Node page, you can now click to open the Node's VM page. The VM page also includes a link back to the Node itself.



14 Pods | 14 Healthy | 0 Alerting

Labels: –

Node IP: 10.30.27.178

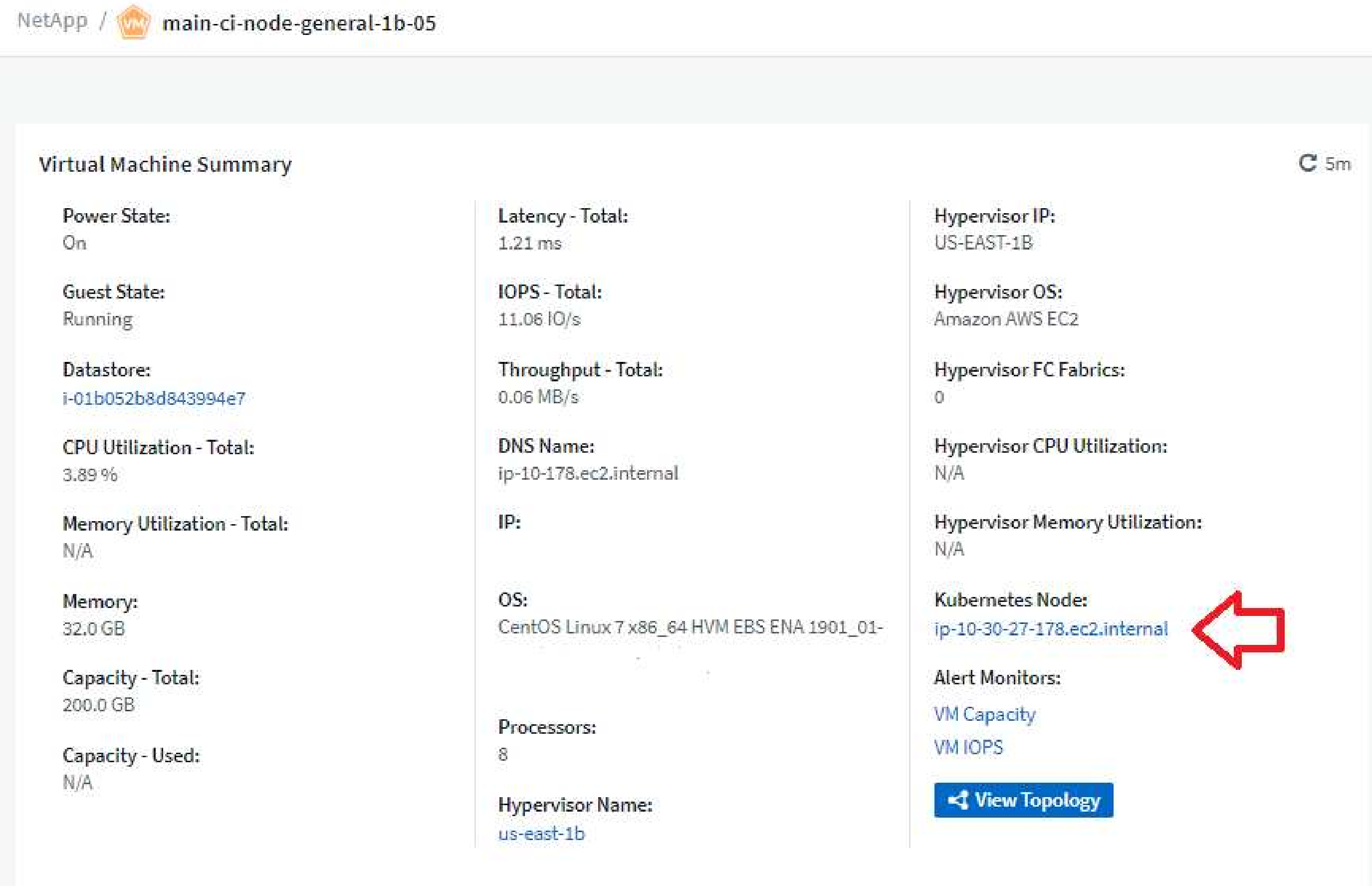
Virtual Machine: main-ci-node-general-1b-05

CPU: 2% of allocatable, 2% of capacity

Memory: 39% of allocatable, 39% of capacity

Filesystem: 8% of capacity

Status ↑		Name	Healthy Containers	Namespace
Healthy	Running	ci-service-assets-bcb744f7c-lsk29	1 of 1	oci
Healthy	Running	ci-service-webui-rest-74b89f5d8-nvkxg	1 of 1	oci
Healthy	Running	filebeat-gg7r7	1 of 1	kube-system
Healthy	Running	ovs-vbjzd	1 of 1	openshift-sdn



NetApp / main-ci-node-general-1b-05

Virtual Machine Summary

Power State:
On

Guest State:
Running

Datastore:
i-01b052b8d843994e7

CPU Utilization - Total:
3.89 %

Memory Utilization - Total:
N/A

Memory:
32.0 GB

Capacity - Total:
200.0 GB

Capacity - Used:
N/A

Latency - Total:
1.21 ms

IOPS - Total:
11.06 IO/s

Throughput - Total:
0.06 MB/s

DNS Name:
ip-10-178.ec2.internal

IP:

OS:
CentOS Linux 7 x86_64 HVM EBS ENA 1901_01-

Processors:
8

Hypervisor Name:
us-east-1b

Hypervisor IP:
US-EAST-1B

Hypervisor OS:
Amazon AWS EC2

Hypervisor FC Fabrics:
0

Hypervisor CPU Utilization:
N/A

Hypervisor Memory Utilization:
N/A

Kubernetes Node:
ip-10-30-27-178.ec2.internal

Alert Monitors:
VM Capacity
VM IOPS

Alert Monitors replacing Performance Policies

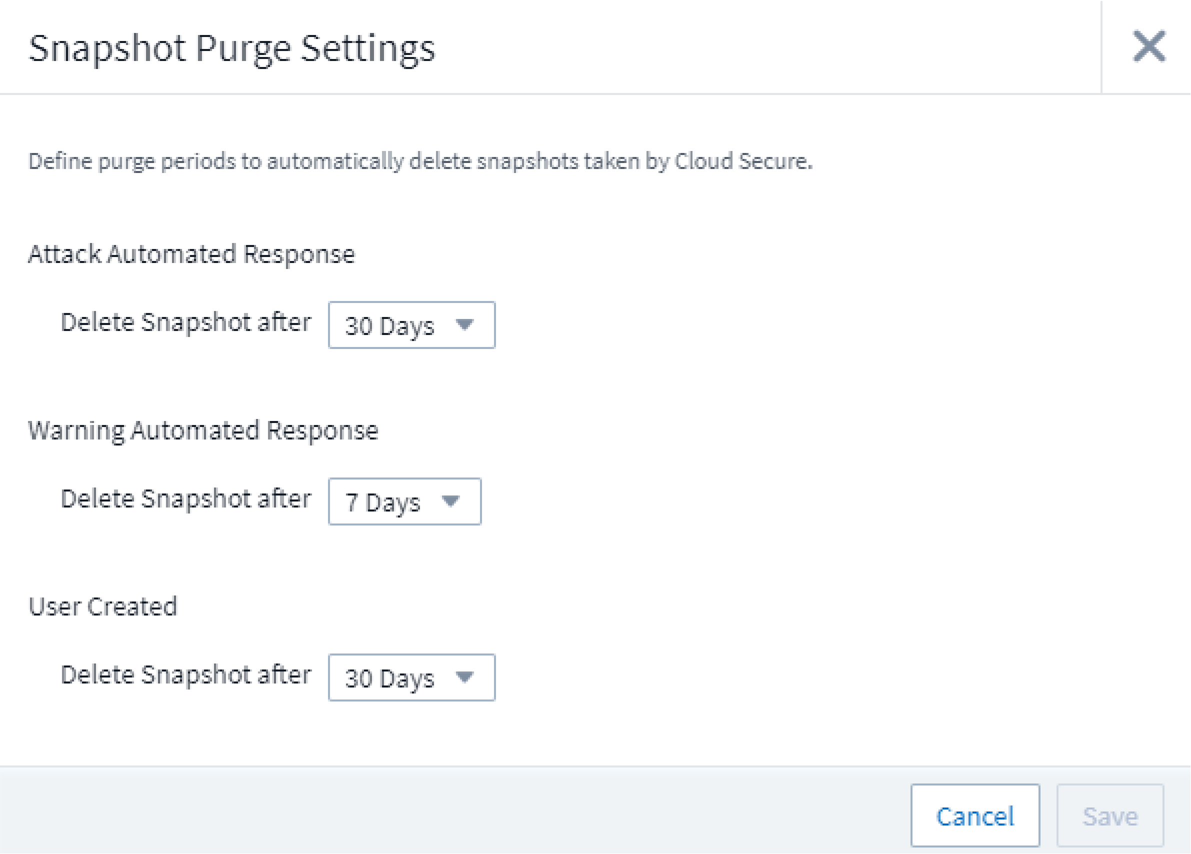
To enable the added benefits of multiple thresholds, webhook and email alert delivery, alerting on all metrics using a single interface, and more, Cloud Insights will be converting Standard and Premium Edition customers from **Performance Policies** to **Monitors** during the months of July and August, 2021. Learn more about Alerts and Monitors, and stay tuned for this exciting change.

Cloud Secure supports NFS

Cloud Secure now supports NFS for ONTAP data collection. Monitor SMB and NFS user access to protect your data from ransomware attacks.
Additionally, Cloud Secure supports Active-Directory and LDAP user directories for collection of NFS user attributes.

Cloud Secure snapshot purge

Cloud Secure automatically deletes snapshots based on the Snapshot Purge Settings, to save storage space and reduce the need for manual snapshot deletion.



Snapshot Purge Settings

Define purge periods to automatically delete snapshots taken by Cloud Secure.

Attack Automated Response

Delete Snapshot after: 30 Days

Warning Automated Response

Delete Snapshot after: 7 Days

User Created

Delete Snapshot after: 30 Days

Cloud Secure data collection speed

A single data collector agent system can now post up to 20,000 events per second to Cloud Secure.

May 2021

Here are some of the changes we’ve made in April:

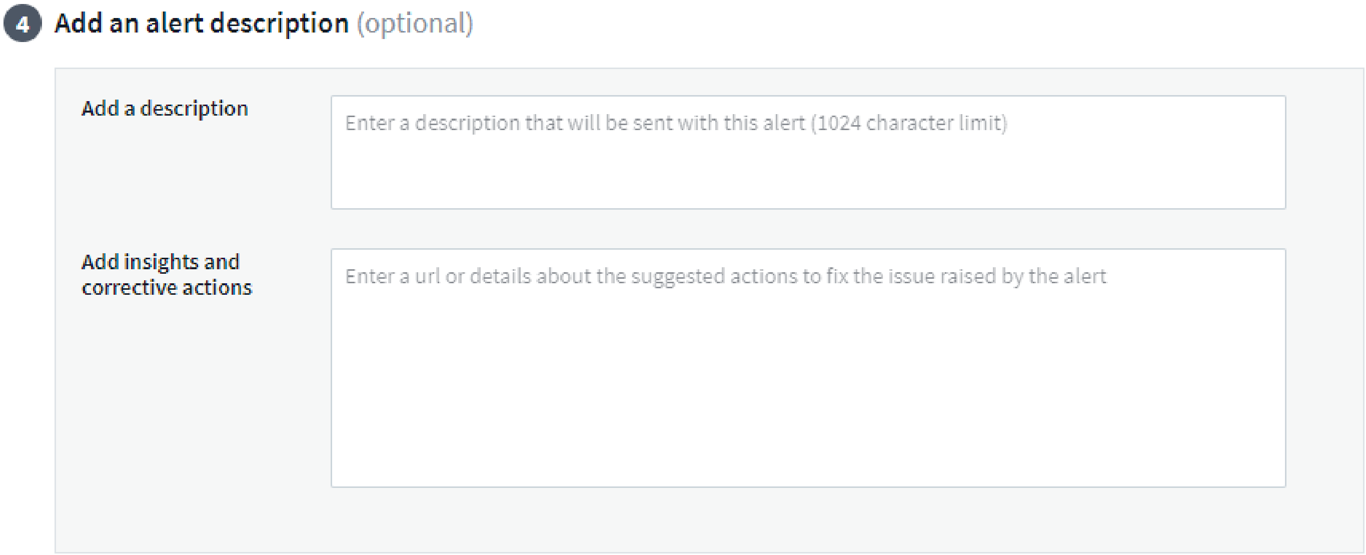
Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version 1.17.3, with performance and security improvements.
Users wishing to update can refer to the appropriate upgrade section of the Agent Installation documentation.

Previous versions of the agent will continue to function with no user action required.

Add Corrective Actions to an Alert

You can now add an optional description as well as additional insights and/or corrective actions when creating or modifying a Monitor by filling in the **Add an Alert Description** section. The description will be sent with the alert. The *insights and corrective actions* field can provide detailed steps and guidance for dealing with alerts and will be displayed in the summary section of the alert landing page.



4 Add an alert description (optional)

Add a description: Enter a description that will be sent with this alert (1024 character limit)

Add insights and corrective actions: Enter a url or details about the suggested actions to fix the issue raised by the alert

Cloud Insights APIs for All Editions

API access is now available in all editions of Cloud Insights.
Users of Basic edition can now automate actions for Acquisition Units and Data Collectors, and Standard Edition users can query metrics and ingest custom metrics.
Premium edition continues to allow full use of all API categories.

API Category	Basic	Standard	Premium
Acquisition Unit	✓	✓	✓
Data Collection	✓	✓	✓
Assets		✓	✓
Data Ingestion		✓	✓
Data Warehouse			✓

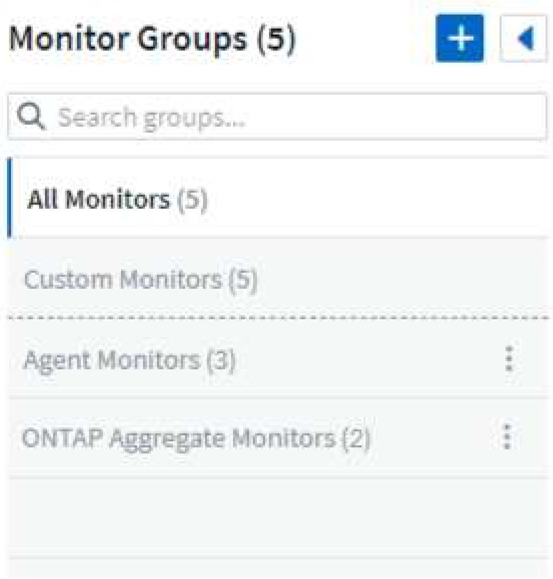
For details on API usage, please refer to the API documentation.

April 2021

Easier Management of Monitors

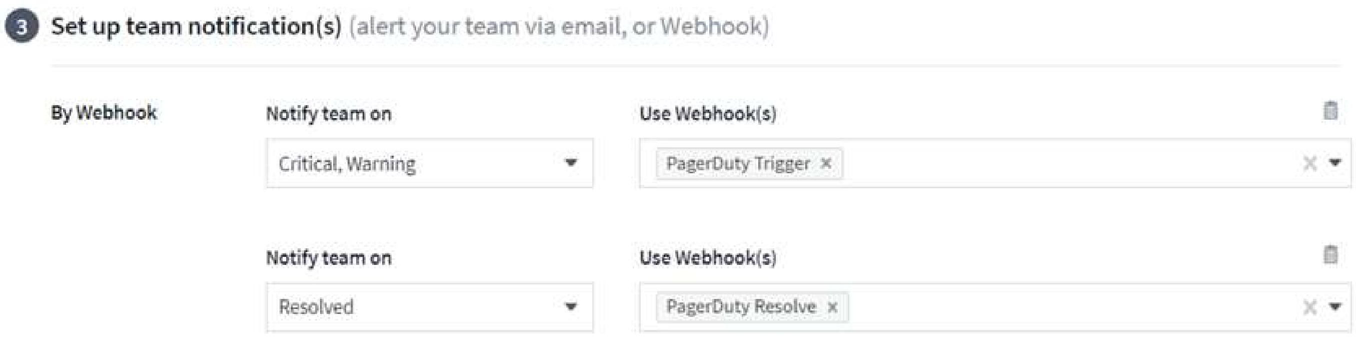
Monitor Grouping simplifies the management of monitors in your environment. Multiple monitors can now be grouped together and paused as one. For example, if you have an update occurring on a stack of infrastructure, you can pause alerts from all those devices via one click.

Monitor groups is the first part of an exciting new feature bringing improved management of ONTAP devices to Cloud Insights.



Enhanced Alerting Options Using Webhooks

Many commercial applications support Webhooks as a standard input interface. Cloud Insights now supports many of these delivery channels, providing default templates for Slack, PagerDuty, Teams, and Discord, in addition to providing customizable generic webhooks to support many other applications.


3 Set up team notification(s) (alert your team via email, or Webhook)

By Webhook

Notify team on: Critical, Warning

Use Webhook(s): PagerDuty Trigger ×

Notify team on: Resolved

Use Webhook(s): PagerDuty Resolve ×

Improved Device Identification

To improve monitoring and troubleshooting as well as deliver accurate reporting, it is helpful to understand the names of devices rather than their IP addresses or other identifiers. Cloud Insights now incorporates an automatic way to identify the names of storage and physical host devices in the environment, using a rule-based approach called **Device Resolution**, available in the **Manage** menu.

You asked for more!

A popular ask by customers has been for more default options for visualizing the range of data, so we have added the following five new choices that are now available throughout the service via the time range picker:

- Last 30 Minutes
- Last 2 Hours
- Last 6 Hours
- Last 12 Hours
- Last 2 Days

Multiple Subscriptions in one Cloud Insights Environment

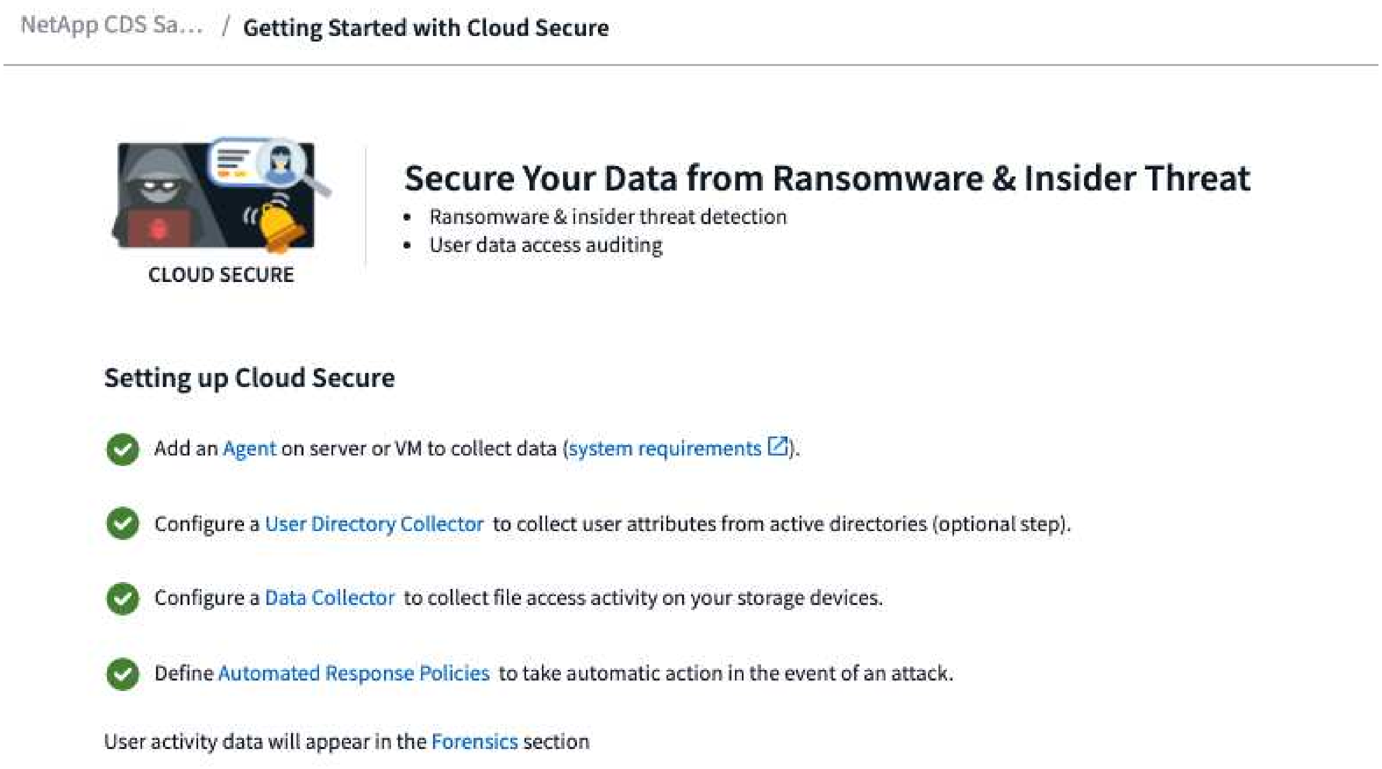
Starting April 2, Cloud Insights supports multiple subscriptions of the same edition type for a customer in a single Cloud Insights instance. This enables customers to co-term parts of their Cloud Insights subscription with infrastructure purchases. Contact NetApp Sales for assistance with multiple subscriptions.

Choose Your Path

While setting up Cloud Insights, you can now choose whether to start with Monitoring and Alerting or Ransomware and Insider Threat Detection. Cloud Insights will configure your starting environment based on the path you choose. You can configure the other path at any time afterward.

Easier Cloud Secure Onboarding

And it is easier than ever to start using Cloud Secure, with a new step-by-step setup checklist.



NetApp CDS Sa... / Getting Started with Cloud Secure

Secure Your Data from Ransomware & Insider Threat

- Ransomware & insider threat detection
- User data access auditing

Setting up Cloud Secure

✓ Add an Agent on server or VM to collect data (system requirements).

✓ Configure a User Directory Collector to collect user attributes from active directories (optional step).

✓ Configure a Data Collector to collect file access activity on your storage devices.

✓ Define Automated Response Policies to take automatic action in the event of an attack.

User activity data will appear in the Forensics section

As always, we love to hear your suggestions! Send them to ng-cloudinsights-customerfeedback@netapp.com.

February 2021

Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version 1.17.0, which includes vulnerability and bug fixes.

Cloud Cost Analyzer

Experience the power of Spot by NetApp with Cloud Cost, which provides a detailed cost analysis of past, present, and estimated spending, providing visibility into cloud usage in your environment. The Cloud Cost dashboard delivers a clear view of cloud expenses and a drill down into individual workloads, accounts, and services.

Cloud Cost can help with these major challenges:

- Tracking and monitoring your cloud expenses
- Identifying waste and potential optimization areas
- Delivering executable action items

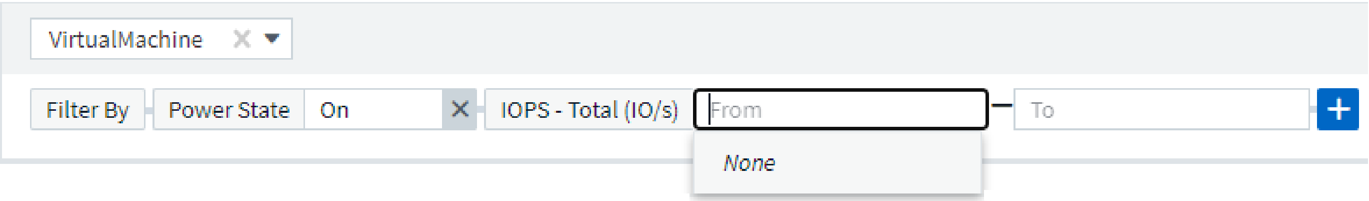
Cloud Cost is focused on monitoring. Upgrade to the full Spot by NetApp account to enable automatic cost saving and environment optimization.

Querying for objects having null values using filters

Cloud Insights now allows searching for attributes and metrics having null/none values through the use of filters. You can perform this filtering on any attributes/metrics in the following places:

- On the Query page
- In Dashboard widgets and page variables
- On the Alerts list page
- When creating Monitors

To filter for null/none values, simply select the *None* option when it appears in the appropriate filter drop-down.



Multi-Region Support

Starting today we offer the Cloud Insights service in different regions across the globe, which facilitates performance and increases security for customers based outside the United States. Cloud Insights/Cloud Secure stores information according to the region in which your environment is created.

Click here for more information.

January 2021

Additional ONTAP Metrics Renamed

As part of our continuing effort to improve efficiency of data-gathering from ONTAP systems, the following ONTAP metrics have been renamed.

If you have existing dashboard widgets or queries using any of these metrics, you will need to edit or re-create them to use the new metric names.

Previous Metric Name	New Metric Name
netapp_ontap.disk_constituent.total_transfers	netapp_ontap.disk_constituent.total_iops
netapp_ontap.disk.total_transfers	netapp_ontap.disk.total_iops
netapp_ontap.fcp_lif.read_data	netapp_ontap.fcp_lif.read_throughput
netapp_ontap.fcp_lif.write_data	netapp_ontap.fcp_lif.write_throughput
netapp_ontap.iscsi_lif.read_data	netapp_ontap.iscsi_lif.read_throughput
netapp_ontap.iscsi_lif.write_data	netapp_ontap.iscsi_lif.write_throughput

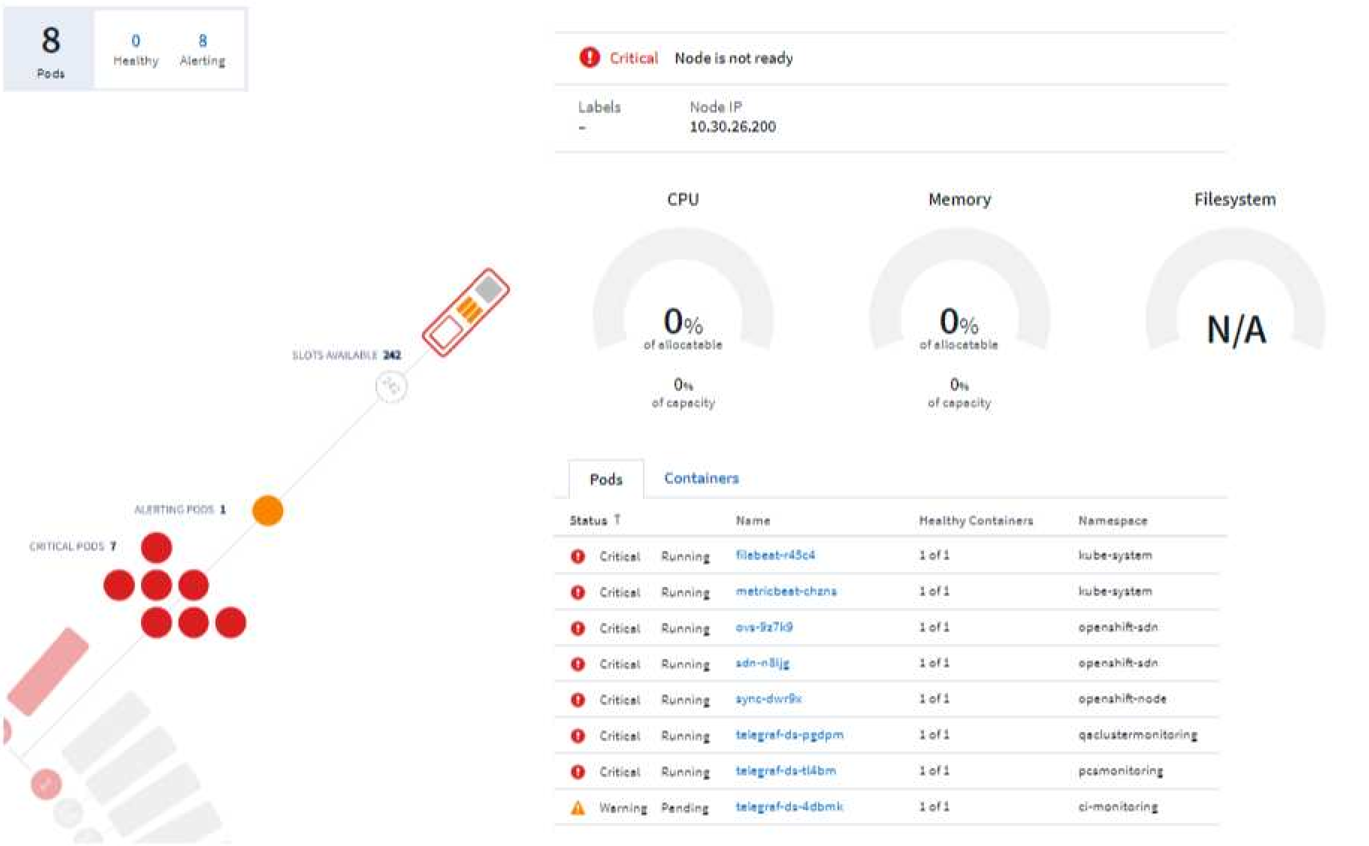
Previous Metric Name	New Metric Name
netapp_ontap.lif.recv_data	netapp_ontap.lif.recv_throughput
netapp_ontap.lif.sent_data	netapp_ontap.lif.sent_throughput
netapp_ontap.lun.read_data	netapp_ontap.lun.read_throughput
netapp_ontap.lun.write_data	netapp_ontap.lun.write_throughput
netapp_ontap.nic_common.rx_bytes	netapp_ontap.nic_common.rx_throughput
netapp_ontap.nic_common.tx_bytes	netapp_ontap.nic_common.tx_throughput
netapp_ontap.path.read_data	netapp_ontap.path.read_throughput
netapp_ontap.path.write_data	netapp_ontap.path.write_throughput
netapp_ontap.path.total_data	netapp_ontap.path.total_throughput
netapp_ontap.policy_group.read_data	netapp_ontap.policy_group.read_throughput
netapp_ontap.policy_group.write_data	netapp_ontap.policy_group.write_throughput
netapp_ontap.policy_group.other_data	netapp_ontap.policy_group.other_throughput
netapp_ontap.policy_group.total_data	netapp_ontap.policy_group.total_throughput
netapp_ontap.system_node.disk_data_read	netapp_ontap.system_node.disk_throughput_read
netapp_ontap.system_node.disk_data_written	netapp_ontap.system_node.disk_throughput_written
netapp_ontap.system_node.hdd_data_read	netapp_ontap.system_node.hdd_throughput_read
netapp_ontap.system_node.hdd_data_written	netapp_ontap.system_node.hdd_throughput_written
netapp_ontap.system_node.ssd_data_read	netapp_ontap.system_node.ssd_throughput_read
netapp_ontap.system_node.ssd_data_written	netapp_ontap.system_node.ssd_throughput_written
netapp_ontap.system_node.net_data_recv	netapp_ontap.system_node.net_throughput_recv
netapp_ontap.system_node.net_data_sent	netapp_ontap.system_node.net_throughput_sent
netapp_ontap.system_node.fcp_data_recv	netapp_ontap.system_node.fcp_throughput_recv
netapp_ontap.system_node.fcp_data_sent	netapp_ontap.system_node.fcp_throughput_sent
netapp_ontap.volume_node.cifs_read_data	netapp_ontap.volume_node.cifs_read_throughput
netapp_ontap.volume_node.cifs_write_data	netapp_ontap.volume_node.cifs_write_throughput
netapp_ontap.volume_node.nfs_read_data	netapp_ontap.volume_node.nfs_read_throughput
netapp_ontap.volume_node.nfs_write_data	netapp_ontap.volume_node.nfs_write_throughput
netapp_ontap.volume_node.iscsi_read_data	netapp_ontap.volume_node.iscsi_read_throughput
netapp_ontap.volume_node.iscsi_write_data	netapp_ontap.volume_node.iscsi_write_throughput
netapp_ontap.volume_node.fcp_read_data	netapp_ontap.volume_node.fcp_read_throughput
netapp_ontap.volume_node.fcp_write_data	netapp_ontap.volume_node.fcp_write_throughput
netapp_ontap.volume.read_data	netapp_ontap.volume.read_throughput
netapp_ontap.volume.write_data	netapp_ontap.volume.write_throughput

Previous Metric Name	New Metric Name
netapp_ontap.workload.read_data	netapp_ontap.workload.read_throughput
netapp_ontap.workload.write_data	netapp_ontap.workload.write_throughput
netapp_ontap.workload_volume.read_data	netapp_ontap.workload_volume.read_throughput
netapp_ontap.workload_volume.write_data	netapp_ontap.workload_volume.write_throughput

New Kubernetes Explorer

The Kubernetes Explorer provides a simple topology view of Kubernetes Clusters, allowing even non-experts to quickly identify issues & dependencies, from the cluster level down to the container and storage.

A wide variety of information can be explored using the Kubernetes Explorer’s drill-down details for status, usage, and health of the Clusters, Nodes, Pods, Containers, and Storage in your Kubernetes environment.



❗ Critical Node is not ready

Labels
-

Node IP
10.30.26.200

Status		Name	Healthy Containers	Namespace
Critical	Running	filebeat-r45c4	1 of 1	kube-system
Critical	Running	metricbeat-chzns	1 of 1	kube-system
Critical	Running	ovs-9z7k9	1 of 1	openshift-sdn
Critical	Running	sdn-n8ljg	1 of 1	openshift-sdn
Critical	Running	sync-dwr9x	1 of 1	openshift-node
Critical	Running	telegraf-ds-pgdpm	1 of 1	qaclustermonitoring
Critical	Running	telegraf-ds-tl4bm	1 of 1	pcsmonitoring
⚠ Warning	Pending	telegraf-ds-4dbmk	1 of 1	ci-monitoring

December 2020

Simpler Kubernetes Installation

Kubernetes Agent installation has been streamlined to require fewer user interactions. Installing the Kubernetes Agent now includes Kubernetes data collection.

November 2020

Additional Dashboards

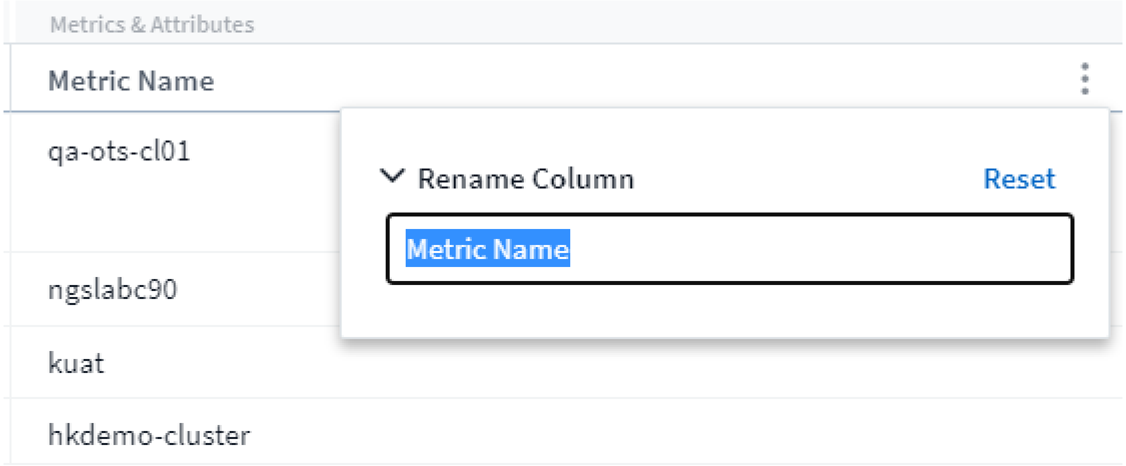
The following new ONTAP-focused dashboards have been added to the gallery and are available for import:

- ONTAP: Aggregate Performance & Capacity
- ONTAP FAS/AFF - Capacity Utilization
- ONTAP FAS/AFF - Cluster Capacity
- ONTAP FAS/AFF - Efficiency
- ONTAP FAS/AFF - FlexVol Performance
- ONTAP FAS/AFF - Node Operational/Optimal Points
- ONTAP FAS/AFF - PrePost Capacity Efficiencies
- ONTAP: Network Port Activity
- ONTAP: Node Protocols Performance
- ONTAP: Node Workload Performance (Frontend)
- ONTAP: Processor
- ONTAP: SVM Workload Performance (Frontend)
- ONTAP: Volume Workload Performance (Frontend)

Column Rename in Table Widgets

You can rename columns in the *Metrics and Attributes* section of a table widget by opening the widget in Edit mode and clicking the menu at the top of the column. Enter the new name and click *Save*, or click *Reset* to set the column back to the original name.

Note that this only affects the column's display name in the table widget; the metric/attribute name does not change in the underlying data itself.



Metrics & Attributes
Metric Name
qa-ots-cl01
ngslabc90
kuat
hkdemo-cluster

October 2020

Default Expansion of Integration Data

Table widget grouping now allows for default expansions of Kubernetes, ONTAP Advanced Data, and Agent Node metrics. For example, if you group Kubernetes *Nodes* by *Cluster*, you will see a row in the table for each cluster. You could then expand each cluster row to see a list of the Node objects.

Basic Edition Technical Support

Technical Support is now available for subscribers to Cloud Insights Basic Edition in addition to Standard and Premium Editions. Additionally, Cloud Insights has simplified the workflow for creating a NetApp support ticket.

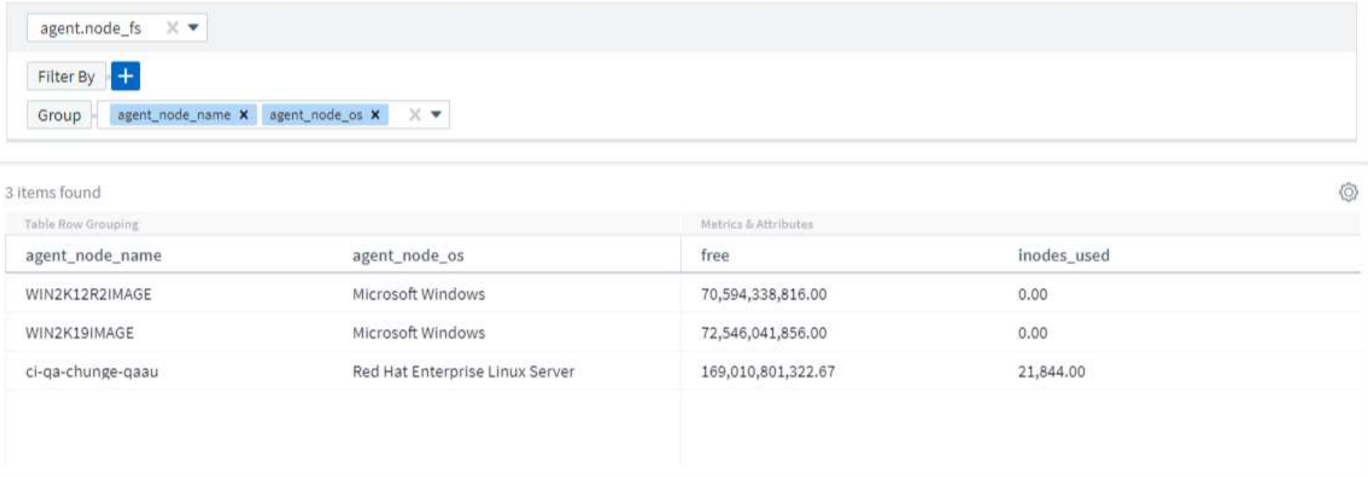
Cloud Secure Public API

Cloud Secure supports REST APIs for accessing Activity and Alert information. This is accomplished through the use of API Access Tokens, created through the Cloud Secure Admin UI, which are then used to access the REST APIs. Swagger documentation for these REST APIs is integrated with Cloud Secure.

September 2020

Query Page with Integration Data

The Cloud Insights Query page supports integration data (i.e. from Kubernetes, ONTAP Advanced Metrics, etc.). When working with integration data, the query results table displays a "Split-Screen" view, with object/grouping on the left side, and object data (attributes/metrics) on the right. You can also choose multiple attributes for grouping integration data.



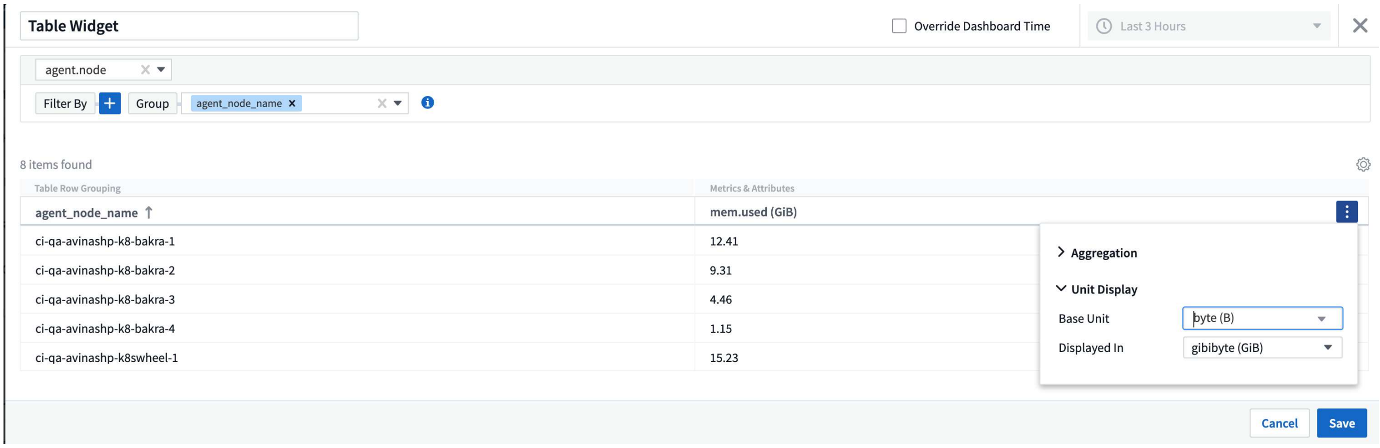
Group: agent_node_name, agent_node_os

3 items found

Table Row Grouping		Metrics & Attributes	
agent_node_name	agent_node_os	free	inodes_used
WIN2K12R2IMAGE	Microsoft Windows	70,594,338,816.00	0.00
WIN2K19IMAGE	Microsoft Windows	72,546,041,856.00	0.00
ci-qa-chunge-qaau	Red Hat Enterprise Linux Server	169,010,801,322.67	21,844.00

Unit Display Formatting in Table Widget

Unit display formatting is now available in Table widgets for columns that display metric/counter data (for example, gigabytes, MB/second, etc.). To change a metric’s display unit, click the "three dots" menu in the column header and select "Unit Display". You can choose from any of the available units. Available units will vary according to the type of metric data in the display column.



agent.node

Group: agent_node_name

8 items found

Table Row Grouping	Metrics & Attributes
agent_node_name ↑	mem.used (GiB)
ci-qa-avinashp-k8-bakra-1	12.41
ci-qa-avinashp-k8-bakra-2	9.31
ci-qa-avinashp-k8-bakra-3	4.46
ci-qa-avinashp-k8-bakra-4	1.15
ci-qa-avinashp-k8swheel-1	15.23

> Aggregation

Unit Display

Base Unit: byte (B)

Displayed In: gibibyte (GiB)

Acquisition Unit Detail Page

Acquisition Units now have their own landing page, providing useful detail for each AU as well as information to help with troubleshooting. The AU detail page provides links to the AU’s data collectors as well as helpful status information.

Cloud Secure Docker Dependency Removed

Cloud Secure’s dependency on Docker has been removed. Docker is no longer required for Cloud Secure agent installation.

Reporting User Roles

If you have Cloud Insights Premium Edition with Reporting, every Cloud Insights user in your environment also has a Single Sign-On (SSO) login to the Reporting application (i.e. Cognos); by clicking the **Reports** link in the menu, they will automatically be logged in to Reporting.

Their user role in Cloud Insights determines their Reporting user role:

Cloud Insights Role	Reporting Role	Reporting Permissions
Guest	Consumer	Can view, schedule, and run reports and set personal preferences such as those for languages and time zones. Consumers cannot create reports or perform administrative tasks.
User	Author	Can perform all Consumer functions as well as create and manage reports and dashboards.
Administrator	Administrator	Can perform all Author functions as well as all administrative tasks such configuration of reports and the shutdown and restart of reporting tasks.

Cloud Insights Reporting is available for environments of 500 MUs or more.

If you are a current Premium Edition customer and wish to retain your reports, read this important note for existing customers.

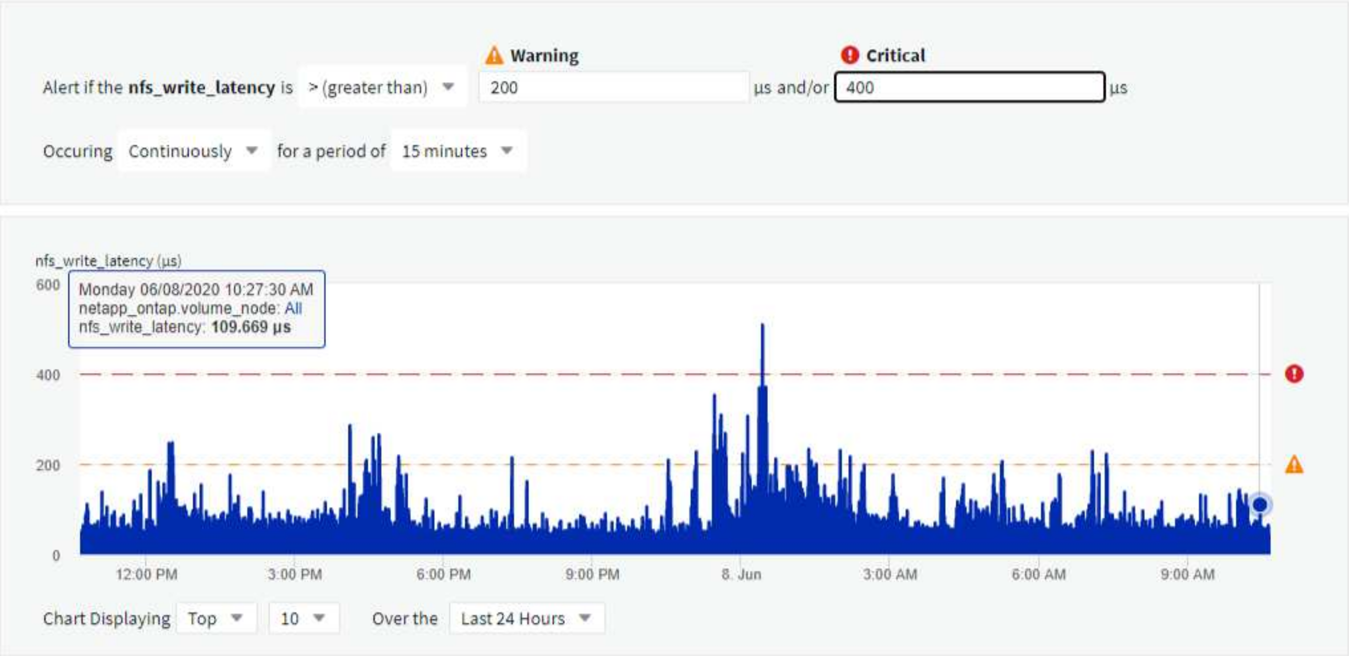
New API Category for Data Ingestion

Cloud Insights has added a **Data Ingestion** API category, giving you greater control over custom data and agents. Detailed documentation for this and other API Categories can be found in Cloud Insights by navigating to **Admin > API Access** and clicking the *API Documentation* link. You can also attach a comment to the AU in the Note field, which is displayed on the AU detail page as well as the AU list page.

August 2020

Monitoring and Alerting

In addition to the current ability to set performance policies for storage objects, VMs, EC2, and ports, Cloud Insights Standard Edition now includes the ability to configure monitors for thresholds on Integration data for Kubernetes, ONTAP advanced metrics, and Telegraf plugins. You simply create a monitor for each object metric you want to trigger alerts, set the conditions for warning-level or critical-level thresholds, and specify the email recipient(s) desired for each level. You can then view and manage alerts to track trends or troubleshoot issues.



⚠ Warning ❗ Critical

Alert if the **nfs_write_latency** is > (greater than) 200 µs and/or 400 µs

Occuring Continuously for a period of 15 minutes

Monday 06/08/2020 10:27:30 AM
netapp_ontap.volume_node: All
nfs_write_latency: **109.669 µs**

Chart Displaying Top 10 Over the Last 24 Hours

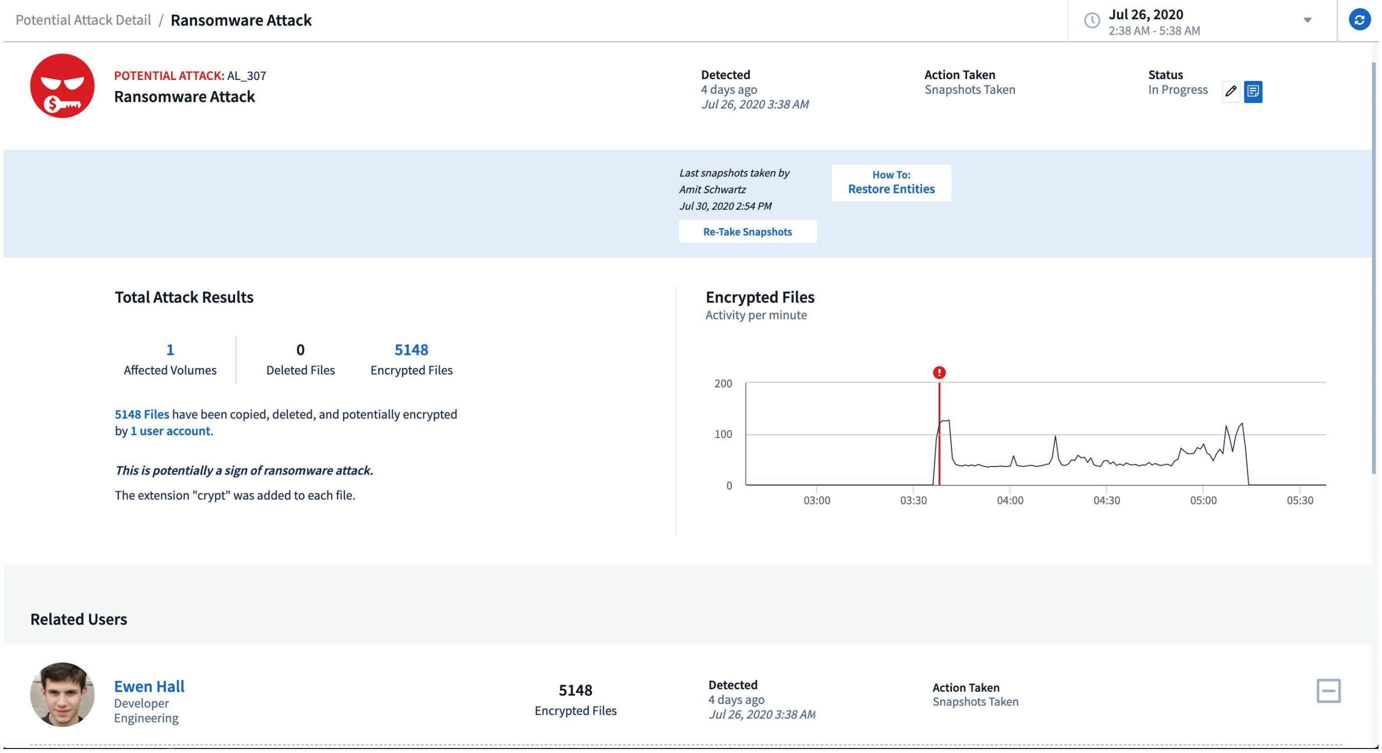
July 2020

Cloud Secure *Take a Snapshot* Action

Cloud Secure protects your data by automatically taking a snapshot when malicious activity is detected, ensuring that your data is safely backed up.

You can define automated response policies that take a snapshot when ransomware attack or other abnormal user activity is detected.
You can also take a snapshot manually from the alert page.

Automatic Snapshot taken:



Potential Attack Detail / **Ransomware Attack**

Jul 26, 2020
2:38 AM - 5:38 AM

POTENTIAL ATTACK: AL_307
Ransomware Attack

Detected
4 days ago
Jul 26, 2020 3:38 AM

Action Taken
Snapshots Taken

Status
In Progress

Last snapshots taken by
Amit Schwartz
Jul 30, 2020 2:54 PM

Total Attack Results

1	0	5148
Affected Volumes	Deleted Files	Encrypted Files

5148 Files have been copied, deleted, and potentially encrypted by 1 user account.

This is potentially a sign of ransomware attack.

The extension "crypt" was added to each file.

Encrypted Files
Activity per minute

Related Users

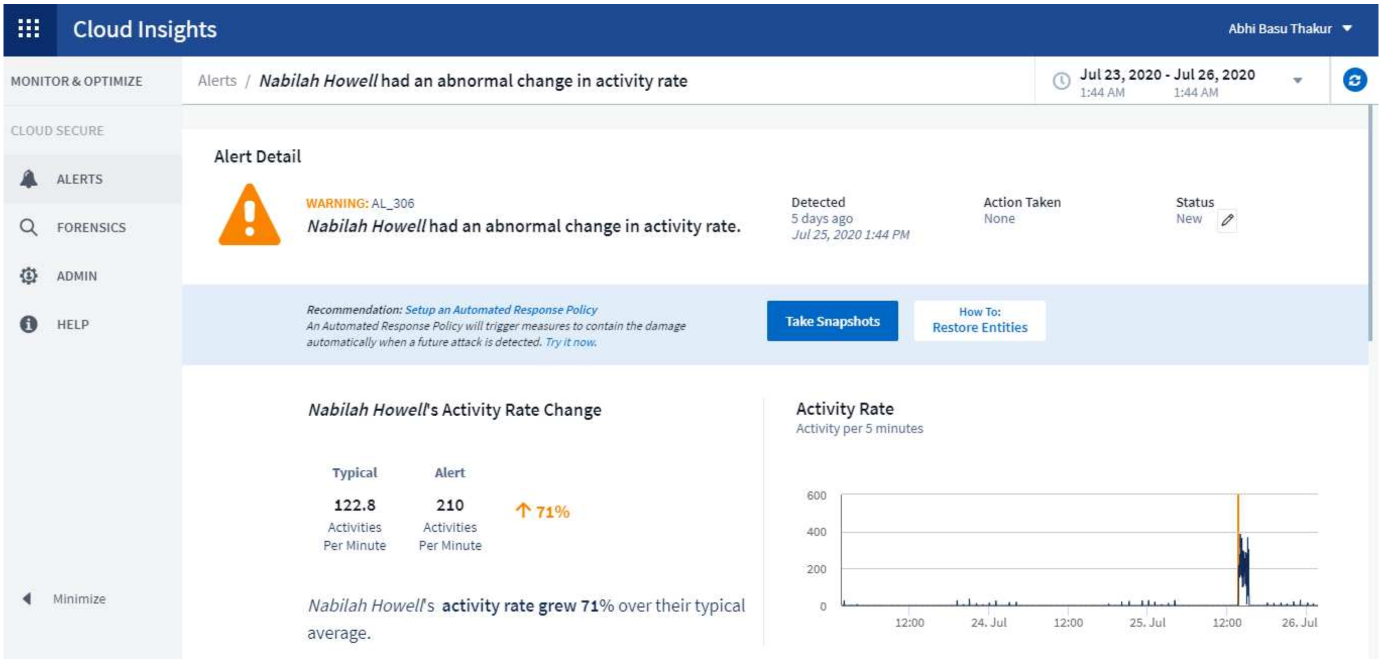
Ewen Hall
Developer
Engineering

5148
Encrypted Files

Detected
4 days ago
Jul 26, 2020 3:38 AM

Action Taken
Snapshots Taken

Manual Snapshot:



Alerts / *Nabilah Howell* had an abnormal change in activity rate

Jul 23, 2020 - Jul 26, 2020
1:44 AM 1:44 AM

Alert Detail

WARNING: AL_306
Nabilah Howell had an abnormal change in activity rate.

Detected
5 days ago
Jul 25, 2020 1:44 PM

Action Taken
None

Status
New

Recommendation: Setup an Automated Response Policy
An Automated Response Policy will trigger measures to contain the damage automatically when a future attack is detected. Try it now.

Nabilah Howell's Activity Rate Change

Typical	Alert	
122.8 Activities Per Minute	210 Activities Per Minute	↑ 71%

Nabilah Howell's **activity rate grew 71%** over their typical average.

Activity Rate
Activity per 5 minutes

Metric/Counter updates

The following capacity counters are available for use in Cloud Insights UI and REST API. Previously these counters were only available for the Data Warehouse / Reporting.

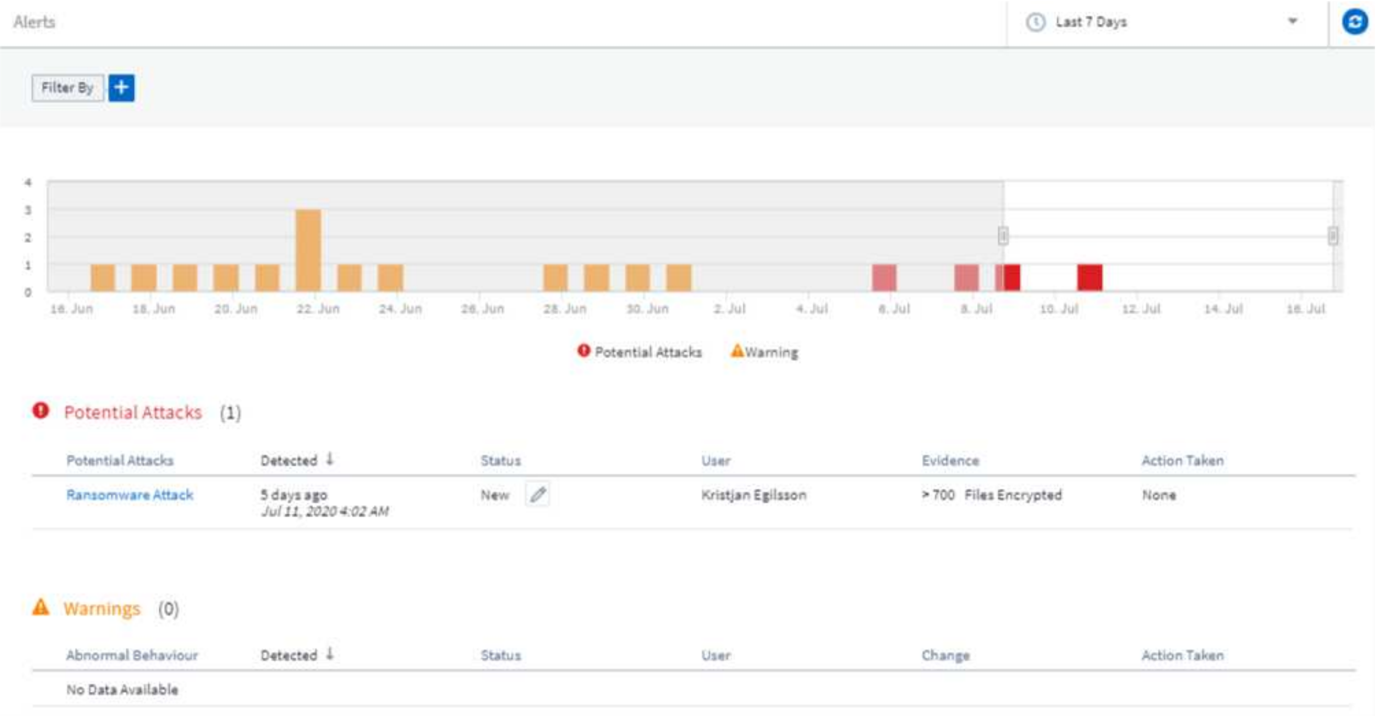
Object Type	Counter
Storage	Capacity - Spare Raw Capacity - Failed Raw
Storage Pool	Data Capacity - Used Data Capacity - Total Other Capacity - Used Other Capacity - Total Capacity - Raw Capacity - Soft Limit
Internal Volume	Data Capacity - Used Data Capacity - Total Other Capacity - Used Other Capacity - Total Clone Saved Capacity - Total

Cloud Secure Potential Attack Detection

Cloud Secure now detects potential attacks such as ransomware. Click on an alert in the Alerts list page to open a detail page showing the following:

- Time of attack
- Associated user and file activity
- Action taken
- Additional information to assist with tracking down possible security breaches

Alerts page showing potential ransomware attack:



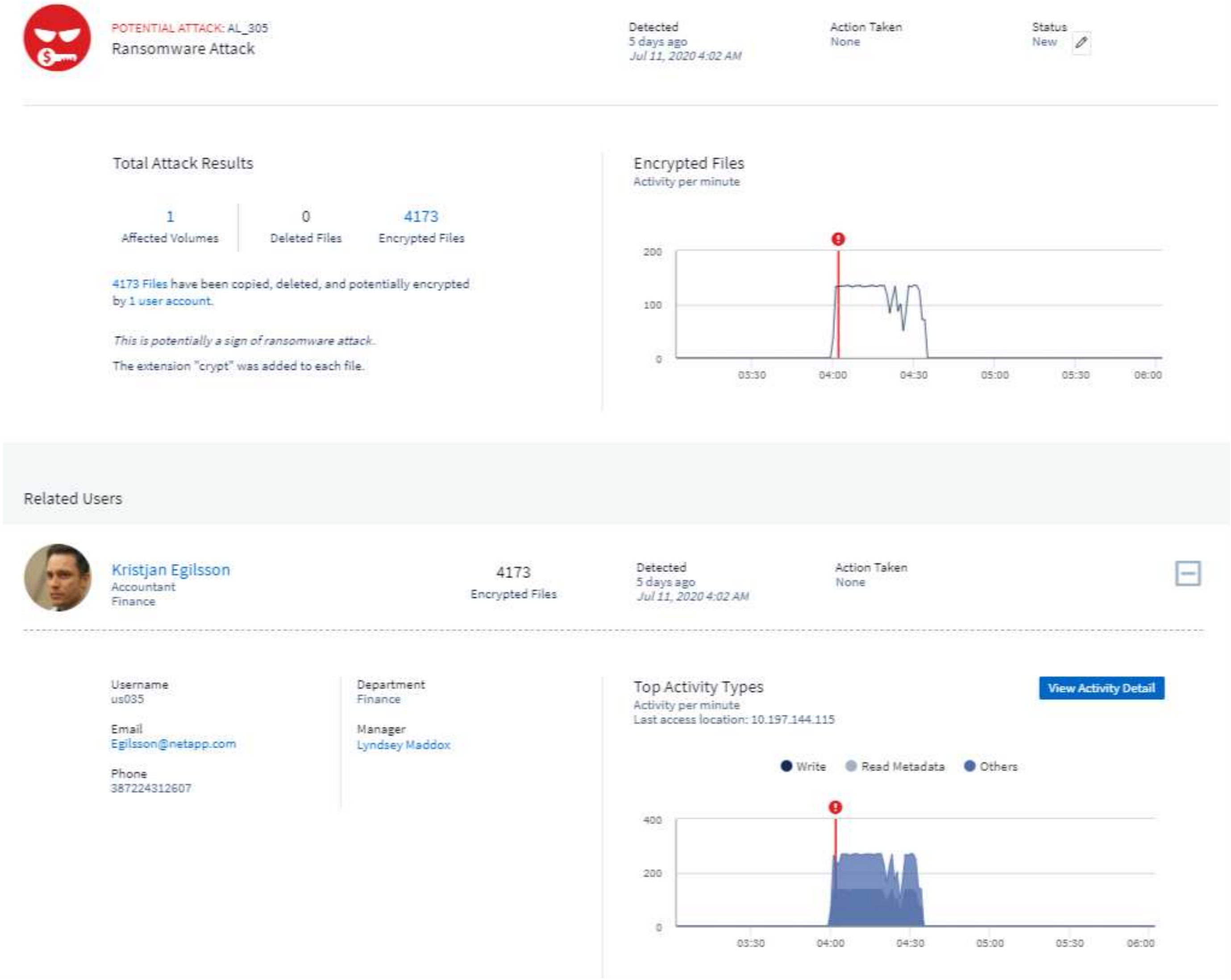
Potential Attacks (1)

Potential Attacks	Detected ↓	Status	User	Evidence	Action Taken
Ransomware Attack	5 days ago *Jul 11, 2020 4:02 AM*	New	Kristjan Egilsson	> 700 Files Encrypted	None

Warnings (0)

Abnormal Behaviour	Detected ↓	Status	User	Change	Action Taken
No Data Available					

Detail page for potential ransomware attack:



POTENTIAL ATTACK: AL_305
Ransomware Attack

Detected
5 days ago
Jul 11, 2020 4:02 AM

Action Taken
None

Status
New

Total Attack Results

1	0	4173
Affected Volumes	Deleted Files	Encrypted Files

4173 Files have been copied, deleted, and potentially encrypted by 1 user account.

This is potentially a sign of ransomware attack.

The extension "crypt" was added to each file.

Encrypted Files
Activity per minute

Related Users

Kristjan Egilsson
Accountant
Finance

4173
Encrypted Files

Detected
5 days ago
Jul 11, 2020 4:02 AM

Action Taken
None

Username
us035

Email
Egilsson@netapp.com

Phone
387224312607

Department
Finance

Manager
Lyndsey Maddox

Top Activity Types
Activity per minute
Last access location: 10.197.144.115

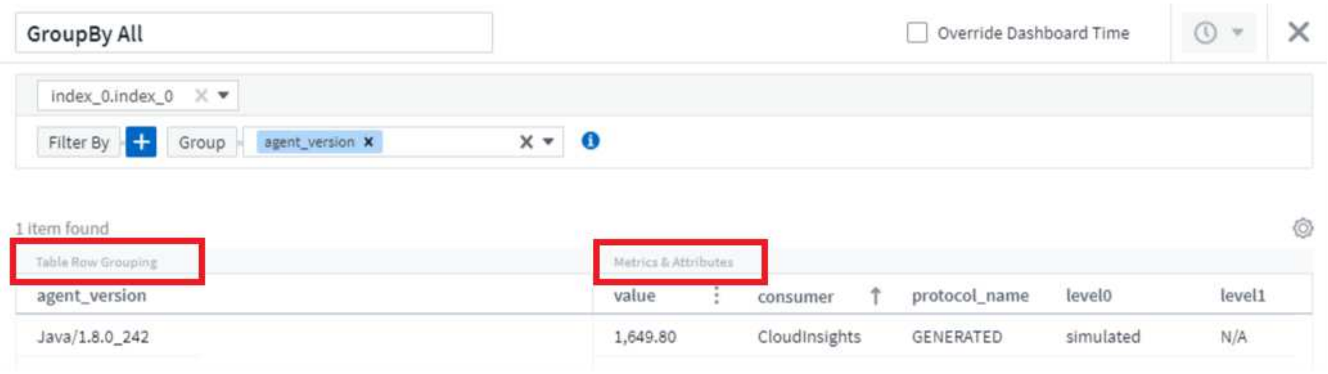
Subscribe to Premium Edition through AWS

During your trial of Cloud Insights, you can self-subscribe through AWS Marketplace to either Cloud Insights Standard Edition or Premium Edition. Previously, you could only self-subscribe through AWS Marketplace to Standard Edition only.

Enhanced Table Widget

The dashboard/asset page Table widget includes the following enhancements:

- "Split-Screen" view: Table widgets display the object/grouping on the left side, and the object data (attributes/metrics) on the right.



GroupBy All

☐ Override Dashboard Time

index_0.index_0

Filter By: + · Group: agent_version

1 item found

Table Row Grouping	Metrics & Attributes				
agent_version	value	consumer	protocol_name	level0	level1
Java/1.8.0_242	1,649.80	CloudInsights	GENERATED	simulated	N/A

- Multiple attribute grouping: For Integration data (Kubernetes, ONTAP Advanced Metrics, Docker, etc.), you can choose multiple attributes for grouping. Data is displayed according to the grouping attributes/you choose.

  Grouping with Integration Data (shown in Edit mode):

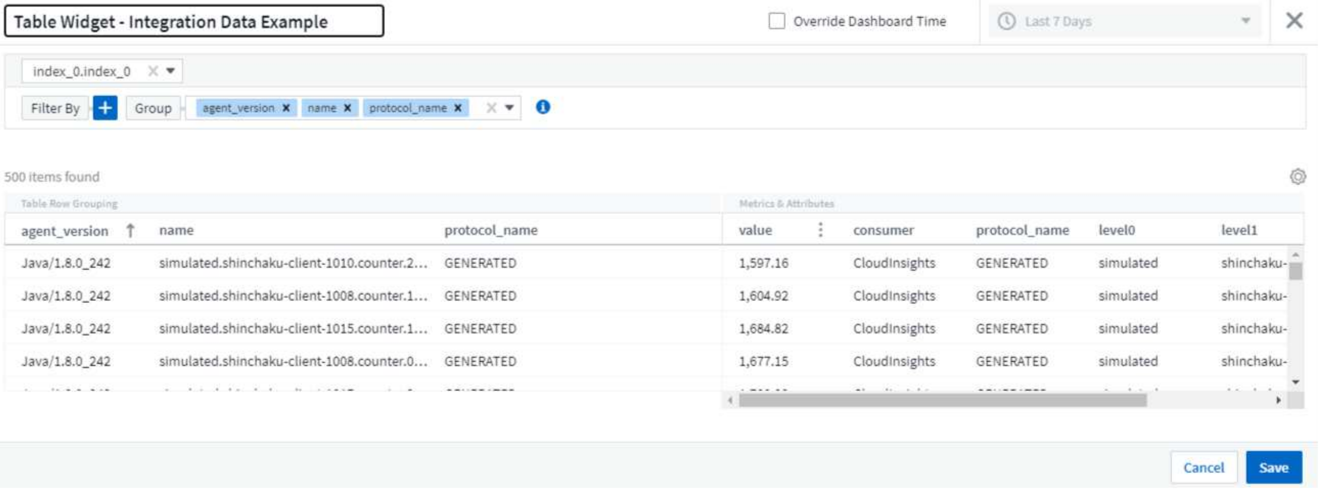


Table Widget - Integration Data Example

☐ Override Dashboard Time · Last 7 Days

index_0.index_0

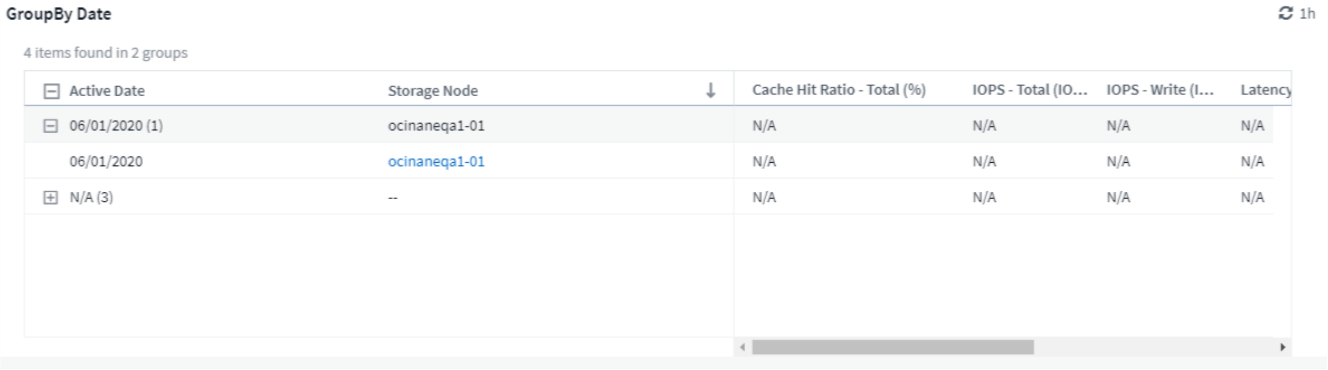
Filter By: + · Group: agent_version, name, protocol_name

500 items found

Table Row Grouping			Metrics & Attributes				
agent_version	name	protocol_name	value	consumer	protocol_name	level0	level1
Java/1.8.0_242	simulated.shinchaku-client-1010.counter.2…	GENERATED	1,597.16	CloudInsights	GENERATED	simulated	shinchaku-
Java/1.8.0_242	simulated.shinchaku-client-1008.counter.1…	GENERATED	1,604.92	CloudInsights	GENERATED	simulated	shinchaku-
Java/1.8.0_242	simulated.shinchaku-client-1015.counter.1…	GENERATED	1,684.82	CloudInsights	GENERATED	simulated	shinchaku-
Java/1.8.0_242	simulated.shinchaku-client-1008.counter.0…	GENERATED	1,677.15	CloudInsights	GENERATED	simulated	shinchaku-

- Grouping for Infrastructure data (storage, EC2, VM, ports, etc.) is by a single attribute as before. When grouping by an attribute which is not the object, the table will allow you to expand the group row to see all the objects within the group.

  Grouping with Infrastructure data (shown in display mode):



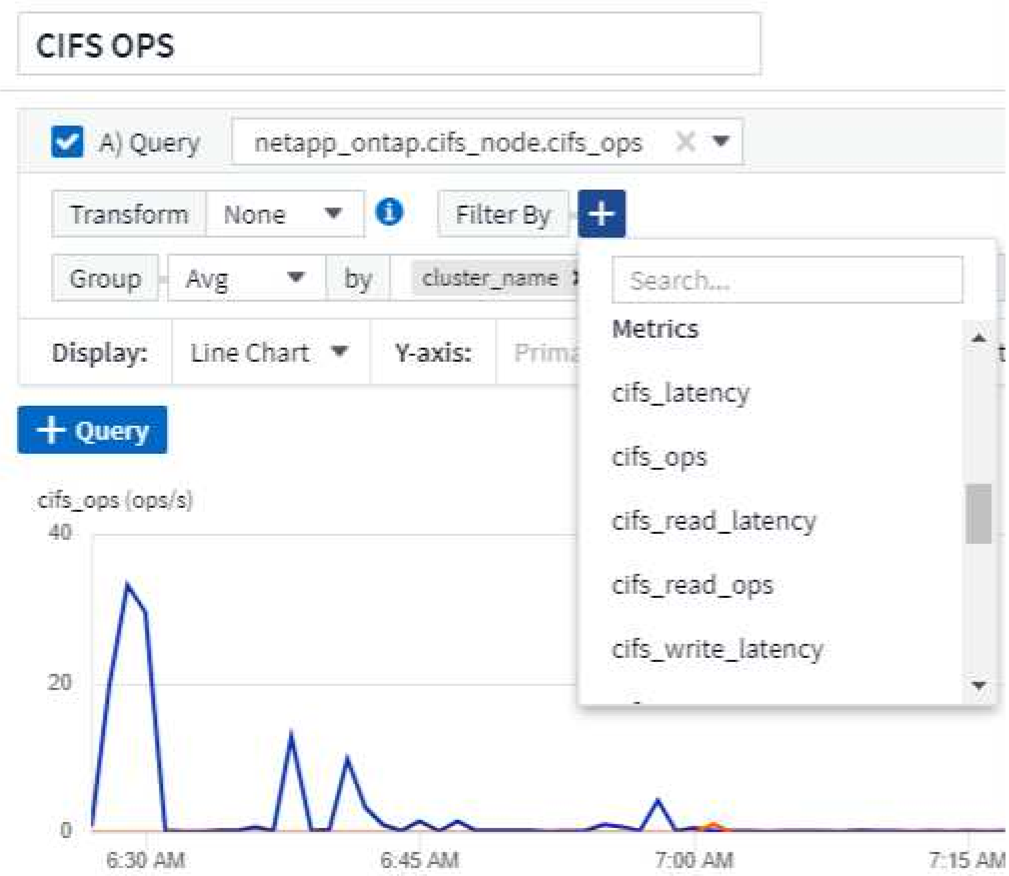
GroupBy Date

4 items found in 2 groups

Active Date	Storage Node	Cache Hit Ratio - Total (%)	IOPS - Total (IO…	IOPS - Write (I…	Latency
⊟ 06/01/2020 (1)	ocinaneqa1-01	N/A	N/A	N/A	N/A
06/01/2020	ocinaneqa1-01	N/A	N/A	N/A	N/A
⊞ N/A (3)	--	N/A	N/A	N/A	N/A

Metrics Filtering

In addition to filtering on an object’s attributes in a widget, you can now filter on metrics as well.


CIFS OPS

☑ A) Query netapp_ontap.cifs_node.cifs_ops

Transform None

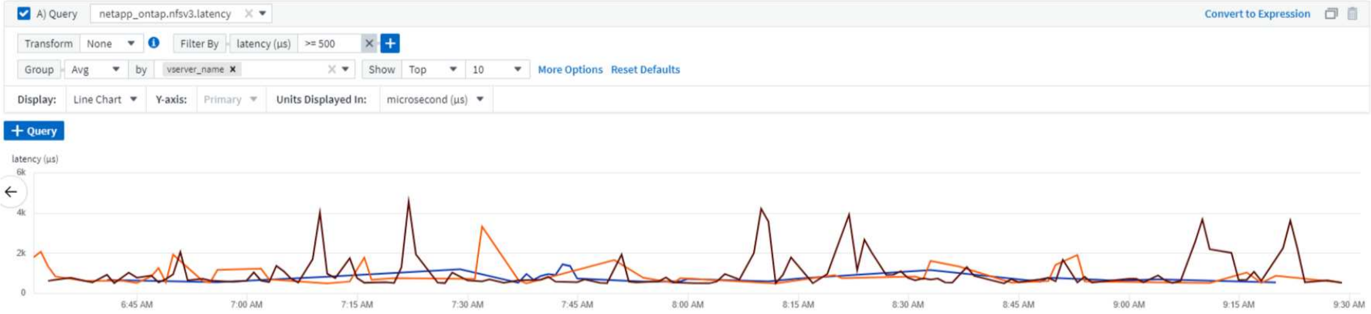
Filter By

Group Avg by cluster_name

Display: Line Chart

Y-axis: Prima

When working with integration data (Kubernetes, ONTAP Advanced Data, etc.), metric filtering removes the individual/unmatched data points from the plotted data series, unlike infrastructure data (storage, VM, ports etc.) where filters work on the aggregated value of the data series and potentially remove the entire object from the chart.


☑ A) Query netapp_ontap.nfsv3.latency

Transform None

Filter By latency (µs) >= 500

Group Avg by vserver_name

Show Top 10

Display: Line Chart

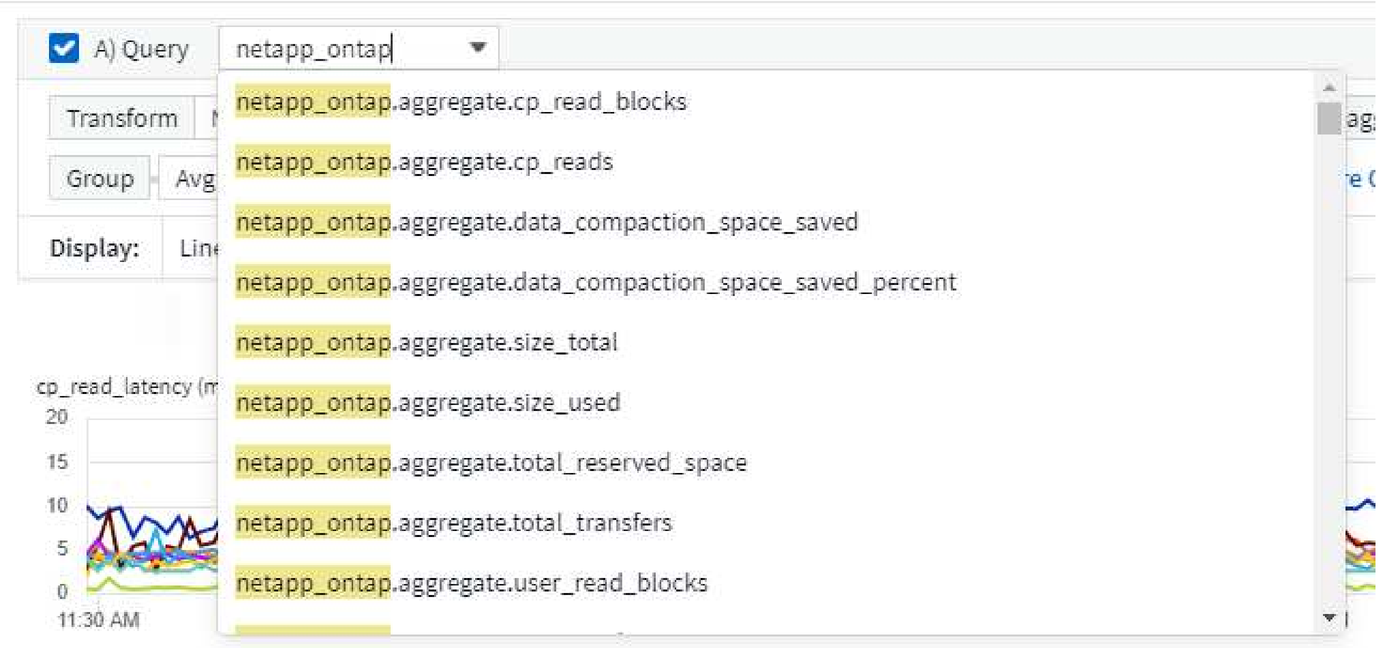
Y-axis: Primary

Units Displayed In: microsecond (µs)

ONTAP Advanced Counter Data

Cloud Insights takes advantage of NetApp's ONTAP-specific **Advanced Counter Data**, which provides a host of counters and metrics collected from ONTAP devices. ONTAP Advanced Counter Data is available to all NetApp ONTAP customers. These metrics enable customized and wide-ranging visualization in Cloud Insights widgets and dashboards.

ONTAP Advanced Counters can be found by searching for "netapp_ontap" in the widget's query, and selecting from among the counters.

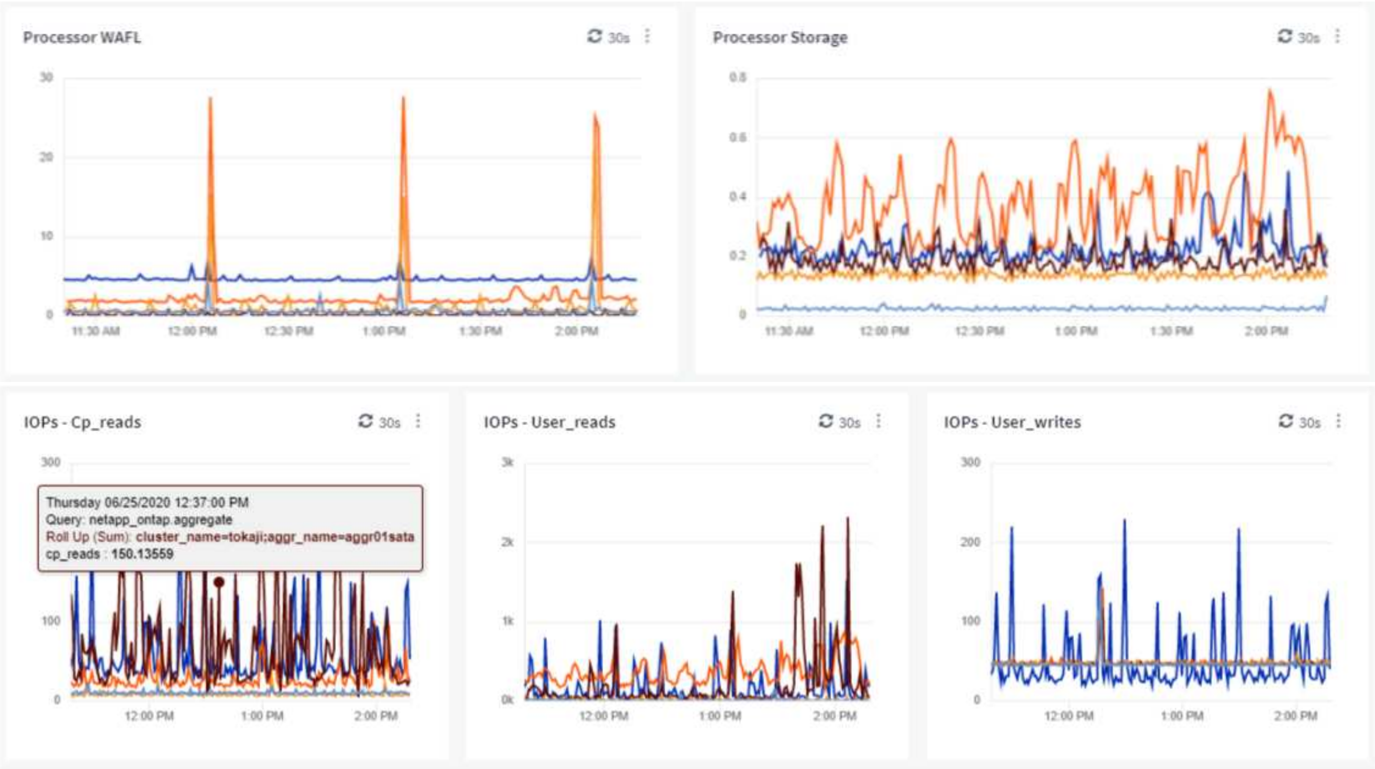


netapp_ontap

netapp_ontap.aggregate.cp_read_blocks
netapp_ontap.aggregate.cp_reads
netapp_ontap.aggregate.data_compaction_space_saved
netapp_ontap.aggregate.data_compaction_space_saved_percent
netapp_ontap.aggregate.size_total
netapp_ontap.aggregate.size_used
netapp_ontap.aggregate.total_reserved_space
netapp_ontap.aggregate.total_transfers
netapp_ontap.aggregate.user_read_blocks

You can refine your search by typing additional parts of the counter name. For example:

- *lif*
- *aggregate*
- *offbox_vscan_server*
- and more



Thursday 06/25/2020 12:37:00 PM
Query: netapp_ontap.aggregate
Roll Up (Sum): cluster_name=tokaji;aggr_name=aggr01sata
cp_reads : 150.13559

Please note the following:

- Advanced Data collection will be enabled by default for new ONTAP data collectors. To enable Advanced Data collection for your existing ONTAP data collectors, edit the data collector and expand the *Advanced Configuration* section.
- Advanced Data collection is not available for 7-mode ONTAP.

Advanced Counter Dashboards

Cloud Insights comes with a variety of pre-designed dashboards to help get you started on visualizing ONTAP Advanced Counters for topics such as *Aggregate Performance*, *Volume Workload*, *Processor Activity*, and more. If you have at least one ONTAP data collector configured, these can be imported from the Dashboard Gallery on any dashboard list page.

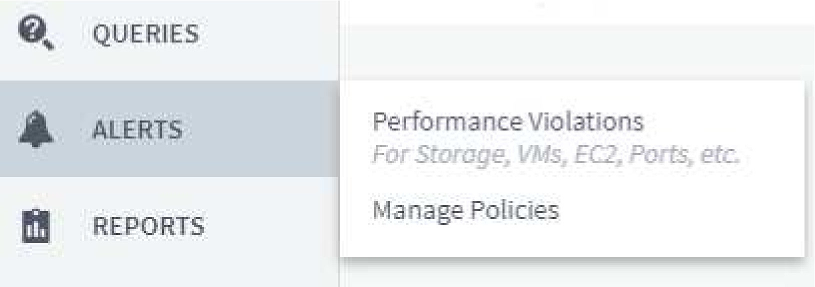
Learn More

More information on ONTAP Advanced Data can be found at the following links:

- https://mysupport.netapp.com/site/tools/tool-eula/netapp-harvest (Note: You will need to sign in to NetApp Support)
- https://nabox.org/faq/

Policies and Violations Menu

Performance Policies and Violations are now found under the **Alerts** menu. Policy and Violation functionality are unchanged.



Updated Telegraf Agent

The agent for ingestion of telegraf integration data has been updated to version 1.14, which includes bugs fixes, security fixes, and new plugins.

Note: When configuring a Kubernetes data collector on the Kubernetes platform, you may see an "HTTP status 403 Forbidden" error in the log, due to insufficient permissions in the "clusterrole" attribute.

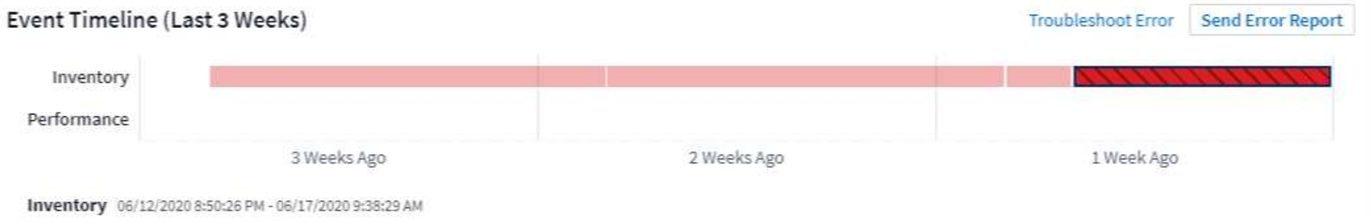
To work around this issue, add the following highlighted lines to the *rules:* section of the endpoint-access clusterrole, and then restart the Telegraf pods.

```
rules:
- apiGroups:
  - ""
  - apps
  - autoscaling
  - batch
  - extensions
  - policy
  - rbac.authorization.k8s.io
  attributeRestrictions: null
  resources:
  - nodes/metrics
  - nodes/proxy     <== Add this line
  - nodes/stats
  - pods            <== Add this line
  verbs:
  - get
  - list            <== Add this line
```

June 2020

Simplified Data Collector Error Reporting

Reporting a data collector error is easier with the *Send Error Report* button on the data collector page. Clicking the button sends basic information about the error to NetApp and prompts investigation into the problem. Once pressed, Cloud Insights acknowledges that NetApp has been notified, and the Error Report button is disabled to indicate that an error report for that data collector has been sent. The button remains disabled until the browser page is refreshed.

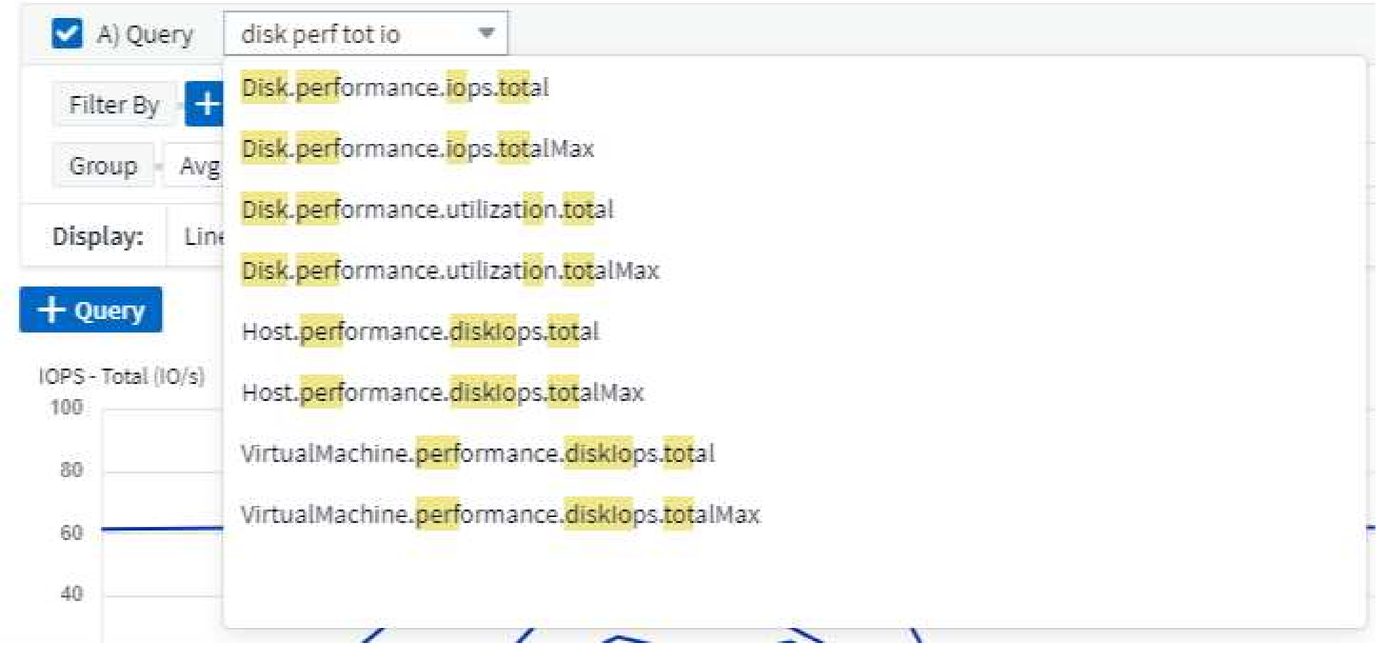


Inventory 06/12/2020 8:50:26 PM - 06/17/2020 9:38:29 AM

Widget Improvements

The following improvements have been made in dashboard widgets. These improvements are considered Preview functionality and may not be available for all Cloud Insights environments.

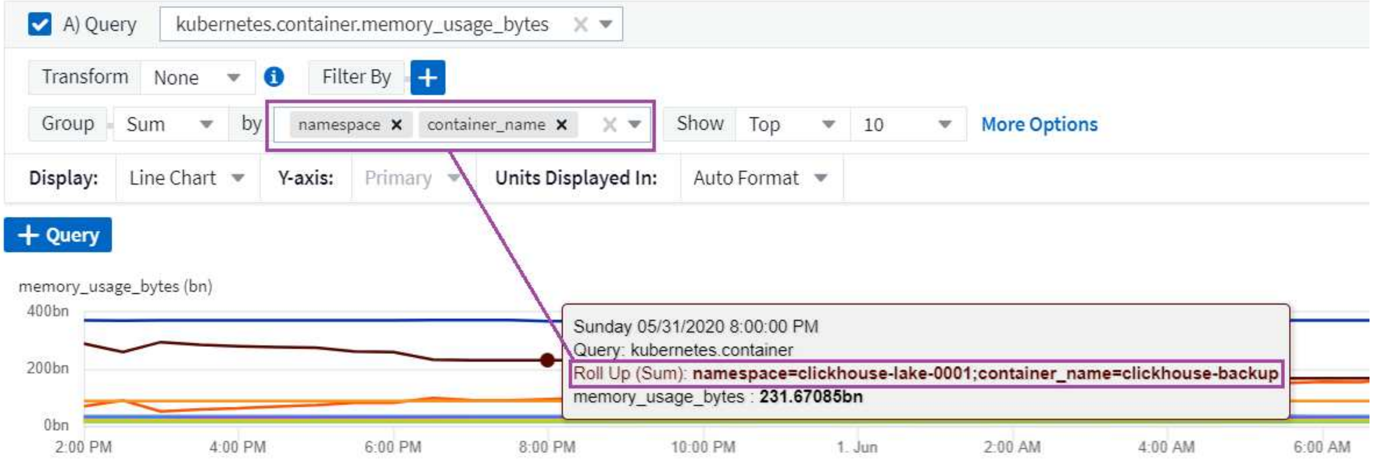
- New object/metric chooser: Objects (Storage, Disk, Ports, Nodes, etc.) and their associated metrics (IOPS, Latency, CPU Count, etc.) are now available in widgets in a single inclusive drop-down with powerful search capability. You can enter multiple partial terms in the drop-down, and Cloud Insights will list all object metrics meeting those terms.



A) Query: disk perf tot io

☑ A) Query
Filter By
+
Group
Avg
Display:
Line
+ Query
IOPS - Total (IO/s)
100
80
60
40
Disk.performance.iops.total
Disk.performance.iops.totalMax
Disk.performance.utilization.total
Disk.performance.utilization.totalMax
Host.performance.diskIops.total
Host.performance.diskIops.totalMax
VirtualMachine.performance.diskIops.total
VirtualMachine.performance.diskIops.totalMax

- Multiple tags grouping: When working with integration data (Kubernetes, etc.), you may group the data by multiple tags/attributes. For example, Sum memory usage by Kubernetes Namespace and Container name.



A) Query: kubernetes.container.memory_usage_bytes

Transform: None

Group: Sum by namespace, container_name

Show: Top 10

Display: Line Chart

Y-axis: Primary

Units Displayed In: Auto Format

Sunday 05/31/2020 8:00:00 PM
Query: kubernetes.container
Roll Up (Sum): namespace=clickhouse-lake-0001;container_name=clickhouse-backup
memory_usage_bytes : 231.67085bn

May 2020

Reporting User Roles

The following roles have been added for Reporting:

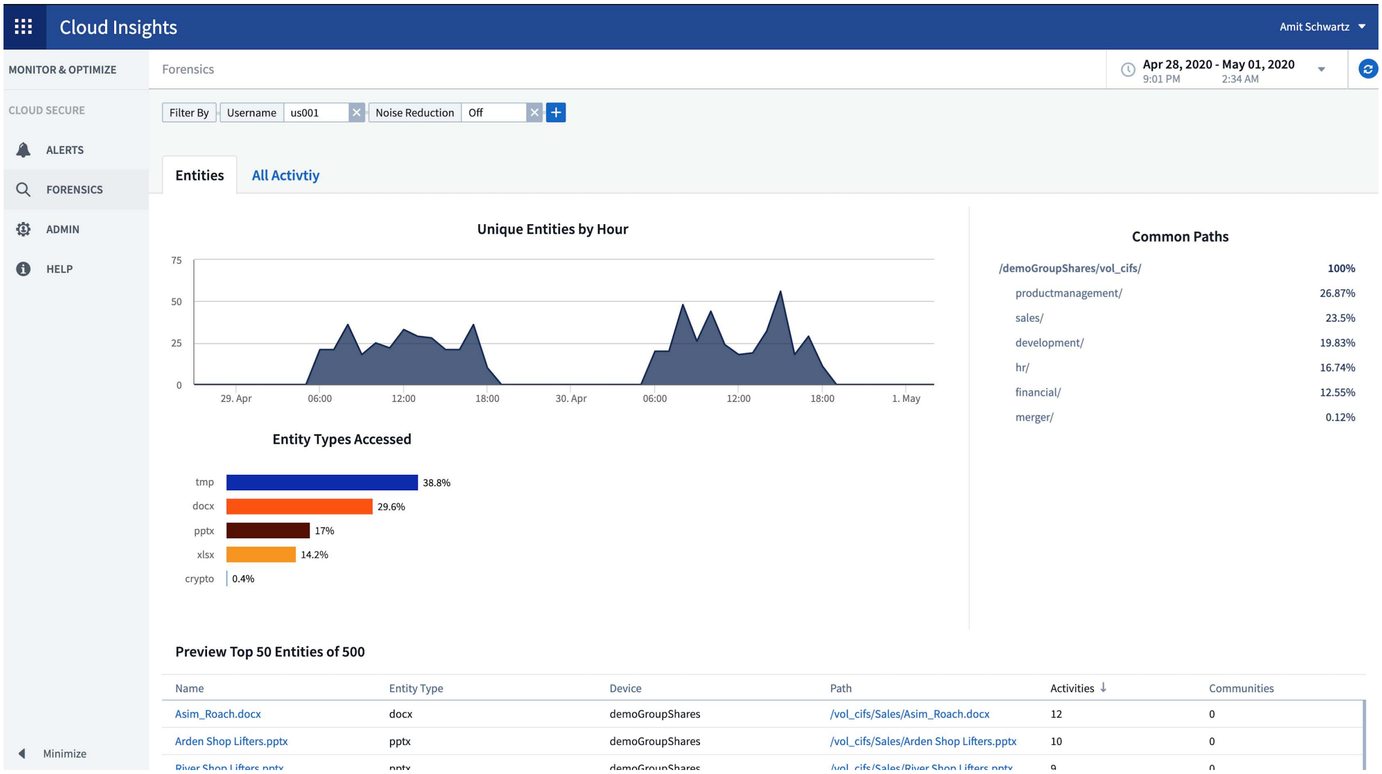
- Cloud Insights Consumers: can run and view reports
- Cloud Insights Authors: can perform the Consumer functions as well as create and manage reports and dashboards
- Cloud Insights Administrators: can perform the Author functions as well as all administrative tasks

Cloud Secure Updates

Cloud Insights includes the following recent Cloud Secure changes.

In the Forensics > Activity Forensics page, we provide two views to analyze and investigate user activity:

- Activity view, focused on user activity (What operation? Where performed?)
- Entities view, focused on what files the user accessed.



Filter By | Username | us001 | Noise Reduction | Off

Common Paths

/demoGroupShares/vol_cifs/	100%
productmanagement/	26.87%
sales/	23.5%
development/	19.83%
hr/	16.74%
financial/	12.55%
merger/	0.12%

Preview Top 50 Entities of 500

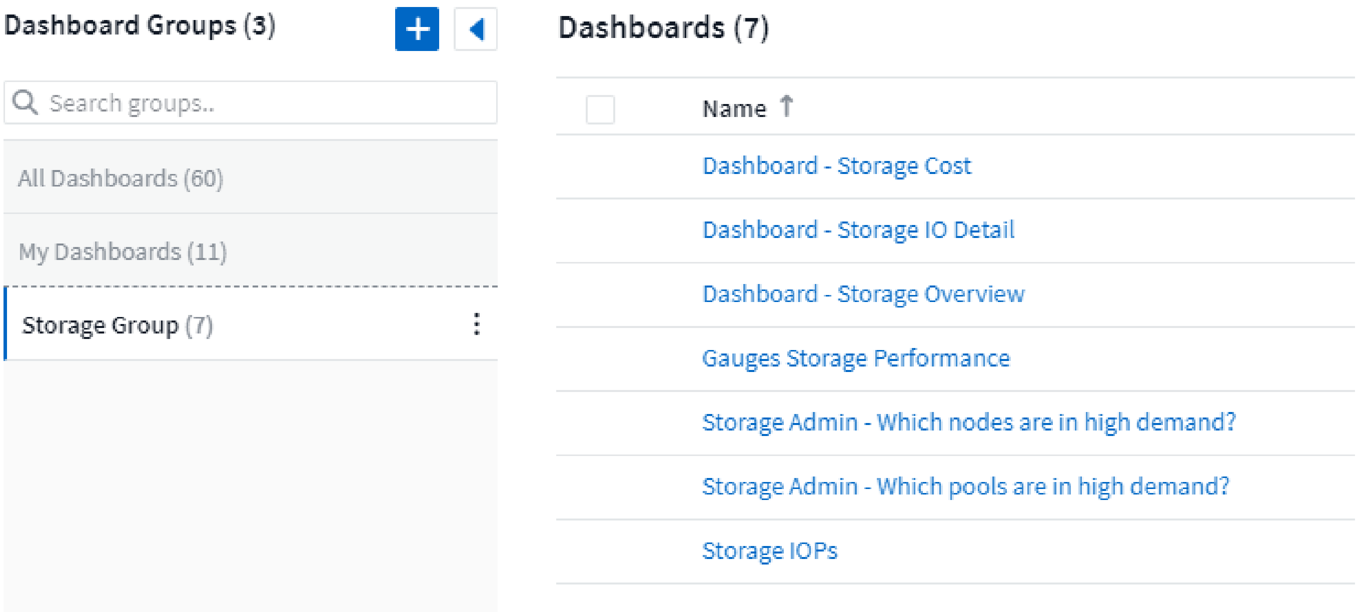
Name	Entity Type	Device	Path	Activities ↓	Communities
Asim_Roach.docx	docx	demoGroupShares	/vol_cifs/Sales/Asim_Roach.docx	12	0
Arden Shop Lifters.pptx	pptx	demoGroupShares	/vol_cifs/Sales/Arden Shop Lifters.pptx	10	0
River Shop Lifters.pptx	pptx	demoGroupShares	/vol_cifs/Sales/River Shop Lifters.pptx	9	0

Additionally, the Alert email notification now contains a direct link to the alert page.

Dashboard Grouping

Dashboard grouping allows better management of dashboards that are relevant to you. You can add related dashboards to a group for "one-stop" management of, for example, your storage or virtual machines.

Groups are customized per user, so one person’s groups can be different from someone else’s. You can have as many groups as you need, with as few or as many dashboards in each group as you like.



Dashboard Groups (3)

Search groups..

All Dashboards (60)

My Dashboards (11)

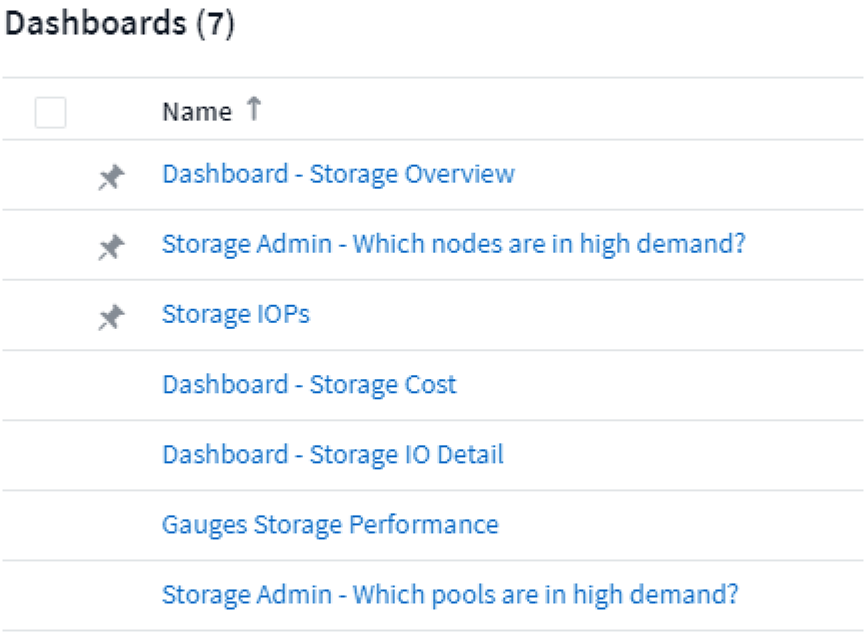
Storage Group (7)

Dashboards (7)

□	Name ↑
	Dashboard - Storage Cost
	Dashboard - Storage IO Detail
	Dashboard - Storage Overview
	Gauges Storage Performance
	Storage Admin - Which nodes are in high demand?
	Storage Admin - Which pools are in high demand?
	Storage IOPs

Dashboard Pinning

You can pin dashboards so favorites always appear at the top of the list.



Dashboards (7)

□		Name ↑
	📌	Dashboard - Storage Overview
	📌	Storage Admin - Which nodes are in high demand?
	📌	Storage IOPs
		Dashboard - Storage Cost
		Dashboard - Storage IO Detail
		Gauges Storage Performance
		Storage Admin - Which pools are in high demand?

TV Mode and Auto-Refresh

TV Mode and Auto-Refresh allow for near-real-time display of data on a dashboard or asset page:

- **TV Mode** provides an uncluttered display; the navigation menu is hidden, providing more screen real estate for your data display.
- Data in widgets on Dashboards and Asset Landing Pages **Auto-Refresh** according a refresh interval (as little as every 10 seconds) determined by the Dashboard Time Range selected (or widget time range, if set to override the dashboard time).

Combined, TV Mode and Auto-Refresh provide a live view of your Cloud Insights data, perfect for seamless demonstrations or in-house monitoring.

April 2020

New Dashboard Time Range Choices

Time range choices for dashboards and other Cloud insights pages now include *Last 1 Hour* and *Last 15 Minutes*.

Cloud Secure Updates

Cloud Insights includes the following recent Cloud Secure changes.

- Better file and folder metadata change recognition to detect if the user changed Permission, Owner, or Group Ownership.
- Export user activity report to CSV.

Cloud Secure monitors and audits all user access operations on files and folders. Activity auditing allows you to comply with internal security policies, meet external compliance requirements such as PCI, GDPR, and HIPAA, and conduct data breach and security incident investigations.

Default Dashboard Time

The default time range for dashboards is now 3 Hours instead of 24 hours.

Optimized Aggregation Times

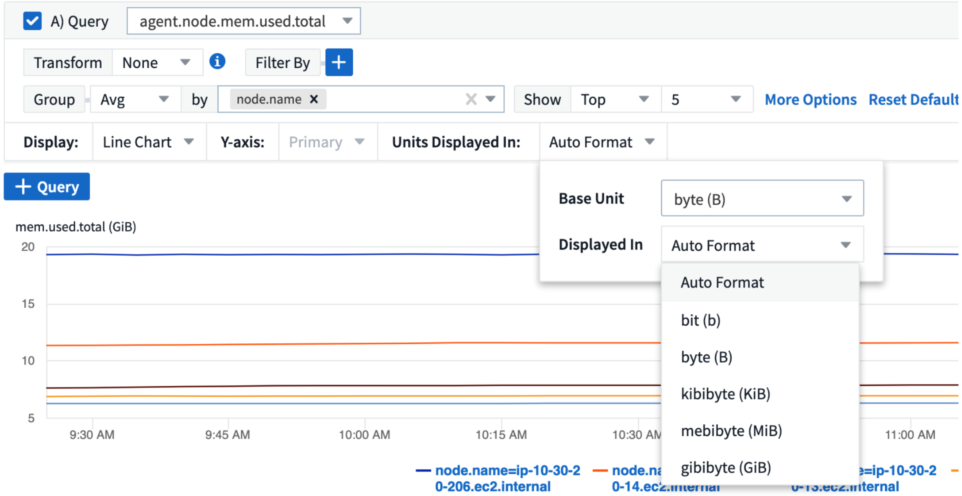
Optimized time aggregation intervals in time-series widgets (Line, Spline, Area, and Stacked Area charts) are more frequent for 3-hour and 24-hour dashboard/widget time ranges, allowing for faster charting of data.

- 3 hour time range optimizes to a 1 minute aggregation interval. Previously this was 5 minutes.
- 24 hour time range optimizes to a 30 minute aggregation interval. Previously this was 1 hour.

You can still override the optimized aggregation by setting a custom interval.

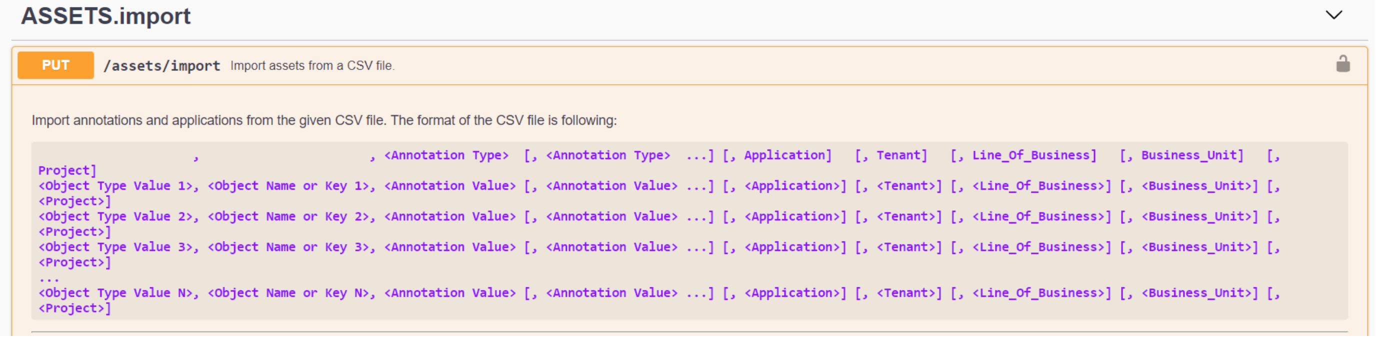
Display Unit Auto-Format

In most widgets, Cloud Insights knows the base unit in which to display values, for example *Megabytes*, *Thousands*, *Percentage*, *Milliseconds (ms)*, etc., and now automatically formats the widget to the most readable unit. For example a data value of 1,234,567,890 bytes would be auto formatted to 1.23 gibibytes. In many cases, Cloud Insights knows the best format for the data being acquired. In cases where the best format is not known, or in widgets where you want to override the automatic formatting, you can choose the format you want.



Import Annotations Using API

With Cloud Insights Premium Edition’s powerful API, you can now import annotations and assign them to objects using a .CSV file. You can also import applications and assign business entities in the same way.


ASSETS.import

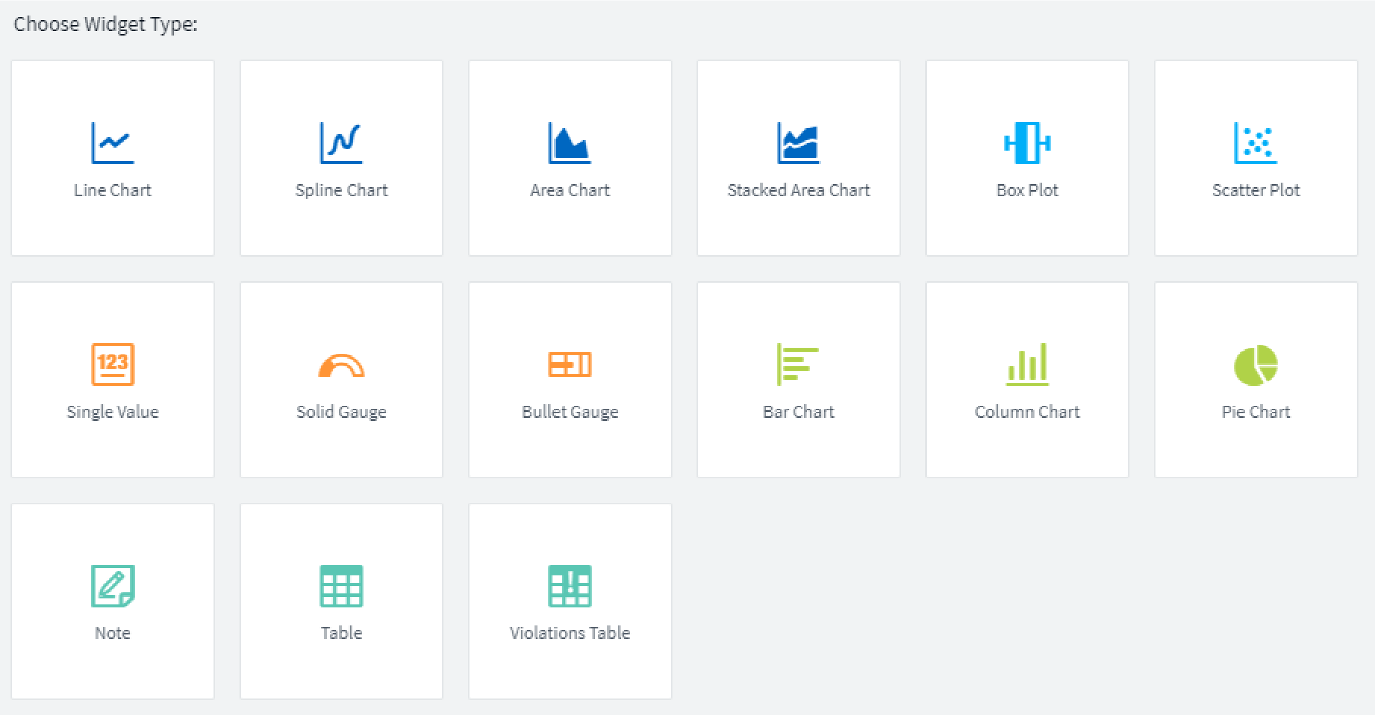
PUT /assets/import Import assets from a CSV file.

Import annotations and applications from the given CSV file. The format of the CSV file is following:

```
                      ,                        , <Annotation Type>  [, <Annotation Type>  ...] [, Application]  [, Tenant]  [, Line_Of_Business]  [, Business_Unit]  [,
Project]
<Object Type Value 1>, <Object Name or Key 1>, <Annotation Value> [, <Annotation Value> ...] [, <Application>] [, <Tenant>] [, <Line_Of_Business>] [, <Business_Unit>] [,
<Project>]
<Object Type Value 2>, <Object Name or Key 2>, <Annotation Value> [, <Annotation Value> ...] [, <Application>] [, <Tenant>] [, <Line_Of_Business>] [, <Business_Unit>] [,
<Project>]
<Object Type Value 3>, <Object Name or Key 3>, <Annotation Value> [, <Annotation Value> ...] [, <Application>] [, <Tenant>] [, <Line_Of_Business>] [, <Business_Unit>] [,
<Project>]
...
<Object Type Value N>, <Object Name or Key N>, <Annotation Value> [, <Annotation Value> ...] [, <Application>] [, <Tenant>] [, <Line_Of_Business>] [, <Business_Unit>] [,
<Project>]
```

Simpler Widget Selector

Adding widgets to dashboards and asset landing pages is easier with a new widget selector that shows all widget types in a single all-at-once view, so the user no longer needs to scroll through a list of widget types to find the one they want to add. Related widgets are color-coordinated and grouped by proximity in the new selector.



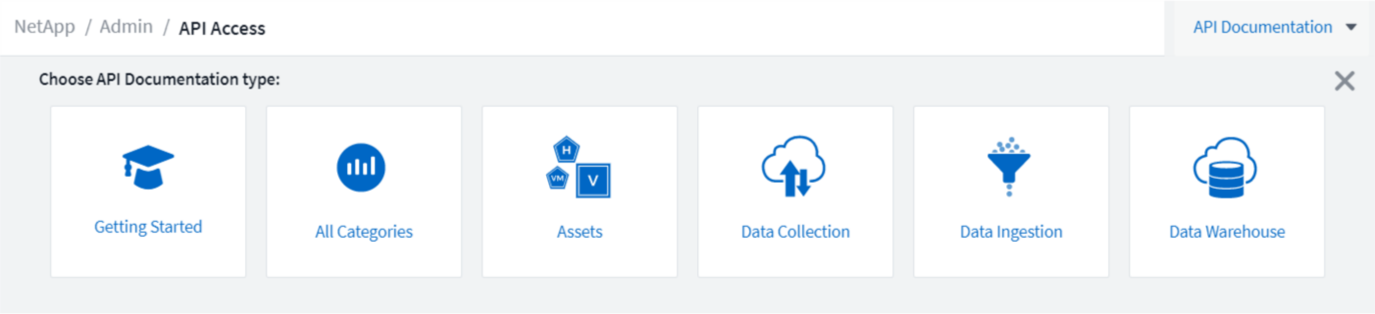
February 2020

API with Premium Edition

Cloud Insights Premium Edition comes with a powerful API that can be used to integrate Cloud Insights with other applications, such as CMDB's or other ticketing systems.

Detailed, Swagger-based information is found in **Admin > API Acccess**, under the **API Documentation** link. Swagger provides a brief description and usage information for the API, and allows you to try each API out in your environment.

The Cloud Insights API uses Access Tokens to provide permission-based access to categories of API, such as ASSETS or COLLECTION.



Initial Polling After Adding A Data Collector

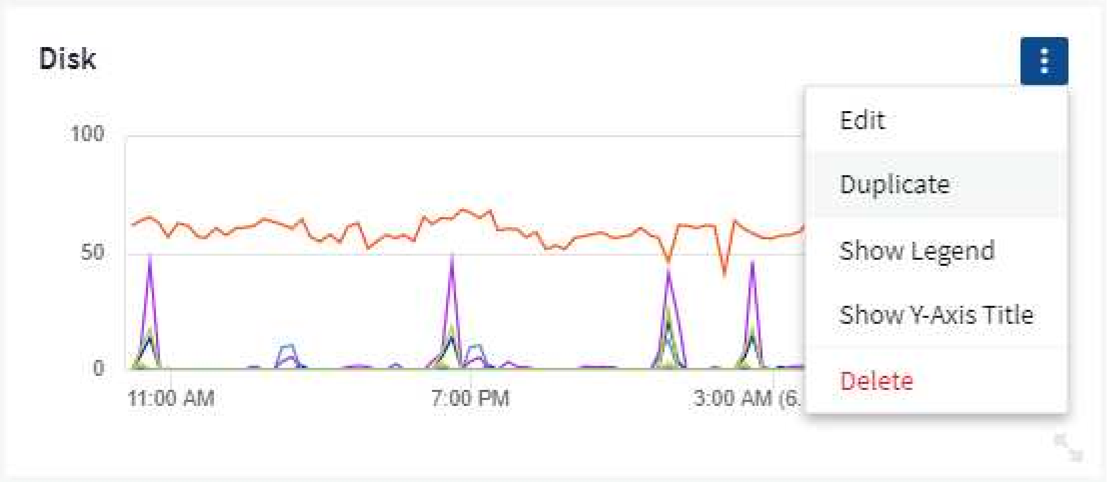
Previously, after configuring a new data collector, Cloud Insights would poll the data collector immediately to gather *inventory* data, but would wait until the configured performance poll interval (typically 15 minutes) to gather initial *performance* data. It would then wait for another interval before initiating the second performance poll, which meant it would take up to *30 minutes* before meaningful data was acquired from a new data collector.

Data collector polling has been greatly improved, such that the initial performance poll occurs immediately after the inventory poll, with the second performance poll occurring within a few seconds after completion of the first performance poll. This allows Cloud Insights to begin showing useful data on dashboards and graphs within a very short time.

This poll behavior also occurs after editing the configuration of an existing data collector.

Easier Widget Duplication

It is easier than ever to create a copy of a widget on a dashboard or landing page. In dashboard Edit mode, click the menu on the widget and select **Duplicate**. The widget editor is launched, pre-filled with the original widget's configuration and with a "copy" suffix in the widget name. You can easily make any necessary changes and Save the new widget. The widget will be placed at the bottom of your dashboard, and you can position it as needed. Remember to Save your dashboard when all changes are complete.



Single Sign-On (SSO)

With Cloud Insights Premium Edition, administrators can enable **Single Sign-On** (SSO) access to Cloud Insights for all users in their corporate domain, without having to invite them individually. With SSO enabled, any user with the same domain email address can log into Cloud Insights using their corporate credentials.

> ⓘ SSO is only available in Cloud Insights Premium Edition, and must be configured before it can be enabled for Cloud Insights. SSO configuration includes Identity Federation through NetApp Cloud Central. Federation allows single sign-on users to access your NetApp Cloud Central accounts using credentials from your corporate directory.

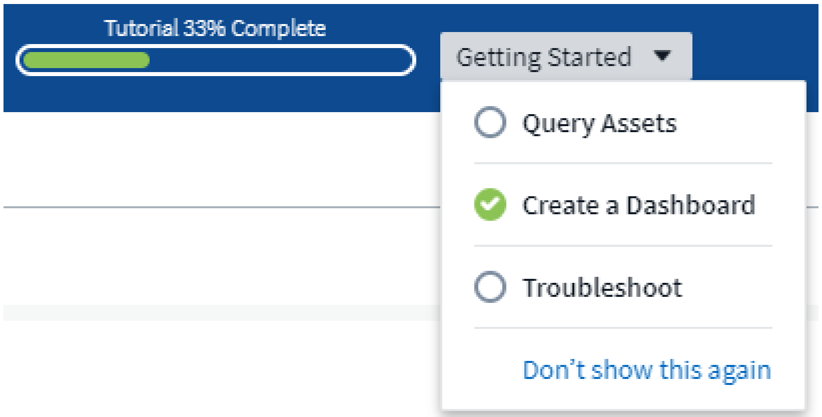
January 2020

Swagger documentation for REST API

Swagger explains each available REST API in Cloud Insights, as well as its usage and syntax. Information on Cloud Insights APIs is available in documentation.

Feature Tutorials Progress Bar

The feature tutorials checklist has been moved to the top banner and now features a progress indicator. Tutorials are available for each user until dismissed, and are always available in Cloud Insights documentation.



Acquisition Unit Changes

When installing an Acquisition Unit (AU) on a host or VM that has the same name as an already-installed AU, Cloud Insights assures a unique name by appending the AU name with "_1", "_2", etc. This is also the case when uninstalling and reinstalling an AU from the same VM without first removing it from Cloud Insights. Want a different AU name altogether? No problem; AU’s can be renamed after installation.

Optimized Time Aggregation in Widgets

In widgets, you can choose between an *Optimized* time aggregation interval or a *Custom* interval that you set. Optimized aggregation automatically selects the right time interval based on the selected dashboard time range (or widget time range, if overriding the dashboard time). The interval dynamically changes as the dashboard or widget time range is changed.

Simplified "Getting Started with Cloud Insights" process

The process for getting started using Cloud Insights has been simplified to make your first-time setup smoother and easier. Simply select an initial data collector and follow the instructions. Cloud Insights will walk you through configuring the data collector and any agent or acquisition unit required. In most cases it will even import one or more initial dashboards so you can start gaining insight into your environment quickly (but please allow up to 30 minutes for Cloud Insights to collect meaningful data).

Additional improvements:

- Acquisition Unit installation is simpler and runs faster.
- Alphabetical Data Collectors choices make it easier to find the one you’re looking for.
- Improved Data Collector setup instructions are easier to follow.
- Experienced users can skip the getting started process with the click of a button.
- A new Progress bar shows you where you are in the process.

December 2019

Business Entity can be used in filters

Business Entity annotations can be used in filters for queries, widgets, performance policies, and landing pages.

Drill-down available for Single-Value and Gauge widgets, and any widgets rolled to by "All"

Clicking the value in a single-value or gauge widget opens a query page showing the results of the first query used in the widget. Additionally, clicking the legend for any widget whose data is rolled up by "All" will also open a query page showing the results of the first query used in the widget.

Trial period extended

New users who sign up for a free trial of Cloud Insights now have 30 days to evaluate the product. This is an increase from the previous 14-day trial period.

Managed Unit calculation

The calculation of Managed Units (MUs) in Cloud Insights has been changed to the following:

- 1 Managed Unit = 2 hosts (any virtual or physical machine)
- 1 Managed Unit = 4 TB of unformatted capacity of physical or virtual disks

This change effectively doubles the environment capacity that you can monitor using your existing Cloud Insights subscription.

November 2019

Editions Feature Comparison Table

The **Admin > Subscription** page comparison table has been updated to list the feature sets available in Basic, Standard, and Premium Editions of Cloud Insights. NetApp is constantly improving its Cloud Services, so check this page often to find the Edition that’s right for your evolving business needs.

October 2019

Reporting

Cloud Insights Reporting is a business intelligence tool that enables you to view pre-defined reports or create custom reports. With Reporting you can perform the following tasks:

- Run a pre-defined report
- Create a custom report
- Customize the report format and delivery method
- Schedule reports to run automatically
- Email reports
- Use colors to represent thresholds on data

Cloud Insights Reporting can generate custom reports for areas like chargeback, consumption analysis, and forecasting, and can help answer questions such as the following:

- What inventory do I have?
- Where is my inventory?
- Who is using our assets?
- What is the chargeback for allocated storage for a business unit?
- How long until I need to acquire additional storage capacity?
- Are business units aligned along the proper storage tiers?
- How is storage allocation changing over a month, quarter, or year?

Reporting is available with Cloud Insights **Premium Edition**.

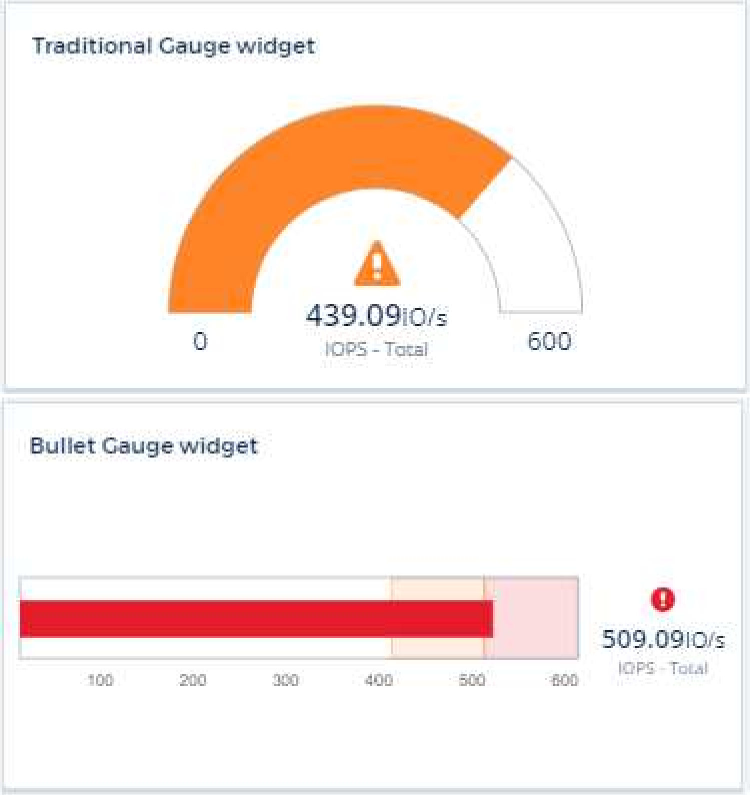
Active IQ Enhancements

Active IQ Risks are now available as objects that can be queried as well as used in dashboard table widgets.
The following Risks object attributes are included:
* Category
* Mitigation Category
* Potential Impact
* Risk Detail
* Severity
* Source
* Storage
* Storage Node
* UI Category

September 2019

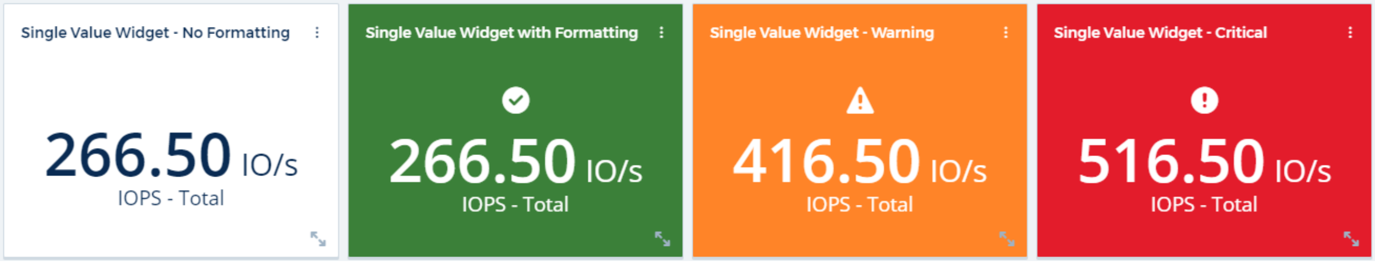
New Gauge Widgets

Two new widgets are available for displaying single-value data on your dashboards in eye-catching colors based on thresholds you specify. You can display values using either a **Solid Gauge** or **Bullet Gauge**. Values that land inside the Warning range are displayed in orange. Values in the Critical range are displayed in red. Values below the Warning threshold are displayed in green.



Conditional Color Formatting for Single Value Widget

You can now display the Single-Value widget with a colored background based on thresholds you set.


Single Value Widget - No Formatting
266.50 IO/s
IOPS - Total
Single Value Widget with Formatting
266.50 IO/s
IOPS - Total
Single Value Widget - Warning
416.50 IO/s
IOPS - Total
Single Value Widget - Critical
516.50 IO/s
IOPS - Total

Invite Users During Onboarding

At any point during the onboarding process, you can click on Admin > User Management > +User to invite additional users to your Cloud Insights environment. Be aware that users with *Guest* or *User* roles will see greater benefit once onboarding is complete and data has been collected.

Data Collector Detail Page improvement

The data collector detail page has been improved to display errors in a more readable format. Errors are now displayed in a separate table on the page, with each error displayed on a separate line in the case of multiple errors for the data collector.

August 2019

All vs. Available Data Collectors

When adding data collectors to your environment, you can set a filter to show only the data collectors available to you based on your subscription level, or all data collectors.

ActiveIQ Integration

Cloud Insights collects data from NetApp ActiveIQ, which provides a series of visualizations, analytics, and other support related services to NetApp customers and their hardware / software systems. Cloud Insights integrates with ONTAP Data Management systems. See Active IQ for more information.

July 2019

Dashboard Improvements

Dashboards and Widgets have been improved with the following changes:

- In addition to Sum, Min, Max, and Avg, **Count** is now an option for roll up in Single-Value widgets. When rolling up by “Count”, Cloud Insights checks if an object is active or not, and only adds the active ones to the count. The resulting number is subject to aggregation and filters.
- In the Single-Value widget, you now have a choice to display the resulting number with 0, 1, 2, 3, or 4 decimal places.
- Line charts show an axis label and units when a single counter is being plotted.
- **Transform** option is available for Services integration data now in all time-series widgets for all metrics. For any services integration (Telegraf) counter or metric in time-series widgets (Line, Spline, Area, Stacked Area), you are given a choice of how you want to Transform the values. None (display value as-is), Sum, Delta, Cumulative, etc.

Downgrading to Basic Edition

Downgrade to Basic Edition fails with an error message if there is no available NetApp device configured that has successfully completed a poll in the last 7 days.

Collecting Kube-State-Metrics

The Kubernetes Data Collector now collects objects and counters from the kube-state-metrics plugin, greatly expanding the number and scope of metrics available for monitoring in Cloud Insights.

June 2019

Cloud Insights Editions

Cloud Insights is available in different Editions to fit your budget and business needs. Existing NetApp customers with an active NetApp support account can enjoy 7 days of data retention and access to NetApp data collectors with the free **Basic Edition**, or get increased data retention, access to all supported data collectors, expert technical support and more with **Standard Edition**. For more information on available features, see NetApp's Cloud Insights site.

New Infrastructure Data Collector: NetApp HCI

- NetApp HCI Virtual Center has been added as an Infrastructure data collector. The HCI Virtual Center data collector collects NetApp HCI Host information and requires read-only privileges on all objects within the Virtual Center.

Note that the HCI data collector acquires from the HCI Virtual Center only. To collect data from the storage system, you must also configure the NetApp SolidFire data collector.

May 2019

New Service Data Collector: Kapacitor

- Kapacitor has been added as a data collector for services.

Integration with Services via Telegraf

In addition to acquisition of data from infrastructure devices such as switches and storage, Cloud Insights now collects data from a variety of Operating Systems and Services, using Telegraf as its agent for collection of integration data. Telegraf is a plugin-driven agent that can be used to collect and report metrics. Input plugins are used to collect the desired information into the agent by accessing the system/OS directly, by calling third-party APIs, or by listening to configured streams.

Documentation for currently supported integrations can be found in the menu to the left under **Reference and Support**.

Storage Virtual Machine Assets

- Storage Virtual Machines (SVMs) are available as assets in Cloud Insights. SVMs have their own Asset Landing Pages, and can be displayed and used in searches, queries, and filters. SVMs can also be used in dashboard widgets as well as associated with annotations.

Reduced Acquisition Unit System Requirements

- The system CPU and memory requirements for the Acquisition Unit (AU) software have been reduced. The new requirements are:

Component	Old Requirement	New Requirement
CPU Cores	4	2

Memory	16 GB	8 GB

Additional Platforms Supported

- The following platforms have been added to those currently supported for Cloud Insights:

Linux	Windows
CentOS 7.3 64-bit CentOS 7.4 64-bit CentOS 7.6 64-bit Debian 9 64-bit Red Hat Enterprise Linux 7.3 64-bit Red Hat Enterprise Linux 7.4 64-bit Red Hat Enterprise Linux 7.6 64-bit Ubuntu Server 18.04 LTS	Microsoft Windows 10 64-bit Microsoft Windows Server 2008 R2 Microsoft Windows Server 2019

April 2019

Filter Virtual Machines by Tags

When configuring the following data collectors, you can filter to include or exclude virtual machines from data collection according to their Tags or Labels.

- Amazon EC2
- Azure
- Google Cloud Platform

March 2019

Email Notifications for Subscription-related Events

- You can select recipients for email notifications when subscription-related events occur, such as upcoming trial expiration or subscribed account changes. You can choose recipients for these notifications from among following:
  - All Account Owners
  - All Administrators
  - Additional Email Addresses that you specify

Additional Dashboards

- The following new AWS-focused dashboards have been added to the gallery and are available for import:
  - AWS Admin - Which EC2 are in high demand?
  - AWS EC2 Instance Performance by Region

February 2019

Collecting from AWS Child Accounts

- Cloud Insights supports collection from AWS child accounts within a single data collector. Your AWS environment must be configured to allow Cloud Insights to collect from child accounts.

Data Collector Naming

- Data Collector names can now include periods (.), hyphens (-), and spaces ( ) in addition to letters, numbers, and underscores. Names may not begin or end with a space, period, or hyphen.

Acquisition Unit for Windows

- You can configure a Cloud Insights Acquisition Unit on a Windows server/VM. Review the Windows pre-requisites before installing the Acquisition Unit software.

January 2019

"Owner" field is more readable

- In Dashboard and Query lists, the data for the "Owner" field was previously an authorization ID string, instead of a user-friendly owner name. The "Owner" field now shows a simpler and more readable owner name.

Managed Unit Breakdown on Subscription Page

- For each data collector listed on the **Admin > Subscription** page, you can now see a breakdown of Managed Unit (MU) counts for hosts and storage, as well as the total.

December 2018

Improvement of UI Load Time

- The initial loading time for the Cloud Insights user interface (UI) has been significantly improved. Refresh time for the UI also benefits from this improvement in circumstances where metadata is loaded.

Bulk Edit Data Collectors

- You can edit information for multiple data collectors at the same time. On the **Observability > Collectors** page, select the data collectors to modify by checking the box to the left of each and click the **Bulk Actions** button. Choose **Edit** and modify the necessary fields.

  The data collectors selected must be the same vendor and model, and reside on the same Acquisition Unit.

Support and Subscription pages are Available During Onboarding

- During the onboarding workflow, you can navigate to the **Help > Support** and **Admin > Subscription** pages. Returning from those pages returns you to the onboarding workflow, providing you have not closed the browser tab.

November 2018

Subscribe through NetApp Sales or AWS Marketplace

- Cloud Insights subscription and billing is now available directly through NetApp. This is in addition to the self-serve subscription available through AWS Marketplace. A new **Contact Sales** link is presented on the **Admin > Subscription** page. For customers whose environments have or are expected to have 1,000 or more Managed Units (MUs), it is recommended to contact NetApp sales via the Contact Sales link.

Text Annotation Hyperlinks

- Text-type annotations can now include hyperlinks.

Onboarding Walkthrough

- Cloud Insights now features an onboarding walkthrough for the first user (administrator or account owner) to log in to a new environment. The walkthrough takes you through installing an Acquisition Unit, configuring an initial data collector, and selecting one or more useful dashboards.

Import Dashboards from the Gallery

- In addition to selecting dashboards during onboarding, you can import dashboards via **Dashboards > Show All Dashboards** and clicking **+From Gallery**.

Duplicating Dashboards

- The ability to duplicate a dashboard has been added to the dashboard list page as a choice in the options menu for each dashboard, and on a dashboard's main page itself from the *Save* menu.

Cloud Central products menu

- The menu allowing you to switch to other NetApp Cloud Central products has moved to the upper right corner of the screen.

Cloud Insights Onboarding

Before you can start working with Cloud Insights, you must sign up on the **NetApp BlueXP** portal. If you already have a BlueXP login, you can start a free trial of Cloud Insights with a few quick steps.

Creating your NetApp BlueXP account

To get started with NetApp's cloud services, go to **NetApp BlueXP** and click **Get Started**.

- If you have not already signed up, select **Sign Up**
- Enter a valid business email address and choose a password.
- Enter your company name, and your full name.
- Accept the terms and conditions and select **Continue**.
- BlueXP will walk you through getting started.

What if I already have a NetApp BlueXP login?

Once you have a NetApp BlueXP account, simply choose **Log In** on the **NetApp BlueXPl** portal page.

Enter your email address and password. You will then be taken to NetApp's cloud offerings page.

Select Cloud Insights.

Starting your Cloud Insights free trial

If this is your first time logging in to Cloud Insights, under the Cloud Insights offering, click on **Start Free Trial**. Cloud Insights will walk you through creating your company's environment.

Once the creation of your environment is complete, you can use your BlueXP credentials to log in and start your free, 30-day trial of Cloud Insights. During this trial you can explore the features that Cloud Insights has to offer.

During the free trial, you can start your subscription to Cloud Insights at any time. When you are subscribed, You can use the Cloud Insights features based on your current subscription.

Sign in and go

Once your environment has been created, at any time you can simply log in to the NetApp BlueXP Portal and click **Go to Cloud Insights**. You will be taken directly to your Cloud Insights environment.

You can also open a browser directly to your Cloud Insights environment URL, for example:

```
https://<environment-prefix>.c01.cloudinsights.netapp.com/
```

The URL will also be included in each user’s invitation email for simple access and bookmarking. If the user is not already logged in to BlueXP, they will be prompted to log in.

ⓘ New users must still sign up for access to BlueXP before they can access their environment URL.

The first time you log in to a new environment, you will be guided through setting up to **begin gathering data**.

Logging Out

To log out of Cloud Insights, click your **User Name** and select **Log Out**. You will be taken back to the BlueXP sign-in screen.

ⓘ Logging out of Cloud Insights logs you out of BlueXP. You will also be logged out of other NetApp Cloud services that use the BlueXP sign in.

Inactivity Timeout

By default, BlueXP will log a user out if there is no activity for six hours (360 minutes). Regardless of activity, users will be logged out after seven days.

Security

Cloud Insights Security

Product and customer data security is of utmost importance at NetApp. Cloud Insights follows security best practices throughout the release life cycle to make sure customer information and data is secured in the best possible way.

Security Overview

Physical security

The Cloud Insights production infrastructure is hosted in Amazon Web Services (AWS). Physical and environmental security-related controls for Cloud Insights production servers, which include buildings as well as locks or keys used on doors, are managed by AWS. As per AWS: “Physical access is controlled both at the perimeter and at building ingress points by professional security staff utilizing video surveillance, intrusion detection systems, and other electronic means. Authorized staff utilize multi-factor authentication mechanisms to access data center floors.”

Cloud Insights follows the best practices of the Shared Responsibility model described by AWS.

Product security

Cloud Insights follows a development lifecycle in line with Agile principles, thus allowing us to address any security-oriented software defects more rapidly, compared to longer release cycle development methodologies. Using continuous integration methodologies, we are able to rapidly respond to both functional and security changes. The change management procedures and policies define when and how changes occur and help to maintain the stability of the production environment. Any impactful changes are formally communicated, coordinated, properly reviewed, and approved prior to their release into the production environment.

Network security

Network access to resources in the Cloud Insights environment is controlled by host-based firewalls. Each resource (such as a load balancer or virtual machine instance) has a host-based firewall that restricts inbound traffic to only the ports needed for that resource to perform its function.

Cloud Insights uses various mechanisms including intrusion detection services to monitor the production environment for security anomalies.

Risk Assessment

Cloud Insights team follows a formalized Risk Assessment process to provide a systematic, repeatable way to identify and assess the risks so that they can be appropriately managed through a Risk Treatment Plan.

Data protection

The Cloud Insights production environment is set up in a highly redundant infrastructure utilizing multiple availability zones for all services and components. Along with utilizing a highly available and redundant compute infrastructure, critical data is backed up at regular intervals and restores are periodically tested. Formal backup policies and procedures minimize the impact of interruptions of business activities and protects business processes against the effects of failures of information systems or disasters and ensures their timely and adequate resumption.

Authentication and access management

All customer access to Cloud Insights is done via browser UI interactions over https. Authentication is accomplished via the 3rd party service, Auth0. NetApp has centralized on this as the authentication layer for all Cloud Data services.

Cloud Insights follows industry best practices including “Least Privilege” and “Role-based access control” around logical access to the Cloud Insights production environment. Access is controlled on a strict need basis and is only granted for select authorized personnel using multi-factor authentication mechanisms.

Collection and protection of customer data

All customer data is encrypted in transit across public networks and encrypted at rest. Cloud Insights utilizes encryption at various points in the system to protect customer data using technologies that includes Transport Layer Security (TLS) and the industry-standard AES-256 algorithm.

Customer deprovisioning

Email notifications are sent out at various intervals to inform the customer their subscription is expiring. Once the subscription has expired, the UI is restricted and a grace period begins for data collection. The customer is then notified via email. Trial subscriptions have a 14-day grace period and paid subscription accounts have a 28-day grace period. After the grace period has expired, the customer is notified via email that the account will be deleted in 2 days. A paid customer can also request directly to be off the service.

Expired tenants and all associated customer data are deleted by the Cloud Insights Operations (SRE) team at the end of the grace period or upon confirmation of a customer’s request to terminate their account. In either case, the SRE team runs an API call to delete the account. The API call deletes the tenant instance and all customer data. Customer deletion is verified by calling the same API and verifying that the customer tenant status is “DELETED.”

Security incident management

Cloud Insights is integrated with NetApp’s Product Security Incident Response Team (PSIRT) process to find, assess, and resolve known vulnerabilities. PSIRT intakes vulnerability information from multiple channels including customer reports, internal engineering, and widely recognized sources such as the CVE database.

If an issue is detected by the Cloud Insights engineering team, the team will initiate the PSIRT process, assess, and potentially remediate the issue.

It is also possible that a Cloud Insights customer or researcher may identify a security issue with the Cloud Insights product and report the issue to Technical Support or directly to NetApp’s incident response team. In these cases, the Cloud Insights team will initiate the PSIRT process, assess, and potentially remediate the issue.

Vulnerability and Penetration testing

Cloud Insights follows industry best practices and performs regular vulnerability and penetration testing using internal and external security professionals and companies.

Security awareness training

All Cloud Insights personnel undergo security training, developed for individual roles, to make sure each employee is equipped to handle the specific security-oriented challenges of their roles.

Compliance

Cloud Insights performs independent third-party Audit and validations from external Licensed CPA firm of its security, processes, and services, including completion of the SOC 2 Audit.

NetApp Security Advisories

You can view NetApp’s available security advisories here.

Information and Region

NetApp takes the security of customer information very seriously. Here is how and where Cloud Insights stores your information.

What information does Cloud Insights store?

Cloud Insights stores the following information:

- Performance data

  Performance data is time-series data providing information about the performance of the monitored device/source. This includes, for example, the number of IOs delivered by a storage system, the throughput of a FibreChannel port, the number of pages delivered by a web server, the response time of a database, and more.

- Inventory data

  Inventory data consists of metadata describing the monitored device/source and how it is configured. This includes, for example, hardware and software versions installed, disks and LUNs in a storage system, CPU cores, RAM and disks of a virtual machine, the tablespaces of a database, the number and type of ports on a SAN switch, directory/file names (if Storage Workload Security is enabled), etc.

- Configuration data

  This summarizes customer-provided configuration data used to manage customer inventory and operations, e.g. hostnames or IP addresses of the monitored devices, polling intervals, timeout values, etc.

- Secrets

  Secrets consist of the credentials used by the Cloud Insights Acquisition Unit to access customer devices and services. These credentials are encrypted using strong asymmetric encryption, and the private keys are stored only on the Acquisition Units and never leave the customer environment. Even privileged Cloud Insights SREs are unable to access customer secrets in plain-text due to this design.

- Functional Data

  This is data generated as a result of NetApp providing the Cloud Data Service, which informs NetApp in the development, deployment, operations, maintenance, and securing of the Cloud Data Service. Functional Data does not contain Customer Information or Personal Information.

- User Access data

  Authentication and access information that allows NetApp Cloud Central to communicate with regional Cloud Insights sites, including data related to user Authorization.

- Storage Workload Security User Directory Data

  In cases where the Workload Security functionality is enabled AND the customer chooses to enable the User Directory collector, the system will store user display names, corporate email addresses, and other information collected from Active Directory.

> ⓘ User Directory data refers to user directory information collected by the Workload Security User Directory data collector, not to data about the users of Cloud Insights/Workload Security themselves.

No explicit personal data is collected from infrastructure and services resources. Collected information consists of performance metrics, configuration information and infrastructure metadata only, much like many vendor phone-homes, including NetApp auto-support and ActiveIQ. However, depending on a customer's naming conventions, data for shares, volumes, VMs, qtrees, applications, etc. may contain personally identifiable information.

If Workload Security is enabled, the system additionally looks at file and directory names on SMB or other shares, which may contain personally identifiable information. Where customers enable the Workload Security User Directory Collector (which essentially maps Windows SIDs to usernames through Active Directory), the display name, corporate email address and any additional attributes selected will be collected and stored by Cloud Insights.

Additionally, access logs to Cloud Insights are maintained and contain users' IP and email addresses used to log into the service.

Where is my information stored?

Cloud Insights stores information according to the region in which your environment is created.

The following information is stored in the host region:

- Telemetry and asset/object information, including counters and performance metrics
- Acquisition Unit information
- Functional data
- Audit information on user activities inside Cloud Insights
- Workload Security Active Directory information
- Workload Security Audit information

The following information resides in the United States, regardless of the region hosting your Cloud Insights environment:

- Environment site (sometimes called "tenant") information such as site/account owner.
- Information that allows NetApp Cloud Central to communicate with regional Cloud Insights sites, including anything to do with user Authorization.
- Information related to the relation between the Cloud Insights user and the tenant.

Host Regions

Host regions include:

- US: us-east-1
- EMEA: eu-central-1
- APAC: ap-southeast-2

More Information

You can read more about NetApp’s privacy and security at the following links:

- Trust Center
- Cross-Border Data Transfers
- Binding Corporate Rules
- Responding to Third-Party Data Requests
- NetApp Privacy Principles

SecurityAdmin Tool

Cloud Insights Includes security features that allow your environment to operate with enhanced security. The features include improvements to encryption, password hashing, and the ability to change internal user passwords as well as key pairs that encrypt and decrypt passwords.

To protect sensitive data, NetApp recommends you change the default keys and the *Acquisition* user password after an installation or upgrade.

Data source encrypted passwords are stored in Cloud Insights, which uses a a public key to encrypt passwords when a user enters them in a data collector configuration page. Cloud Insights does not have the private keys required to decrypt the data collector passwords; only Acquisition Units (AUs) have the data collector private key required to decrypt data collector passwords.

Upgrade and installation considerations

When your Insight system contains non-default security configurations (i.e. you have rekeyed passwords), you must back up your security configurations. Installing new software, or in some cases upgrading software, reverts your system to a default security configuration. When your system reverts to the default configuration, you must restore the non-default configuration in order for the system to operate correctly.

Managing security on the acquisition unit

The SecurityAdmin tool allows you to manage security options for Cloud Insights, and is run on the acquisition unit system. Security management includes managing keys and passwords, saving and restoring security configurations you create or restoring configurations to the default settings.

Before you begin

- You must have admin privileges on the AU system in order to install the Acquisition Unit software (which includes the SecurityAdmin tool).
- If you have non-admin users who will subsequently need to access the SecurityAdmin tool, they must be added to the *cisys* group. The *cisys* group is created during AU installation.

After AU install, the SecurityAdmin tool is found on the acquisition unit system at either of these locations:

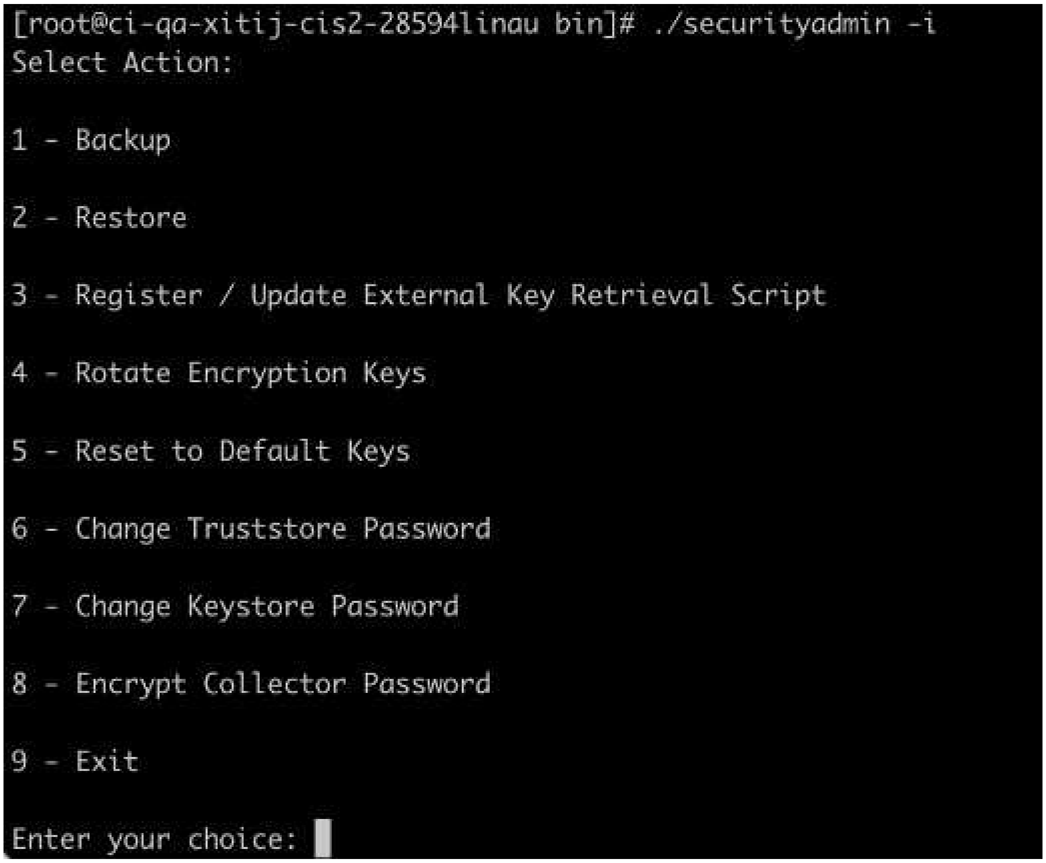
```
Windows - C:\Program Files\SANscreen\securityadmin\bin\securityadmin.bat
Linux - /bin/oci-securityadmin.sh
```

Using the SecurityAdmin Tool

Start the SecurityAdmin tool in interactive mode (-i).

It is recommended to use the SecurityAdmin tool in interactive mode, to avoid passing secrets on the command line, which can be captured in logs.

The following options are displayed:



```
[root@ci-qa-xitij-cis2-28594linau bin]# ./securityadmin -i
Select Action:

1 - Backup

2 - Restore

3 - Register / Update External Key Retrieval Script

4 - Rotate Encryption Keys

5 - Reset to Default Keys

6 - Change Truststore Password

7 - Change Keystore Password

8 - Encrypt Collector Password

9 - Exit

Enter your choice:
```

1. **Backup**

   Creates a backup zip file of the vault containing all passwords and keys and places the file in a location specified by the user, or in the following default locations:

   ```
   Windows - C:\Program Files\SANscreen\backup\vault
   Linux - /var/log/netapp/oci/backup/vault
   ```

   It is recommended that vault backups be kept secure, as they include sensitive information.

2. **Restore**

   Restores the zip backup of the vault that was created. Once restored, all passwords and keys are reverted to values existing at the time of the backup creation.

   Restore can be used to synchronize passwords and keys on multiple servers, for example using these steps: 1) Change encryption keys on the AU. 2) Create a backup of the vault. 3) Restore the vault backup to each of the AUs.

3. **Register / Update External Key Retrieval Script**

   Use an external script to register or change the AU encryption keys used to encrypt or decrypt device passwords.

   When you change encryption keys, you should back up your new security configuration so that you can restore it after an upgrade or installation.

   Note this option is only available on Linux.

   When using your own key retrieval script with the SecurityAdmin tool, keep the following in mind:

   - The current supported Algorithm is RSA with minimum 2048 bits.
   - The script must return the private and public keys in plain text. The script must not return encrypted private and public keys.
   - The script should return raw, encoded contents (PEM format only).
   - The external script must have *execute* permissions.

4. **Rotate Encryption Keys**

   Rotate your encryption keys (un-registers current keys and registers new keys). To use a key from an external key management system, you must specify the public key id and private key id.

1. **Reset to Default Keys**

   Resets acquisition user password and acquisition user encryption keys to default values, Default values are those provided during installation.

2. **Change Truststore Password**

   Change the password of the truststore.

3. **Change Keystore Password**

   Change the password of the keystore.

4. **Encrypt Collector Password**

   Encrypt data collector password.

5. **Exit**

   Exit the SecurityAdmin tool.

Chose the option you want to configure and follow the prompts.

Specifying a user to run the tool

If you are in a controlled, security-conscious environment, you may not have the *cisys* group but may still want specific users to run the SecurityAdmin tool.

You can achieve this by manually installing the AU software and specifying the user/group for whom you want access.

- Using the API, download the CI Installer to the AU system and unzip it.
  - You will need a one-time authorization token. See the API Swagger documentation (*Admin > API Access* and select the *API Documentation* link) and find the *GET /au/oneTimeToken* API section.
  - Once you have the token, use the *GET /au/installers/{platform}/{version}* API to download the installer file. You will need to provide platform (Linux or Windows) as well as installer version.
- Copy the downloaded installer file to the AU system and unzip it.
- Navigate to the folder containing the files, and run the installer as root, specifying the user and group:

```
./cloudinsights-install.sh <User> <Group>
```

If the specified user and/or group do not exist, they will be created. The user will have access to the SecurityAdmin tool.

Updating or Removing Proxy

The SecurityAdmin tool can be used to set or remove proxy information for the Acquisition Unit by running the tool with the *-pr* parameter:

```
[root@ci-eng-linau bin]# ./securityadmin -pr
usage: securityadmin -pr -ap <arg> | -h | -rp | -upr <arg>

The purpose of this tool is to enable reconfiguration of security aspects
of the Acquisition Unit such as encryption keys, and proxy configuration,
etc. For more information about this tool, please check the Cloud Insights
Documentation.

-ap,--add-proxy <arg>       add a proxy server.  Arguments: ip=ip
                             port=port user=user password=password
                             domain=domain
                             (Note: Always use double quote(") or single
                             quote(') around user and password to escape
                             any special characters, e.g., <, >, ~, `, ^,
                             !
                             For example: user="test" password="t'!<@1"
                             Note: domain is required if the proxy auth
                             scheme is NTLM.)
-h,--help
-rp,--remove-proxy          remove proxy server
-upr,--update-proxy <arg>   update a proxy.  Arguments: ip=ip port=port
                             user=user password=password domain=domain
                             (Note: Always use double quote(") or single
                             quote(') around user and password to escape
                             any special characters, e.g., <, >, ~, `, ^,
                             !
                             For example: user="test" password="t'!<@1"
                             Note: domain is required if the proxy auth
                             scheme is NTLM.)
```

For example, to remove the proxy, run this command:

```
[root@ci-eng-linau bin]# ./securityadmin -pr -rp
```

You must restart the Acquisition Unit after running the command.

To update a proxy, the command is

```
./securityadmin -pr -upr <arg>
```

External Key Retrieval

If you provide a UNIX shell script, it can be executed by the acquisition unit to retrieve the **private key** and the **public key** from your key management system.

To retrieve the key, Cloud Insights will execute the script, passing in two parameters: *key id* and *key type*. *Key id* can be used to identify the key in your key management system. *Key type* is either "public" or "private". When the key type is "public", the script must return the public key. When the key type is "private", the private key must be returned.

To send the key back to the acquisition unit, the script must print the key to standard output. The script must print *only* the key to standard output; no other text must be printed to standard output. Once the requested key is printed to the standard output, the script must exit with an exit code of 0; any other return code is considered an error.

The script must be registered with the acquisition unit using the SecurityAdmin tool, which will execute the script along with the acquisition unit. The script must have *read* and *execute* permission for the root and "cisys" user. If the shell script is modified after registering, the modified shell script must be re-registered with the acquisition unit.

input parameter: key id	Key identifier used to identify the key in the customers key management system.
input parameter: key type	public or private.
output	The requested key must be printed to the standard output. 2048 bit RSA key is currently supported. Keys must be encoded and printed in the following format - private key format - PEM, DER-encoded PKCS8 PrivateKeyInfo RFC 5958 public key format - PEM, DER-encoded X.509 SubjectPublicKeyInfo RFC 5280
exit code	Exit code of zero for success. All other exit values are considered failure.
script permissions	Script must have read and execute permission for the root and "cisys" user.
logs	Script executions are logged. Logs can be found in - /var/log/netapp/cloudinsights/securityadmin/securityadmin.log /var/log/netapp/cloudinsights/acq/acq.log

Encrypting a Password for use in API

Option 8 allows you to encrypt a password, which you can then pass to a data collector via API.

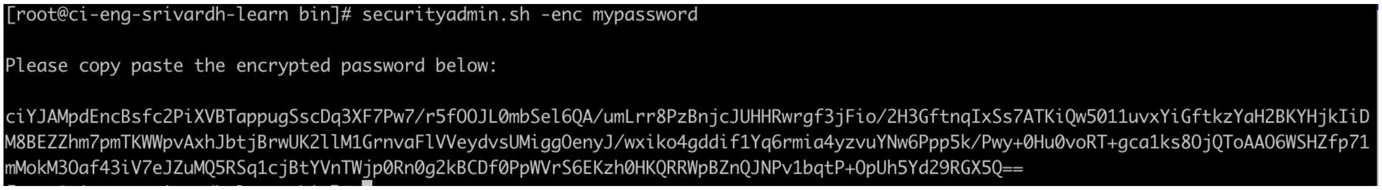
Start the SecurityAdmin tool in interactive mode and select option 8: *Encrypt Password*.

```
securityadmin.sh -i
```

You are prompted to enter the password you want to encrypt. Note that the characters you type are not shown on screen. Re-enter the password when prompted.

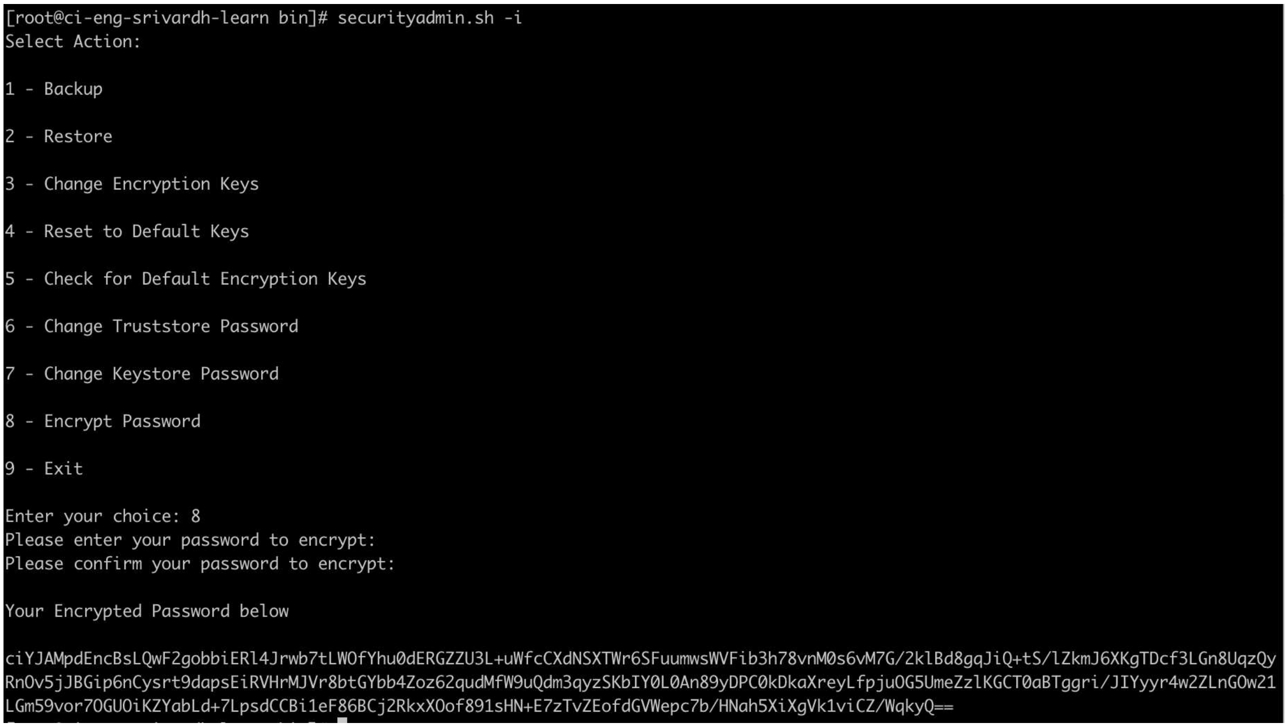
Alternatively, if you will use the command in a script, on a command line use *securityadmin.sh* with the "-enc" parameter, passing in your unencrypted password:

```
securityadmin -enc mypassword
```



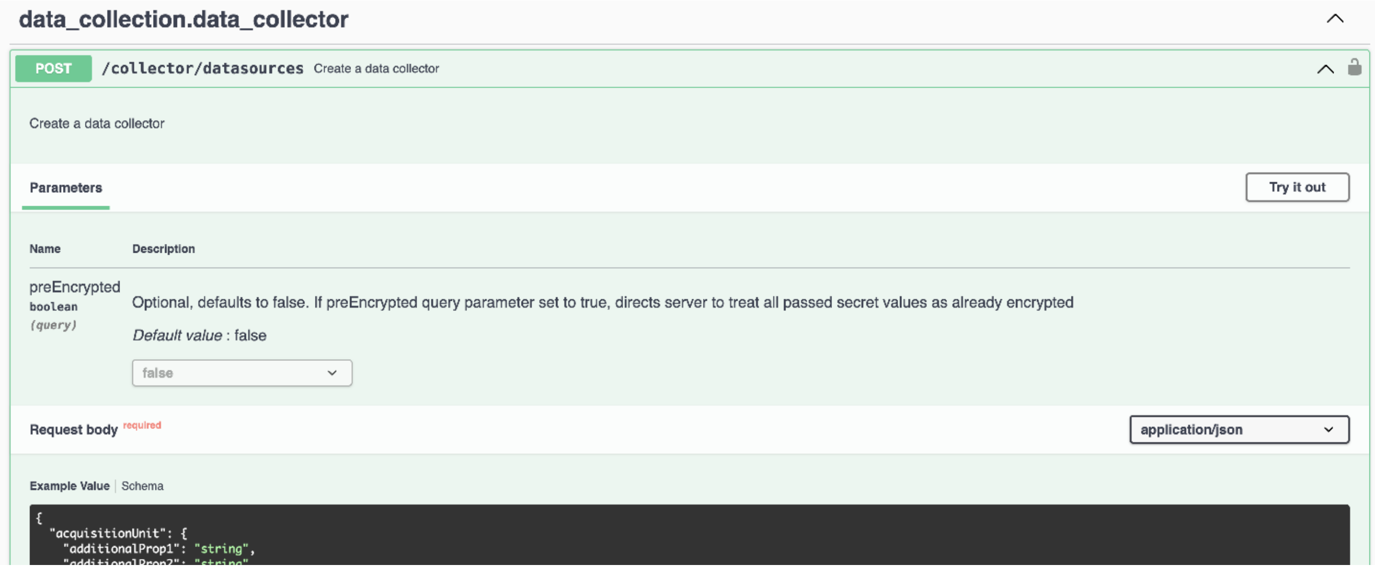
```
[root@ci-eng-srivardh-learn bin]# securityadmin.sh -enc mypassword

Please copy paste the encrypted password below:

ciYJAMpdEncBsfc2PiXVBTappugSscDq3XF7Pw7/r5fOOJL0mbSel6QA/umLrr8PzBnjcJUHHRwrgf3jFio/2H3GftnqIxSs7ATKiQw5011uvxYiGftkzYaH2BKYHjkIiD
M8BEZZhm7pmTKWWpvAxhJbtjBrwUK2llM1GrnvaFlVVeydvsUMiggOenyJ/wxiko4gddif1Yq6rmia4yzvuYNw6Ppp5k/Pwy+0Hu0voRT+gca1ks8OjQToAAO6WSHZfp71
mMokM3Oaf43iV7eJZuMQ5RSq1cjBtYVnTWjp0Rn0g2kBCDf0PpWVrS6EKzh0HKQRRWpBZnQJNPv1bqtP+OpUh5Yd29RGX5Q==
```

The encrypted password is displayed on screen. Copy the entire string including any leading or trailing symbols.



```
[root@ci-eng-srivardh-learn bin]# securityadmin.sh -i
Select Action:

1 - Backup

2 - Restore

3 - Change Encryption Keys

4 - Reset to Default Keys

5 - Check for Default Encryption Keys

6 - Change Truststore Password

7 - Change Keystore Password

8 - Encrypt Password

9 - Exit

Enter your choice: 8
Please enter your password to encrypt:
Please confirm your password to encrypt:

Your Encrypted Password below

ciYJAMpdEncBsLQwF2gobbiERl4Jrwb7tLWOfYhu0dERGZZU3L+uWfcCXdNSXTWr6SFuumwsWVFib3h78vnM0s6vM7G/2klBd8gqJiQ+tS/lZkmJ6XKgTDcf3LGn8UqzQy
RnOv5jJBGip6nCysrt9dapsEiRVHrMJVr8btGYbb4Zoz62qudMfW9uQdm3qyzSKbIY0L0An89yDPC0kDkaXreyLfpjuOG5UmeZzlKGCT0aBTggri/JIYyyr4w2ZLnGOw21
LGm59vor7OGUOiKZYabLd+7LpsdCCBi1eF86BCj2RkxXOof891sHN+E7zTvZEofdGVWepc7b/HNah5XiXgVk1viCZ/WqkyQ==
```

To send the encrypted password to a data collector, you can use the Data Collection API. The swagger for this API can be found at **Admin > API Access** and click the "API Documentation" link. Select the "Data Collection" API type. Under the *data_collection.data_collector* heading, choose the */collector/datasources* POST API for this example.



data_collection.data_collector

POST /collector/datasources Create a data collector

Create a data collector

Parameters

Try it out

Name	Description
preEncrypted boolean *(query)*	Optional, defaults to false. If preEncrypted query parameter set to true, directs server to treat all passed secret values as already encrypted *Default value* : false false

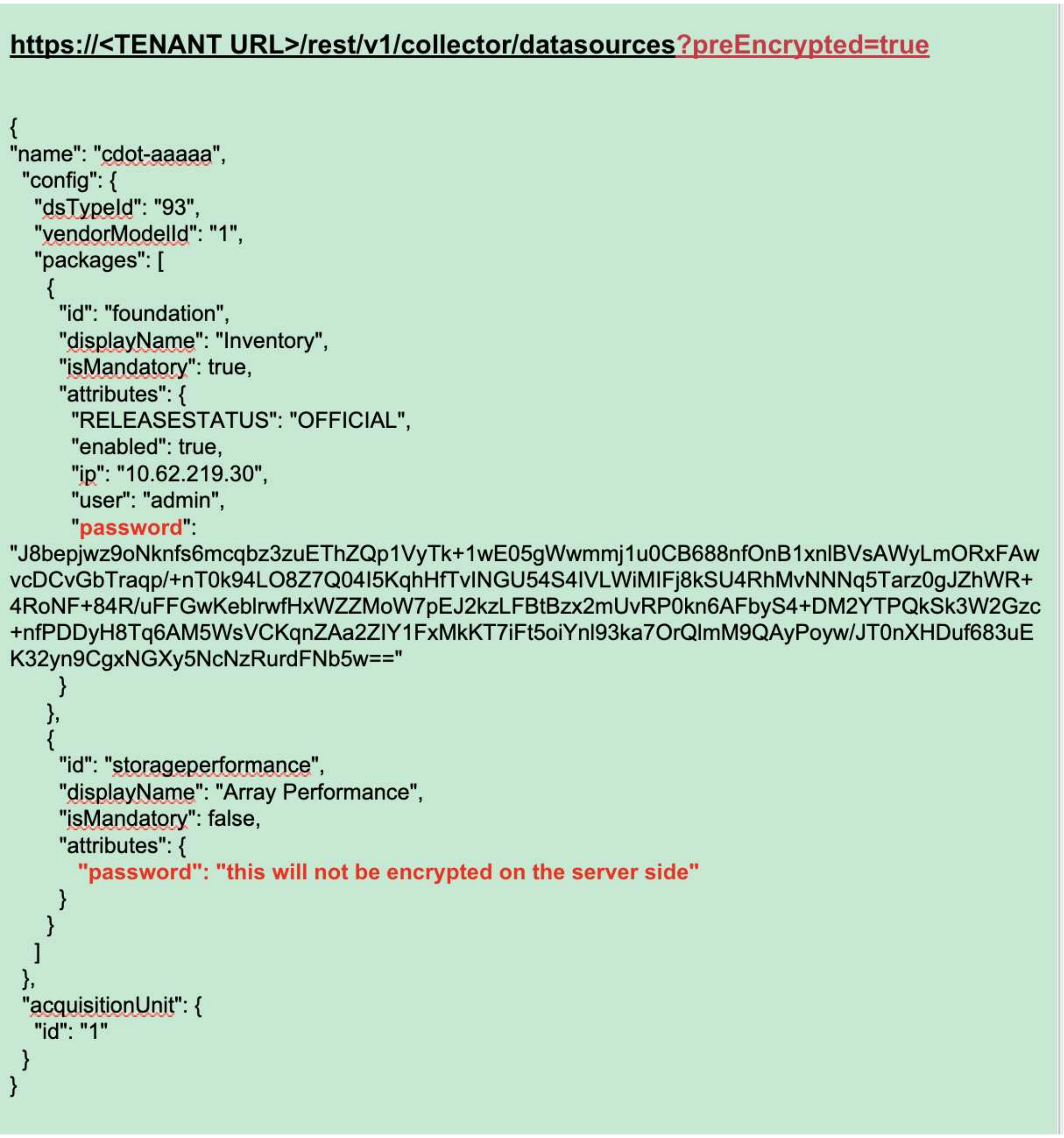
Request body required

application/json

Example Value | Schema

```
{
  "acquisitionUnit": {
    "additionalProp1": "string",
    "additionalProp2": "string"
```

If you set the *preEncrypted* option to *True*, any password you pass through the API command will be treated as **already encrypted**; the API will not re-encrypt the password(s). When building your API, simply paste the previously-encrypted password in the appropriate location.



https://<TENANT URL>/rest/v1/collector/datasources?preEncrypted=true

```
{
"name": "cdot-aaaaa",
  "config": {
    "dsTypeId": "93",
    "vendorModelId": "1",
    "packages": [
      {
        "id": "foundation",
        "displayName": "Inventory",
        "isMandatory": true,
        "attributes": {
          "RELEASESTATUS": "OFFICIAL",
          "enabled": true,
          "ip": "10.62.219.30",
          "user": "admin",
          "password":
"J8bepjwz9oNknfs6mcqbz3zuEThZQp1VyTk+1wE05gWwmmj1u0CB688nfOnB1xnlBVsAWyLmORxFAw
vcDCvGbTraqp/+nT0k94LO8Z7Q04I5KqhHfTvINGU54S4IVLWiMIFj8kSU4RhMvNNNq5Tarz0gJZhWR+
4RoNF+84R/uFFGwKeblrwfHxWZZMoW7pEJ2kzLFBtBzx2mUvRP0kn6AFbyS4+DM2YTPQkSk3W2Gzc
+nfPDDyH8Tq6AM5WsVCKqnZAa2ZIY1FxMkKT7iFt5oiYnl93ka7OrQlmM9QAyPoyw/JT0nXHDuf683uE
K32yn9CgxNGXy5NcNzRurdFNb5w=="
        }
      },
      {
        "id": "storageperformance",
        "displayName": "Array Performance",
        "isMandatory": false,
        "attributes": {
          "password": "this will not be encrypted on the server side"
        }
      }
    ]
  },
  "acquisitionUnit": {
    "id": "1"
  }
}
```

Getting Started

Feature Tutorials

Cloud Insights is loaded with useful features that enable you to quickly and easily find data, troubleshoot issues, and provide insights into your corporate environment. Find data easily with powerful queries, visualize data in dashboards, and send email alerts for data thresholds you set.

Cloud Insights includes a number of video tutorials to help you understand these features and better implement your business insight strategies. Every user who has access to your Cloud Insights environment can take advantage of these tutorials.

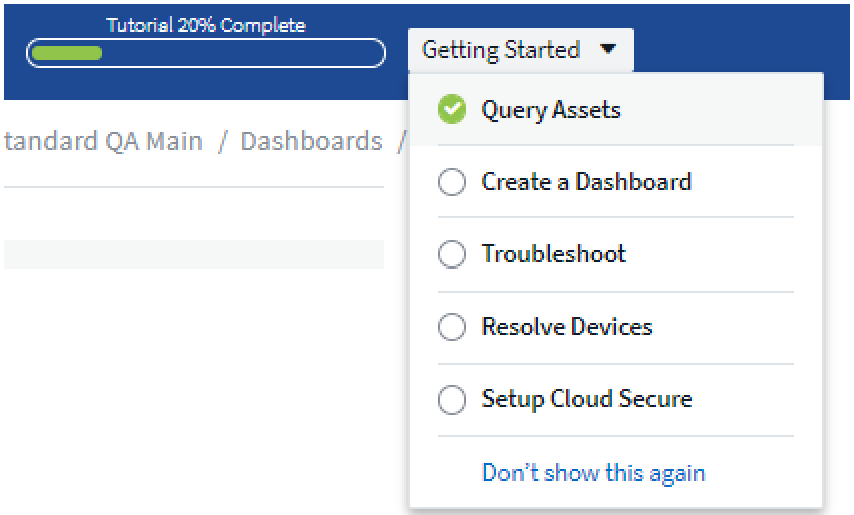
Introduction

Watch a brief tutorial explaining how Cloud Insights works.

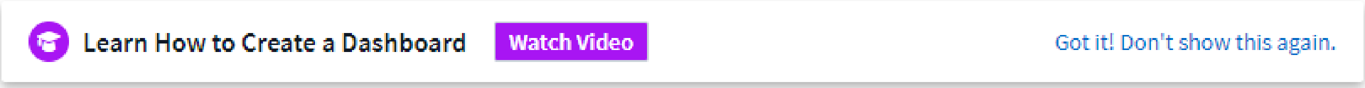
► https://docs.netapp.com/us-en/cloudinsights//media/howTo.mp4 *(video)*

Checklist and Video Tutorials

The **Startup Checklist** displayed on your Cloud Insights site contains a list of several useful tasks and concepts. Selecting an item in the checklist takes you to the appropriate Cloud Insights page for that concept. For example, clicking on the *Create a Dashboard* item opens the Cloud Insights **Dashboards** page.



At the top of the page is a link to a video tutorial showing how to create a dashboard. You can view the video as many times as you like until you click the *Got it! Don't Show This Again* link for that video. The video is available every time you go to the Dashboards page, until you dismiss it.



Learn How to Create a Dashboard
Watch Video
Got it! Don't show this again.

After watching the video at least once, the *Create a Dashboard* item in the checklist is checked off, indicating that you have completed the tutorial. You can then proceed to the next tutorial.

ⓘ You can view the tutorials in any order you like, as many times as you like until dismissed.

Dismissing the Checklist

The Startup Checklist is displayed on your site until you click the *Don't Show This Again* link at the bottom of the checklist. Even after dismissing the checklist, the tutorials are still available on each appropriate Cloud Insights page until you dismiss each one from the message header bar.

View the Tutorials

Querying Data

► https://docs.netapp.com/us-en/cloudinsights//media/Queries.mp4 *(video)*

Creating a Dashboard

► https://docs.netapp.com/us-en/cloudinsights//media/Dashboards.mp4 *(video)*

Troubleshooting

► https://docs.netapp.com/us-en/cloudinsights//media/Troubleshooting.mp4 *(video)*

Resolve Devices

► https://docs.netapp.com/us-en/cloudinsights//media/AHR_small.mp4 *(video)*

Collecting Data

Getting started gathering data

After you have signed up for Cloud Insights and log in to your environment for the first time, you will be guided through the following steps in order to begin collecting and managing data.

Data collectors discover information from your data sources, such as storage devices, network switches, and virtual machines. The information gathered is used for analysis, validation, monitoring and troubleshooting.

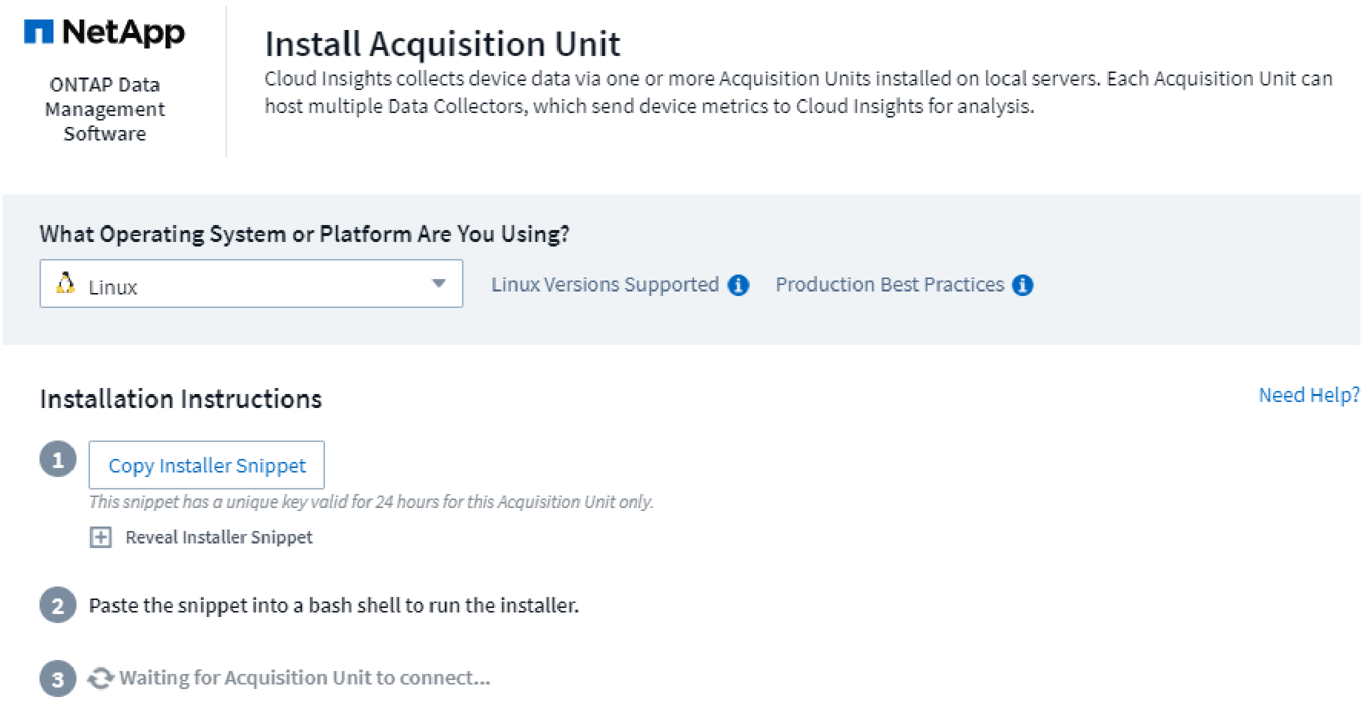
Cloud Insights has available three types of data collectors:

- Infrastructure (storage devices, network switches, compute infrastructure)
- Operating Systems (such as VMware or Windows)
- Services (such as Kafka)

Select your first data collector from the supported vendors and models available. You can easily add additional data collectors later.

Install an Acquisition Unit

If you selected an *Infrastructure* data collector, an Acquisition Unit is required to inject data into Cloud Insights. You will need to download and install the Acquisition Unit software on a server or VM on the data center from which you will be collecting. A single Acquisition Unit can be used for multiple data collectors.



NetApp

ONTAP Data Management Software

Install Acquisition Unit

Cloud Insights collects device data via one or more Acquisition Units installed on local servers. Each Acquisition Unit can host multiple Data Collectors, which send device metrics to Cloud Insights for analysis.

What Operating System or Platform Are You Using?

Linux ▾ Linux Versions Supported ℹ Production Best Practices ℹ

Installation Instructions

Need Help?

1 Copy Installer Snippet

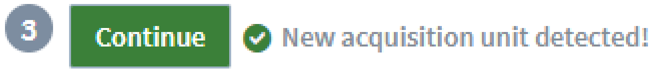
This snippet has a unique key valid for 24 hours for this Acquisition Unit only.

⊞ Reveal Installer Snippet

2 Paste the snippet into a bash shell to run the installer.

3 Waiting for Acquisition Unit to connect...

- Follow the instructions displayed to install your Acquisition Unit. Once the Acquisition Unit software is installed, the Continue button is displayed and you can proceed to the next step.



3 Continue ✓ New acquisition unit detected!

You may set up additional acquisition units later if needed. For example, you may want different Acquisition Units collecting information from data centers in different regions.

Configure the Data Collector - Infrastructure

For *Infrastructure* data collectors, you will be asked to fill out the data collector fields presented:

- Give the data collector a unique and meaningful name.
- Enter the credentials (user name and password) to connect to the device, as appropriate.
- Fill in any other mandatory fields in *Configuration* and *Advanced Configuration* sections.
- Click **Add Collector** to save the data collector.

You will be able to configure additional data collectors later.

Configure the Data Collector - Operating Systems and Services

Operating System:

For *Operating System* data collectors, choose a platform (Linux, Windows) to install a Cloud Insights Agent. You must have at least one agent to collect data from Services.
The agent also collects data from the host itself, for use in Cloud Insights. This data is categorized as "Node" data in widgets, etc.

- Open a terminal or command window on the agent host or VM, and paste the displayed command to install the agent.

- When installation is complete, click **Complete Setup**.

Services:

For *Service* data collectors, click on a tile to open the instructions page for that service.

- Choose a platform and an Agent Access Key.
- If you don’t have an agent installed on that platform, follow the instructions to install the agent.
- Click **Continue** to open the data collector instruction page.
- Follow the instructions to configure the data collector.
- When configuration is complete, click **Complete Setup**.

Add Dashboards

Depending on the type of initial data collector you selected to configure (storage, switch, etc.), one or more relevant dashboards will be imported. For example, if you configured a storage data collector, a set of storage-related dashboards will be imported, and one will be set as your Cloud Insights Home Page. You can change the home page from the **Dashboards > Show All Dashboards** list.

You can import additional dashboards later, or create your own.

That’s all there is to it

After you complete the initial setup process, your environment will begin to collect data.

If your initial setup process is interrupted (for example, if you close the browser window), you will need to follow the steps manually:

- Choose a Data Collector
- Install an Agent or Acquisition Unit if prompted
- Configure the Data Collector

Useful definitions

The following definitions may be useful when talking about Cloud Insights data collectors or features:

- Collector life cycle: A collector will belong to one of the following states in its life cycle:
  - **Preview**: Available in a limited capacity or to a limited audience. Preview features and data collectors are expected to become GA following the preview period. Preview periods vary based on audience or functionality.
  - **GA**: A feature or data collector that is Generally Available to all customers, based on Edition or feature set.
  - **Deprecated**: Applies to data collectors that are, or are expected to become, no longer functionally sustainable. Deprecated data collectors are often replaced with newer, functionally-updated data collectors.
  - **Deleted**: A data collector that has been removed and is no longer available.
- Acquisition Unit: a computer dedicated to hosting data collectors, typically a Virtual Machine. This computer is typically located in the same data center / VPC as the monitored items.
- Data Source: a module for communicating with a hardware or software stack. It consists of a configuration

and code that runs on the AU computer to communicate with the device.

Acquisition Unit Requirements

You must install an Acquisition Unit (AU) in order to acquire information from your infrastructure data collectors (storage, VM, port, EC2, etc.). Before you install the Acquisition Unit, you should ensure that your environment meets operating system, CPU, memory, and disk space requirements.

Requirements

Component	Linux Requirement	Windows Requirement
Operating system	A computer running a licensed version of one of the following: * Centos (64-bit): 7.2 through 7.9, 8.1 through 8.4, Stream 8, Stream 9 * Debian (64-bit): 9 and 10 * OpenSUSE Leap 15.1 through 15.5 * Oracle Enterprise Linux (64-bit): 7.5 through 7.9, 8.1 through 8.8 * Red Hat Enterprise Linux (64-bit): 7.2 through 7.9, 8.1 through 8.8, 9.1, 9.2 * Rocky 9.0, 9.1, 9.3 * SUSE Enterprise Linux Server 15, 15 SP2 through 15 SP5 * Ubuntu Server: 18.04, 20.04, 22.04 LTS * SELinux on the above platforms This computer should be running no other application-level software. A dedicated server is recommended. If you are running with SELinux, it is recommended to execute the following commands on the acquisition unit system: sudo semanage fcontext -a -t usr_t "/opt/netapp/cloudinsights(/.*)?" sudo restorecon -R /opt/netapp/cloudinsights	A computer running a licensed version of one of the following: * Microsoft Windows 10 64-bit * Microsoft Windows Server 2012 * Microsoft Windows Server 2012 R2 * Microsoft Windows Server 2016 * Microsoft Windows Server 2019 * Microsoft Windows Server 2022 * Microsoft Windows 11 This computer should be running no other application-level software. A dedicated server is recommended.
CPU	2 CPU cores	Same
Memory	8 GB RAM	Same

Available disk space	50 GB (100 GB recommended) For Linux, disk space should be allocated in this manner: /opt/netapp 10 GB (20 GB for large environments) /var/log/netapp 40 GB (80 GB for large environments) /tmp at least 1 GB available during installation	50 GB
Network	100 Mbps/1 Gbps Ethernet connection, static IP address, and port 80 or 443 connectivity from Acquisition Unit to *.cloudinsights.netapp.com or your Cloud Insights environment (i.e. https://<environment_id>.c01.cloudinsights.netapp.com) is required. For requirements between Acquisition Unit and each Data Collector, please refer to instructions for the Data Collector. If your organization requires proxy usage for internet access, you may need to understand your organization's proxy behavior and seek certain exceptions for Cloud Insights to work. For example, does your organization block access by default, and only allow access to specific web sites/domains by exception? If so, you will need to get the following domain added to the exception list: *.cloudinsights.netapp.com For more information, read about Proxies here (Linux) or here (Windows).	Same
Permissions	Sudo permissions on the Acquisition Unit server. /tmp must be mounted with exec capabilities.	Administrator permissions on the Acquisition Unit server
Virus Scan		During installation, you must completely disable all virus scanners. Following installation, the paths used by the Acquisition Unit software must be excluded from virus scanning.

Additional recommendations

- For accurate audit and data reporting, it is strongly recommended to synchronize the time on the Acquisition Unit machine using **Network Time Protocol (NTP)** or **Simple Network Time Protocol (SNTP)**.

Regarding Sizing

You can get started with a Cloud Insights Acquisition Unit with just 8GB memory and 50GB of disk space, however, for larger environments you should ask yourself the following questions:

Do you expect to:

- Discover more than 2500 virtual machines or 10 large (> 2 node) ONTAP clusters, Symmetrix, or HDS/HPE VSP/XP arrays on this Acquisition Unit?
- Deploy 75 or more total data collectors on this Acquisition Unit?

For each "Yes" answer above, it is recommend to add 8 GB of memory and 50 GB of disk space to the AU. So for example if you answered "Yes" to both, you should deploy a 24GB memory system with 150GB or more of disk space. On Linux, the disk space to be added to the log location.

For additional sizing questions, contact NetApp Support.

Additional Federal Edition requirement

- For Acquisition Unit installations in Cloud Insights Federal Edition clusters, the underlying operating system must have a good source of entropy. On Linux systems this is typically done by installing *rng-tools* or by using hardware random number generation (RNG). It is the customer’s responsibility to ensure this requirement is met on the Acquisition Unit machine.

Configuring Acquisition Units

Cloud Insights collects device data using one or more Acquisition Units installed on local servers. Each Acquisition Unit can host multiple Data Collectors, which send device metrics to Cloud Insights for analysis.

This topic describes how to add Acquisition Units and describes additional steps required when your environment uses a proxy.

> For accurate audit and data reporting, it is strongly recommended to synchronize the time on the Acquisition Unit machine using **Network Time Protocol (NTP)** or **Simple Network Time Protocol (SNTP)**.

Read about Cloud Insights security here.

Adding a Linux Acquisition Unit

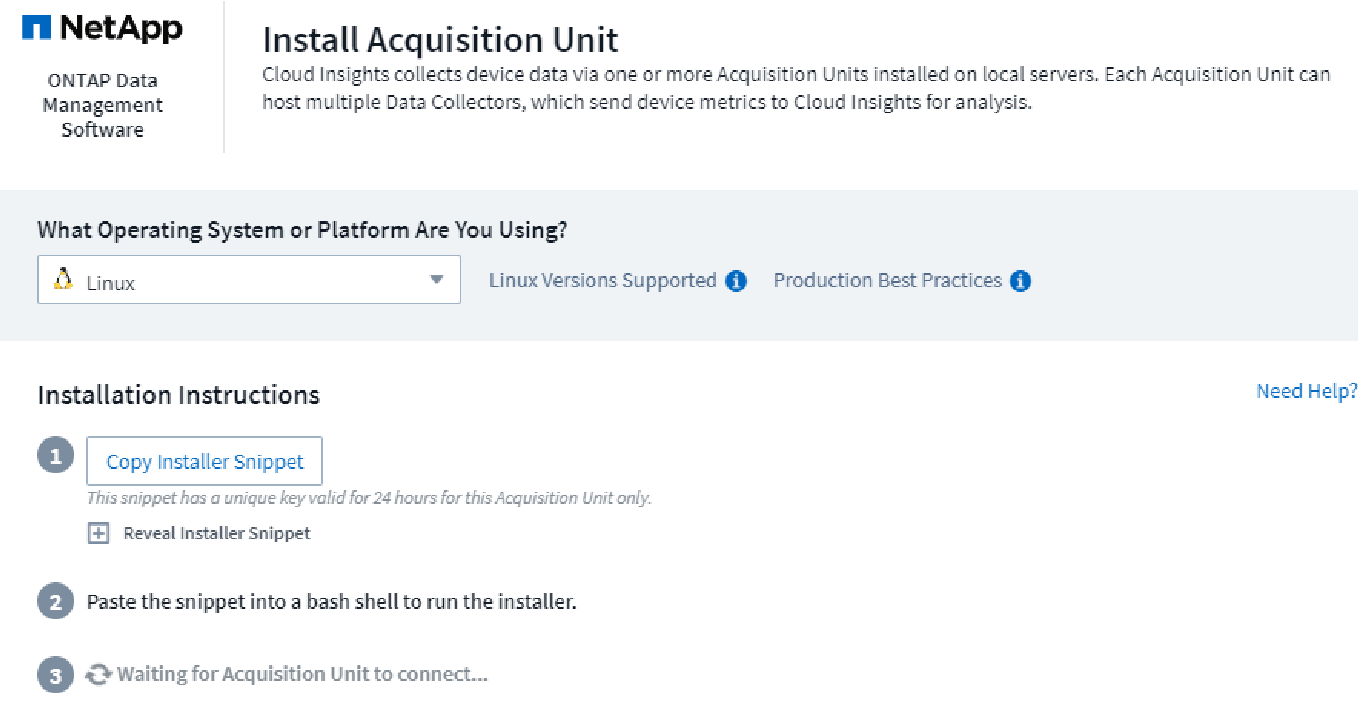
Before you begin

- If your system is using a proxy, you must set the proxy environment variables before the acquisition unit is installed. For more information, see Setting proxy environment variables.

Steps for Linux Acquisition Unit Installation

1. Log in as Administrator or Account Owner to your Cloud Insights environment.
2. Click **Observability > Collectors > Acquisition Units > +Acquisition Unit**

   The system displays the *Install Acquisition Unit* dialog. Choose Linux.



NetApp

ONTAP Data Management Software

Install Acquisition Unit

Cloud Insights collects device data via one or more Acquisition Units installed on local servers. Each Acquisition Unit can host multiple Data Collectors, which send device metrics to Cloud Insights for analysis.

What Operating System or Platform Are You Using?

Linux

Installation Instructions

1 Copy Installer Snippet

This snippet has a unique key valid for 24 hours for this Acquisition Unit only.

⊞ Reveal Installer Snippet

2 Paste the snippet into a bash shell to run the installer.

3 Waiting for Acquisition Unit to connect...

1. Verify that the server or VM hosting the Acquisition Unit meets the recommended system requirements.
2. Verify that the server is running a supported version of Linux. Click *OS Versions Supported (i)* for a list of supported versions.
3. Copy the Installation command snippet in the dialog into a terminal window on the server or VM that will host the Acquisition unit.
4. Paste and execute the command in the Bash shell.

After you finish

- Click **Observability > Collectors > Acquisition units** to check the status of Acquisition Units.
- You can access the Acquisition Unit logs at /var/log/netapp/cloudinsights/acq/acq.log
- Use the following script to control the Acquisition Unit:
  - cloudinsights-service.sh (stop, start, restart, check the status)
- Use the following script to uninstall the Acquisition Unit:
  - cloudinsights-uninstall.sh

Setting proxy environment variables

For environments that use a proxy, you must set the proxy environment variables before you add the Acquisition Unit. The instructions for configuring the proxy are provided on the *Add Acquisition Unit* dialog.

1. Click + in *Have a Proxy Server?*
2. Copy the commands to a text editor and set your proxy variables as needed.

Note: Be aware of restrictions on special characters in proxy username and password fields: '%' and '!' are allowed in the username field. ':', '%', and '!' are allowed in the password field.

3. Run the edited command in a terminal using the Bash shell.
4. Install the Acquisition Unit software.

Proxy Configuration

The Acquisition Unit uses 2-way/mutual authentication to connect to the Cloud Insights server. The client certificate must be passed to the Cloud Insights server to be authenticated. To accomplish this, the proxy must be set up to forward the https request to the Cloud Insights server without decrypting the data.

The simplest way to do this is to specify wildcard configuration in your proxy/firewall to communicate with Cloud Insights, for example:

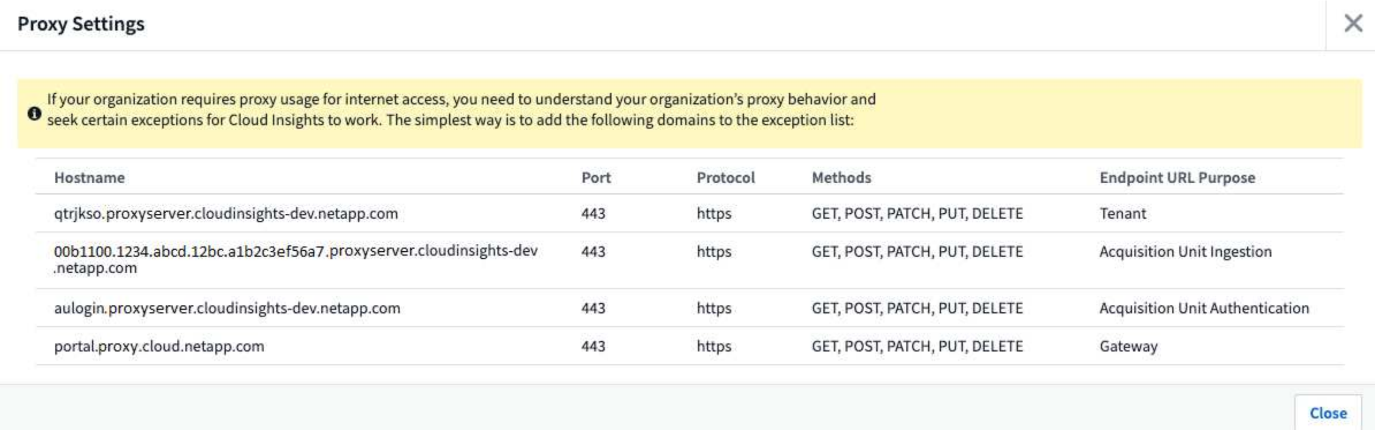
```
*.cloudinsights.netapp.com
```

> The use of an asterisk (*) for wildcard is common, but your proxy/firewall configuration may use a different format. Check with your proxy documentation to ensure correct wildcard specification in your environment.

More information on proxy configuration can be found in the NetApp Knowledgbase.

Viewing Proxy URLs

You can view your proxy endpoint URLs by clicking the **Proxy Settings** link when choosing a data collector during onboarding, or the link under *Proxy Settings* on the **Help > Support** page. A table like the following is displayed.



Proxy Settings

If your organization requires proxy usage for internet access, you need to understand your organization's proxy behavior and seek certain exceptions for Cloud Insights to work. The simplest way is to add the following domains to the exception list:

Hostname	Port	Protocol	Methods	Endpoint URL Purpose
qtrjkso.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Tenant
00b1100.1234.abcd.12bc.a1b2c3ef56a7.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Acquisition Unit Ingestion
aulogin.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Acquisition Unit Authentication
portal.proxy.cloud.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Gateway

If you have Workload Security in your environment, the configured endpoint URLs will also be displayed in this list.

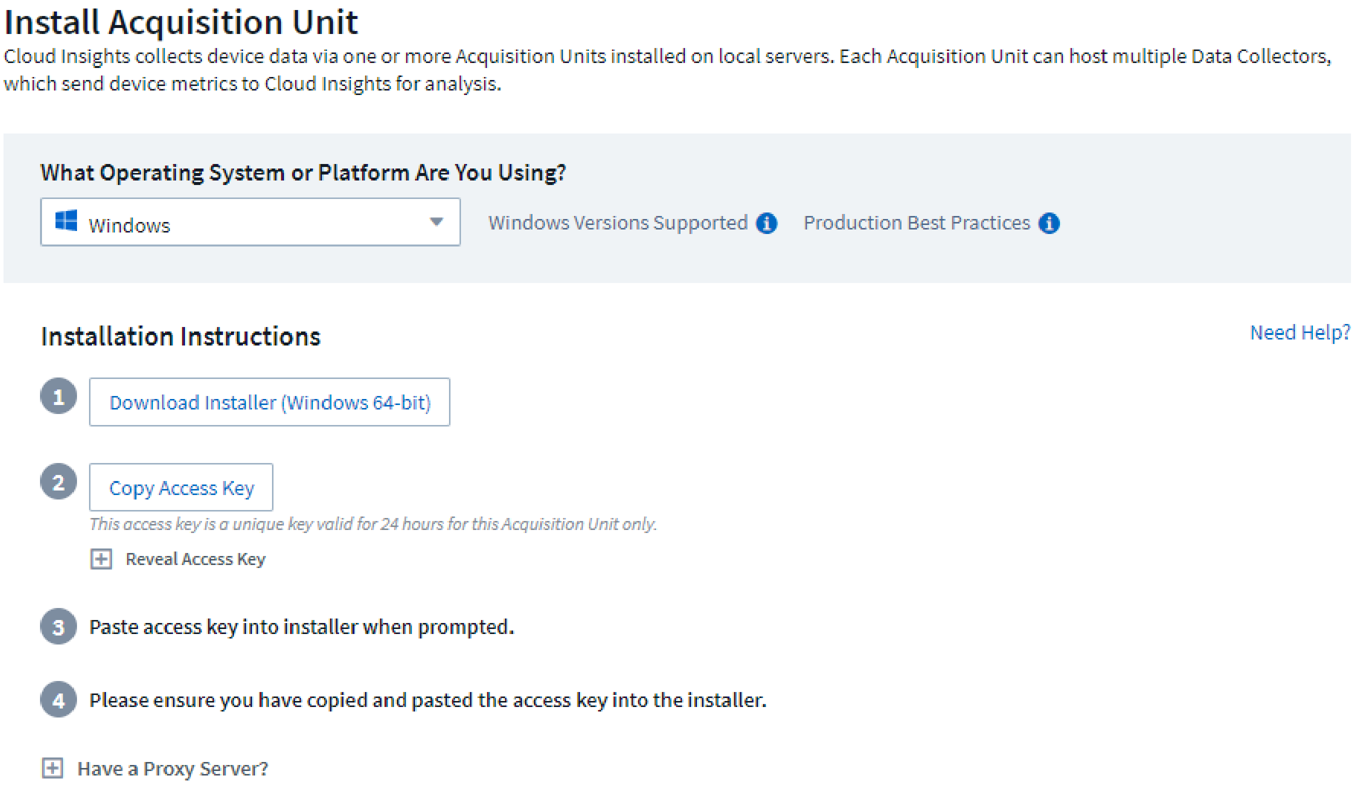
Adding a Windows Acquisition Unit

Steps for Windows Acquisition Unit Installation

1. Log in to the Acquisition Unit server/VM as a user with Administrator permissions.
2. On that server, open a browser window and log in to your Cloud Insights environment as Administrator or Account Owner.

3. Click **Observability > Collectors > Acquisition Units > +Acquisition Unit** .

   The system displays the *Install Acquisition Unit* dialog. Choose Windows.



Install Acquisition Unit

Cloud Insights collects device data via one or more Acquisition Units installed on local servers. Each Acquisition Unit can host multiple Data Collectors, which send device metrics to Cloud Insights for analysis.

What Operating System or Platform Are You Using?

Windows

Windows Versions Supported
Production Best Practices
Installation Instructions
Need Help?
1 Download Installer (Windows 64-bit)
2 Copy Access Key

This access key is a unique key valid for 24 hours for this Acquisition Unit only.

3 Paste access key into installer when prompted.

4 Please ensure you have copied and pasted the access key into the installer.

1. Verify that the server or VM hosting the Acquisition Unit meets the recommended system requirements.
2. Verify that the server is running a supported version of Windows. Click *OS Versions Supported (i)* for a list of supported versions.
3. Click the **Download Installer (Windows 64-bit)** button.
4. Copy the Access Key. You will need this during the Installation.
5. On the Acquisition Unit server/VM, execute the downloaded installer.
6. Paste the Access Key into the installation wizard when prompted.
7. During installation, you will be presented with the opportunity to provide your proxy server settings.

After you finish

- Click * > Observability > Collectors > Acquisition units* to check the status of Acquisition Units.
- You can access the Acquisition Unit log in <install dir>\Cloud Insights\Acquisition Unit\log\acq.log
- Use the following script to stop, start, restart, or check the status of the Acquisition Unit:

```
cloudinsights-service.sh
```

Proxy Configuration

The Acquisition Unit uses 2-way/mutual authentication to connect to the Cloud Insights server. The client certificate must be passed to the Cloud Insights server to be authenticated. To accomplish this, the proxy must be set up to forward the https request to the Cloud Insights server without decrypting the data.

The simplest way to do this is to specify wildcard configuration in your proxy/firewall to communicate with Cloud Insights, for example:

```
*.cloudinsights.netapp.com
```

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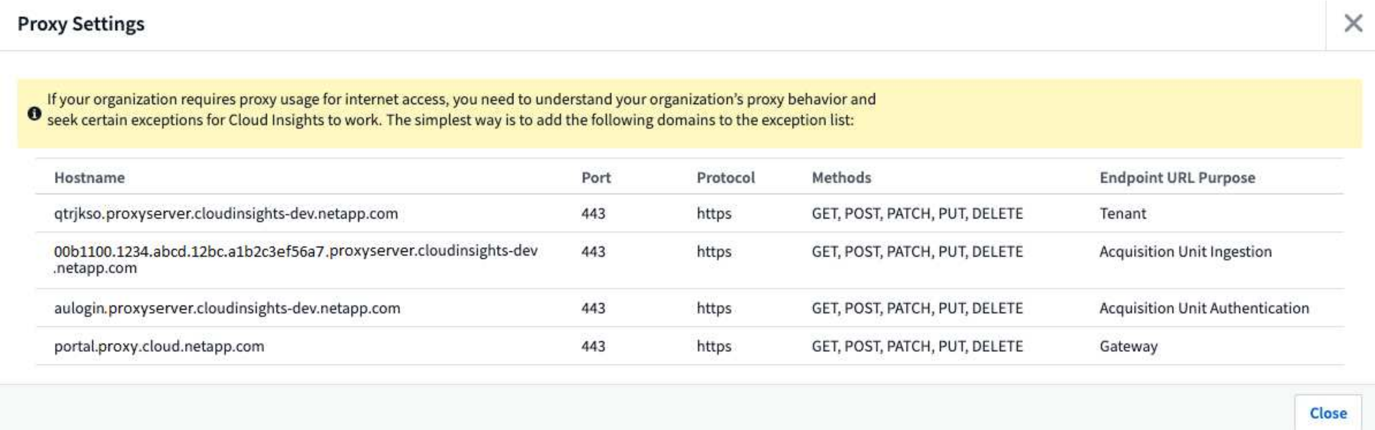

Proxy Settings

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Hostname	Port	Protocol	Methods	Endpoint URL Purpose
qtrjkso.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Tenant
00b1100.1234.abcd.12bc.a1b2c3ef56a7.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Acquisition Unit Ingestion
aulogin.proxyserver.cloudinsights-dev.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Acquisition Unit Authentication
portal.proxy.cloud.netapp.com	443	https	GET, POST, PATCH, PUT, DELETE	Gateway

If you have Workload Security in your environment, the configured endpoint URLs will also be displayed in this list.

Uninstalling an Acquisition Unit

To uninstall the Acquisition Unit software, do the following:

Windows:

If you are uninstalling a **Windows** acquisition unit:

1. On the Acquisition Unit server/VM, open Control Panel and choose **Uninstall a Program**. Select the Cloud Insights Acquisition Unit program for removal.
2. Click Uninstall and follow the prompts.

Linux:

If you are uninstalling a **Linux** acquisition unit:

1. On the Acquisition Unit server/VM, run the following command:

```
sudo cloudinsights-uninstall.sh -p
```

2. For help with uninstall, run:

```
sudo cloudinsights-uninstall.sh --help
```

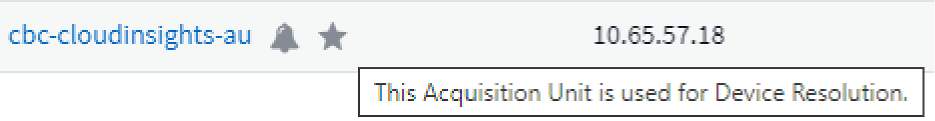
Windows and Linux:

After uninstalling the AU:

1. In Cloud Insights, go to **Observability > Collectors and select the *Acquisition Units** tab.
2. Click the Options button to the right of the Acquisition Unit you wish to uninstall, and select *Delete*. You can delete an Acquisition Unit only if there are no data collectors assigned to it.

> You cannot delete an Acquisition Unit (AU) that has data collectors connected to it. Move all of the AU’s data collectors to another AU (edit the collector and simply select a different AU) before deleting the original AU.

An Acquisition unit with a star next to it is being used for device resolution. Before removing this AU, you must select another AU to use for Device Resolution. Hover over a different AU and open the "three dots" menu to select "Use for Device Resolution".



Reinstalling an Acquisition Unit

To re-install an Acquisition Unit on the same server/VM, you must follow these steps:

Before you begin

You must have a temporary Acquisition Unit configured on a separate server/VM before re-installing an Acquisition Unit.

Steps

1. Log in to the Acquisition Unit server/VM and uninstall the AU software.
2. Log into your Cloud Insights environment and go to **Observability > Collectors**.
3. For each data collector, click the Options menu on the right and select *Edit*. Assign the data collector to the temporary Acquisition Unit and click **Save**.

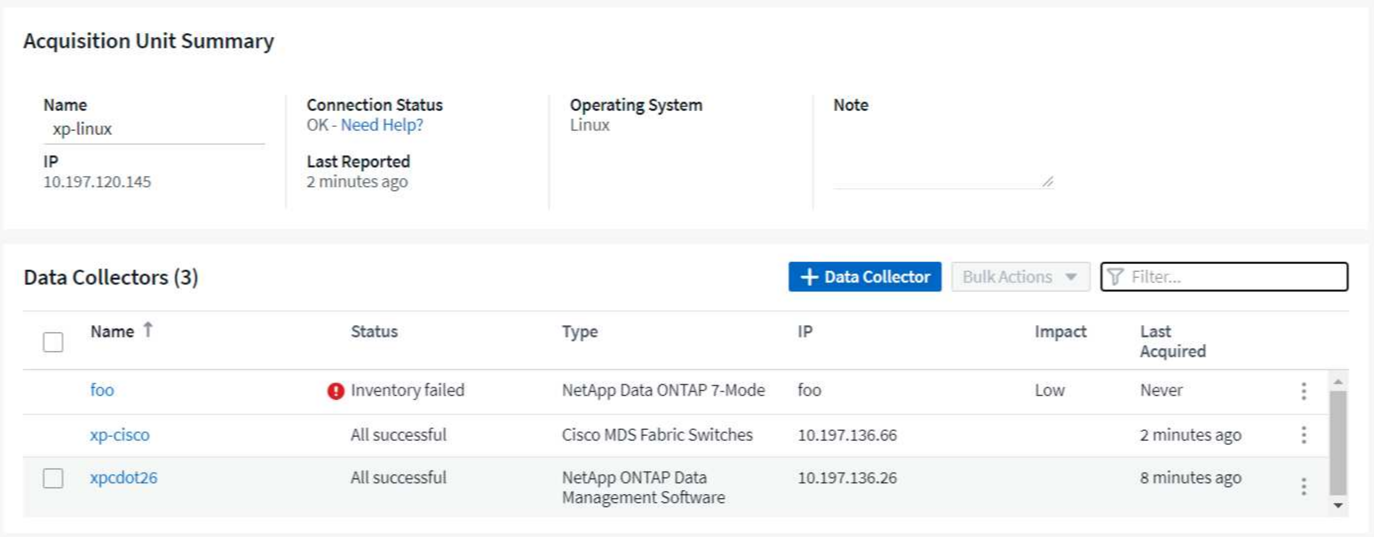
   You can also select multiple data collectors of the same type and click the **Bulk Actions** button. Choose *Edit* and assign the data collectors to the temporary Acquisition Unit.

4. After all of the data collectors have been moved to the temporary Acquisition Unit, go to **Observability > Collectors** and select the **Acquisition Units** tab.
5. Click the Options button to the right of the Acquisition Unit you wish to re-install, and select *Delete*. You can delete an Acquisition Unit only if there are no data collectors assigned to it.
6. You can now re-install the Acquisition Unit software on the original server/VM. Click **+Acquisition Unit** and follow the instructions above to install the Acquisition Unit.
7. Once the Acquisition Unit has been re-installed, assign your data collectors back to the Acquisition Unit.

Viewing AU Details

The Acquisition Unit (AU) detail page provides useful detail for an AU as well as information to help with troubleshooting. The AU detail page contains the following sections:

- A **summary** section showing the following:
  - **Name** and **IP** of the Acquisition Unit
  - Current connection **Status** of the AU
  - **Last Reported** successful data collector poll time
  - The **Operating System** of the AU machine
  - Any current **Note** for the AU. Use this field to enter a comment for the AU. The field displays the most recently added note.
- A table of the AU’s **Data Collectors** showing, for each data collector:
  - **Name** - Click this link to drill down into the data collector’s detail page with additional information
  - **Status** - Success or error information
  - **Type** - Vendor/model
  - **IP** address of the data collector
  - Current **Impact** level
  - **Last Acquired** time - when the data collector was last successfully polled


Acquisition Unit Summary

Name: xp-linux
IP: 10.197.120.145
Connection Status: OK - Need Help?
Last Reported: 2 minutes ago
Operating System: Linux
Note:

Data Collectors (3)

	Name	Status	Type	IP	Impact	Last Acquired
□	foo	Inventory failed	NetApp Data ONTAP 7-Mode	foo	Low	Never
	xp-cisco	All successful	Cisco MDS Fabric Switches	10.197.136.66		2 minutes ago
□	xpcdot26	All successful	NetApp ONTAP Data Management Software	10.197.136.26		8 minutes ago

For each data collector, you can click on the "three dots" menu to Clone, Edit, Poll, or Delete the data collector. You can also select multiple data collectors in this list to perform bulk actions on them.

To restart the Acquisition Unit, click the **Restart** button at the top of the page. Drop down this button to attempt to **Restore Connection** to the AU in the event of a connection problem.

Configuring an Agent to Collect Data (Windows/Linux)

Cloud Insights uses Telegraf as its agent for collection of integration data. Telegraf is a plugin-driven server agent that can be used to collect and report metrics, events, and logs. Input plugins are used to collect the desired information into the agent by accessing the system/OS directly, by calling third-party APIs, or by listening to configured streams (i.e. Kafka, statsD, etc). Output plugins are used to send the collected metrics, events, and logs from the agent to Cloud Insights.

The current Telegraf version for Cloud Insights is **1.24.0**.

For information on installing on Kubernetes, see the NetApp Kubernetes Monitoring Operator page.

For accurate audit and data reporting, it is strongly recommended to synchronize the time on the Agent machine using **Network Time Protocol (NTP)** or **Simple Network Time Protocol (SNTP)**.

If you want to verify the installation files before instaling the Agent, see the section below on Verifying Checksums.

Installing an Agent

If you are installing a Service data collector and have not yet configured an Agent, you are prompted to first install an Agent for the appropriate Operating System. This topic provides instructions for installing the Telegraf agent on the following Operating Systems:

- Windows
- RHEL and CentOS
- Ubuntu and Debian

To install an agent, regardless of the platform you are using, you must first do the following:

1. Log into the host you will use for your agent.
2. Log in to your Cloud Insights environment and navigate to **Observability > Collectors**.
3. Click on **+Data Collector** and choose a data collector to install.
4. Choose the appropriate platform for your host (Windows, Linux)
5. Follow the remaining steps for each platform.

Once you have installed an agent on a host, you do not need to install an agent again on that host.

Once you have installed an agent on a server/VM, Cloud Insights collects metrics from that system in addition to collecting from any data collectors you configure. These metrics are gathered as "Node" metrics.

If you are using a proxy, read the proxy instructions for your platform before installing the Telegraf agent.

Log Locations

Telegraf log messages are redirected from stdout to the following log files be default:

- RHEL/CentOS: /var/log/telegraf/telegraf.log
- Ubuntu/Debian: /var/log/telegraf/telegraf.log
- Windows: C:\Program Files\telegraf\telegraf.log

Windows

Pre-requisites:

- PowerShell must be installed
- If you are behind a proxy, you must follow the instructions in the **Configuring Proxy Support for Windows** section.

Configuring Proxy Support for Windows

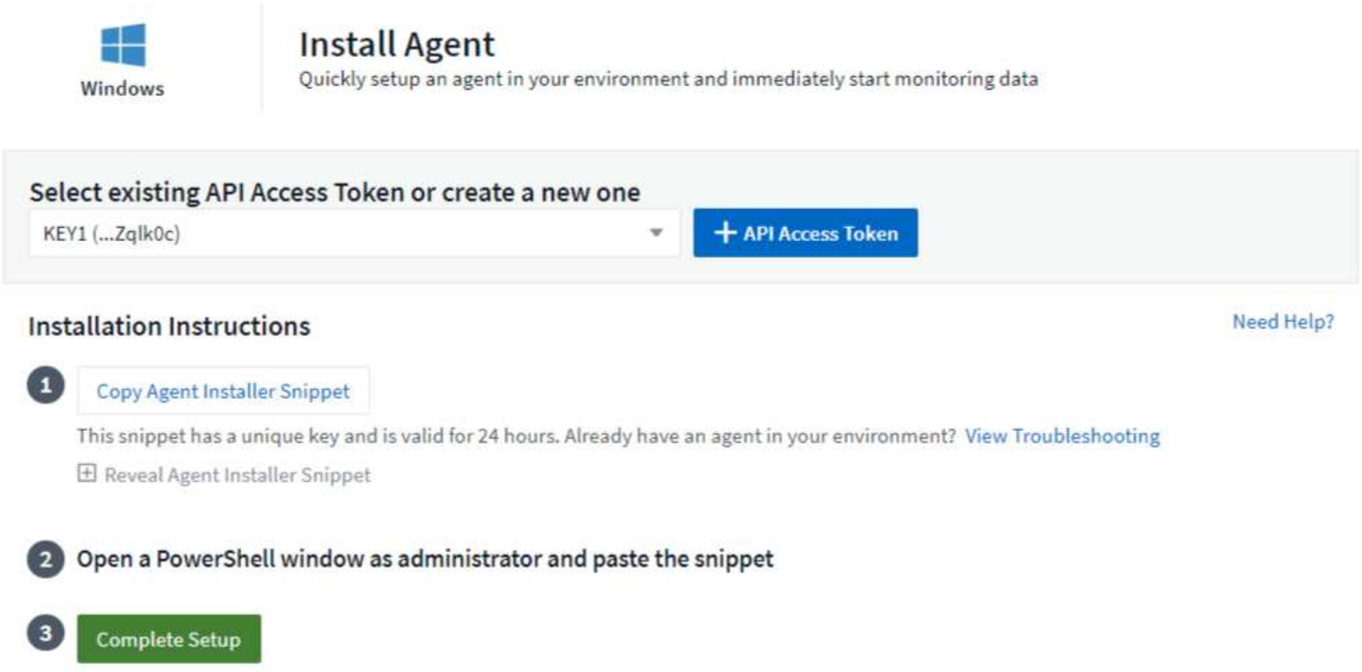
If your environment uses a proxy, read this section before you install.

The steps below outline the actions needed to set the *http_proxy/https_proxy* environment variables. For some proxy environments, users may also need to set the *no_proxy environment* variable.

For systems residing behind a proxy, perform the following to set the *https_proxy* and/or *http_proxy* environment variable(s) **PRIOR** to installing the Telegraf agent:

```
[System.Environment]::SetEnvironmentVariable(“https_proxy”,
“<proxy_server>:<proxy_port>”,
[System.EnvironmentVariableTarget]::Machine)
```

Installing the agent


Windows
Install Agent
Quickly setup an agent in your environment and immediately start monitoring data
Select existing API Access Token or create a new one
KEY1 (...Zqlk0c)
+ API Access Token
Installation Instructions
Need Help?
1
Copy Agent Installer Snippet
This snippet has a unique key and is valid for 24 hours. Already have an agent in your environment? View Troubleshooting
⊞ Reveal Agent Installer Snippet
2
Open a PowerShell window as administrator and paste the snippet
3
Complete Setup

Steps to install agent on Windows:

1. Choose an Agent Access Key.
2. Copy the command block from the agent installation dialog. You can click the clipboard icon to quickly copy the command to the clipboard.
3. Open a PowerShell window
4. Paste the command into the PowerShell window and press Enter.
5. The command will download the appropriate agent installer, install it, and set a default configuration. When finished, it will restart the agent service. The command has a unique key and is valid for 24 hours.
6. Click **Finish** or **Continue**

After the agent is installed, you can use the following commands to start/stop the service:

```
Start-Service telegraf
Stop-Service telegraf
```

Uninstalling the Agent

To uninstall the agent on Windows, do the following in a PowerShell window:

1. Stop and delete the Telegraf service:

   ```
   Stop-Service telegraf
   sc.exe delete telegraf
   ```

2. Remove the certificate from the trustore:

```
cd Cert:\CurrentUser\Root
//rm E5FB7B68C08B1CA902708584C274F8EFC7BE8ABC
rm 1A918038E8E127BB5C87A202DF173B97A05B4996
```

3. Delete the *C:\Program Files\telegraf* folder to remove the binary, logs, and configuration files
4. Remove the *SYSTEM\CurrentControlSet\Services\EventLog\Application\telegraf* key from the registry

Upgrading the Agent

To upgrade the telegraf agent, do the following:

1. Stop and delete the telegraf service:

```
Stop-Service telegraf
sc.exe delete telegraf
```

2. Delete the *SYSTEM\CurrentControlSet\Services\EventLog\Application\telegraf* key from the registry
3. Delete *C:\Program Files\telegraf\telegraf.conf*
4. Delete *C:\Program Files\telegraf\telegraf.exe*
5. Install the new agent.

RHEL and CentOS

Pre-requisites:

- The following commands must be available: curl, sudo, ping, sha256sum, openssl, and dmidecode
- If you are behind a proxy, you must follow the instructions in the **Configuring Proxy Support for RHEL/CentOS** section.

Configuring Proxy Support for RHEL/CentOS

ⓘ If your environment uses a proxy, read this section before you install.

ⓘ The steps below outline the actions needed to set the *http_proxy/https_proxy* environment variables. For some proxy environments, users may also need to set the *no_proxy environment* variable.

For systems residing behind a proxy, perform the following steps **PRIOR** to installing the Telegraf agent:

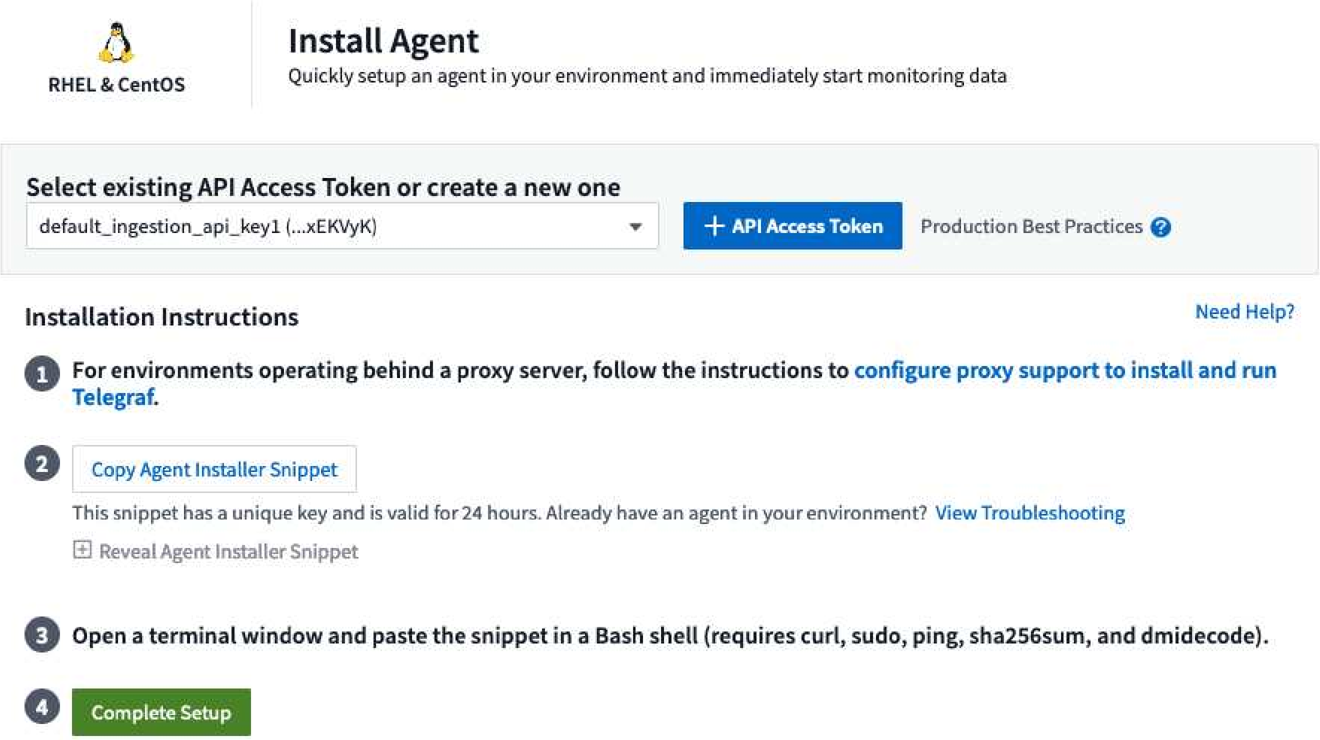
1. Set the *https_proxy* and/or *http_proxy* environment variable(s) for the current user:

```
export https_proxy=<proxy_server>:<proxy_port>
```

2. Create */etc/default/telegraf*, and insert definitions for the *https_proxy* and/or *http_proxy* variable(s):

```
https_proxy=<proxy_server>:<proxy_port>
```

Installing the agent



RHEL & CentOS

Install Agent

Quickly setup an agent in your environment and immediately start monitoring data

Select existing API Access Token or create a new one

default_ingestion_api_key1 (...xEKVyK)

Installation Instructions

1. For environments operating behind a proxy server, follow the instructions to configure proxy support to install and run Telegraf.
2.

   This snippet has a unique key and is valid for 24 hours. Already have an agent in your environment? View Troubleshooting

3. Open a terminal window and paste the snippet in a Bash shell (requires curl, sudo, ping, sha256sum, and dmidecode).
4.

Steps to install agent on RHEL/CentOS:

1. Choose an Agent Access Key.
2. Copy the command block from the agent installation dialog. You can click the clipboard icon to quickly copy the command to the clipboard.
3. Open a Bash window
4. Paste the command into the Bash window and press Enter.
5. The command will download the appropriate agent installer, install it, and set a default configuration. When finished, it will restart the agent service. The command has a unique key and is valid for 24 hours.
6. Click **Finish** or **Continue**

After the agent is installed, you can use the following commands to start/stop the service:

If your operating system is using systemd (CentOS 7+ and RHEL 7+):

```
sudo systemctl start telegraf
sudo systemctl stop telegraf
```

If your operating system is not using systemd (CentOS 7+ and RHEL 7+):

```
sudo service telegraf start
sudo service telegraf stop
```

Uninstalling the Agent

To uninstall the agent on RHEL/CentOS, in a Bash terminal, do the following:

1. Stop the Telegraf service:

   ```
   systemctl stop telegraf (If your operating system is using systemd
   (CentOS 7+ and RHEL 7+)
   /etc/init.d/telegraf stop (for systems without systemd support)
   ```

2. Remove the Telegraf agent:

   ```
   yum remove telegraf
   ```

3. Remove any configuration or log files that may be left behind:

   ```
   rm -rf /etc/telegraf*
   rm -rf /var/log/telegraf*
   ```

Upgrading the Agent

To upgrade the telegraf agent, do the following:

1. Stop the telegraf service:

   ```
   systemctl stop telegraf (If your operating system is using systemd
   (CentOS 7+ and RHEL 7+)
   /etc/init.d/telegraf stop (for systems without systemd support)
   ```

2. Remove the previous telegraf agent:

   ```
   yum remove telegraf
   ```

3. Install the new agent.

Ubuntu and Debian

Pre-requisites:

- The following commands must be available: curl, sudo, ping, sha256sum, openssl, and dmidecode
- If you are behind a proxy, you must follow the instructions in the **Configuring Proxy Support for Ubuntu/Debian** section.

Configuring Proxy Support for Ubuntu/Debian

ⓘ If your environment uses a proxy, read this section before you install.

ⓘ The steps below outline the actions needed to set the *http_proxy/https_proxy* environment variables. For some proxy environments, users may also need to set the *no_proxy environment* variable.

For systems residing behind a proxy, perform the following steps **PRIOR** to installing the Telegraf agent:

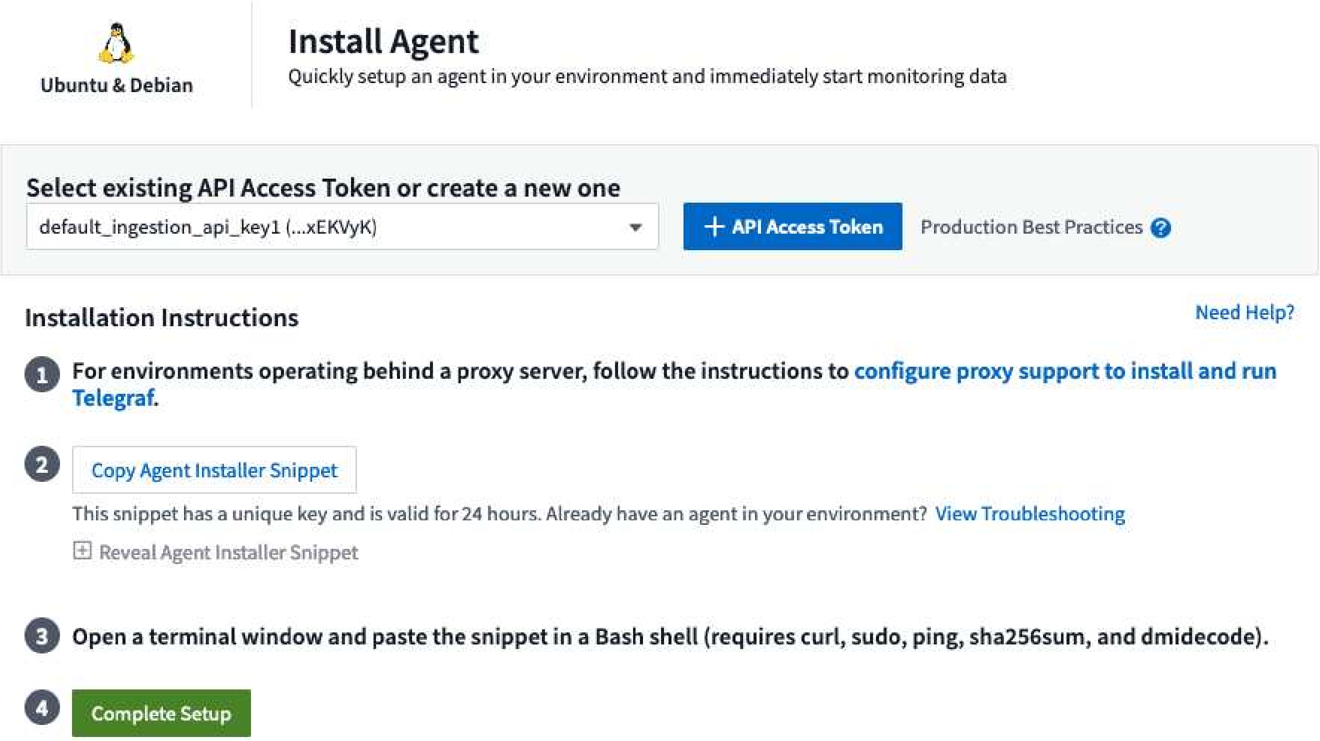
1. Set the *https_proxy* and/or *http_proxy* environment variable(s) for the current user:

```
export https_proxy=<proxy_server>:<proxy_port>
```

2. Create /etc/default/telegraf, and insert definitions for the *https_proxy* and/or *http_proxy* variable(s):

```
https_proxy=<proxy_server>:<proxy_port>
```

Installing the agent



Install Agent

Quickly setup an agent in your environment and immediately start monitoring data

Select existing API Access Token or create a new one

default_ingestion_api_key1 (...xEKVyK)

Installation Instructions

1 For environments operating behind a proxy server, follow the instructions to configure proxy support to install and run Telegraf.

2 Copy Agent Installer Snippet

This snippet has a unique key and is valid for 24 hours. Already have an agent in your environment? View Troubleshooting

3 Open a terminal window and paste the snippet in a Bash shell (requires curl, sudo, ping, sha256sum, and dmidecode).

4 Complete Setup

Steps to install agent on Debian or Ubuntu:

1. Choose an Agent Access Key.
2. Copy the command block from the agent installation dialog. You can click the clipboard icon to quickly copy the command to the clipboard.
3. Open a Bash window
4. Paste the command into the Bash window and press Enter.
5. The command will download the appropriate agent installer, install it, and set a default configuration. When finished, it will restart the agent service. The command has a unique key and is valid for 24 hours.
6. Click **Finish** or **Continue**

After the agent is installed, you can use the following commands to start/stop the service:

If your operating system is using systemd:

```
sudo systemctl start telegraf
sudo systemctl stop telegraf
```

If your operating system is not using systemd:

```
sudo service telegraf start
sudo service telegraf stop
```

Uninstalling the Agent

To uninstall the agent on Ubuntu/Debian, in a Bash terminal, run the following:

1. Stop the Telegraf service:

   ```
   systemctl stop telegraf (If your operating system is using systemd)
   /etc/init.d/telegraf stop (for systems without systemd support)
   ```

2. Remove the Telegraf agent:

   ```
   dpkg -r telegraf
   ```

3. Remove any configuration or log files that may be left behind:

   ```
   rm -rf /etc/telegraf*
   rm -rf /var/log/telegraf*
   ```

Upgrading the Agent

To upgrade the telegraf agent, do the following:

1. Stop the telegraf service:

```
systemctl stop telegraf (If your operating system is using systemd)
/etc/init.d/telegraf stop (for systems without systemd support)
```

2. Remove the previous telegraf agent:

```
dpkg -r telegraf
```

3. Install the new agent.

Verifying Checksums

The Cloud Insights agent installer performs integrity checks, but some users may want to perform their own verifications before installing or applying downloaded artifacts. This can be done by downloading the installer and generating a checksum for the downloaded package, then comparing the checksum to the value shown in the install instructions.

Download the installer package without installing

To perform a download-only operation (as opposed to the default download-and-install), users can edit the agent installation command obtained from the UI and remove the trailing “install” option.

Follow these steps:

1. Copy the Agent Installer snippet as directed.
2. Instead of pasting the snippet into a command window, paste it into a text editor.
3. Remove the trailing “--install” (Linux) or “-install” (Windows) from the command.
4. Copy the entire command from the text editor.
5. Now paste it into your command window (in a working directory) and run it.

Non-Windows (these examples are for Kubernetes; actual script names may vary):

- Download and install (default):

```
installerName=cloudinsights-kubernetes.sh … && sudo -E -H
./$installerName --download --install
```

- Download-only:

```
installerName=cloudinsights-kubernetes.sh … && sudo -E -H
./$installerName --download
```

Windows:

- Download and install (default):

```
!$($installerName=".\cloudinsights-windows.ps1") … -and
$(&$installerName -download -install)
```

- Download-only:

```
!$($installerName=".\cloudinsights-windows.ps1") … -and
$(&$installerName -download)
```

The download-only command will download all required artifacts from Cloud Insights to the working directory. The artifacts include, but may not be limited to:

- an installation script
- an environment file
- YAML files
- a checksum file (ending in sha256.signed or sha256.ps1)

The installation script, environment file, and YAML files can be verified using visual inspection.

Generate checksum value

To generate the checksum value, perform the following command for your appropriate platform:

- RHEL/Ubuntu:

```
sha256sum <package_name>
```

- Windows:

```
Get-FileHash telegraf.zip -Algorithm SHA256 | Format-List
```

Verify checksum

Extract the expected checksum from the checksum file

- Non-Windows:

```
openssl smime -verify -in telegraf*.sha256.signed -CAfile
netapp_cert.pem -purpose any -nosigs -noverify
```

- Windows:

  ```
  (Get-Content telegraf.zip.sha256.ps1 -First 1).toUpper()
  ```

Install the downloaded package

Once all of the artifacts have been satisfactorily verified, the agent installation can be initiated by running:

Non-Windows:

```
sudo -E -H ./<installation_script_name> --install
```

Windows:

```
.\cloudinsights-windows.ps1 -install
```

Troubleshooting

Some things to try if you encounter problems setting up an agent:

Problem:	**Try this:**
After configuring a new plugin and restarting Telegraf, Telegraf fails to start up. The logs indicate that an error resembling the following: "[telegraf] Error running agent: Error loading config file /etc/telegraf/telegraf.d/cloudinsights-default.conf: plugin outputs.http: line <linenumber>: configuration specified the fields ["use_system_proxy"], but they weren’t used"	The installed Telegraf version is outdated. Follow the steps on this page to **Upgrade the Agent** for your appropriate platform.
I ran the installer script on an old installation and now the agent isn’t sending data	Uninstall the telegraf agent and then re-run the installation script. Follow the **Upgrade the Agent** steps on this page for your appropriate platform.
I already installed an agent using Cloud Insights	If you have already installed an agent on your host/VM, you do not need to install the agent again. In this case, simply choose the appropriate Platform and Key in the Agent Installation screen, and click on **Continue** or **Finish**.
I already have an agent installed but not by using the Cloud Insights installer	Remove the previous agent and run the Cloud Insights Agent installation, to ensure proper default configuration file settings. When complete, click on **Continue** or **Finish**.

Additional information may be found from the Support page or in the Data Collector Support Matrix.

Configuring Data Collectors

You configure Data Collectors in your Cloud Insights environment to collect data from devices in the data center.

Before you begin

- You must have configured an Acquisition Unit before you can start collecting data.
- You need credentials for the devices from which you are collecting Data.
- Device network addresses, account information, and passwords are required for all devices you are collecting data from.

Steps

1. From the Cloud Insights menu, click **Observability > Collectors**

   The system displays the available Data Collectors arranged by vendor.

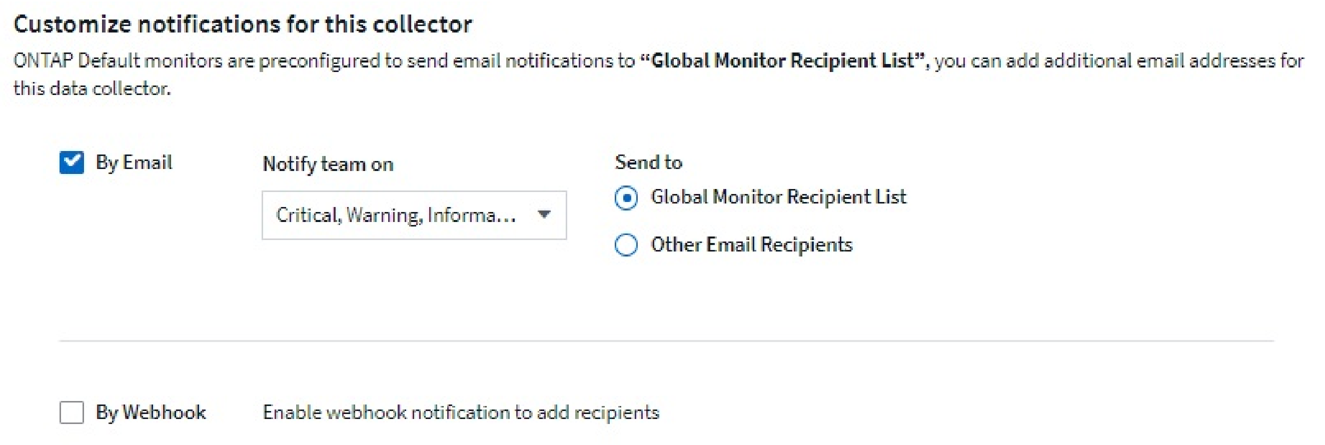
2. Click **+ Collector** and select the data collector to configure.

   In the dialog box you can configure the data collector and add an Acquisition Unit.

3. Enter a name for the data collector.

   Names can contain can contain letters (a-z), numbers (0-9), dashes (-), underscores (_), apostrophes ('), and periods (.).

4. Enter the Acquisition Unit to associate with this data collector.
5. Enter the required fields in the Configuration screen.
6. When prompted to configure notifications, choose to alert by Email, Webhook, or both, and choose the alert types on which to notify (Critical, Warning, Informational, and/or Resolved). You can choose to notify to the Global Monitor Recipient list (configured in **Admin > Notifications**), or specify additional recipients. When ready to continue, click **Complete Setup**.



Customize notifications for this collector

ONTAP Default monitors are preconfigured to send email notifications to **"Global Monitor Recipient List"**, you can add additional email addresses for this data collector.

☑ By Email

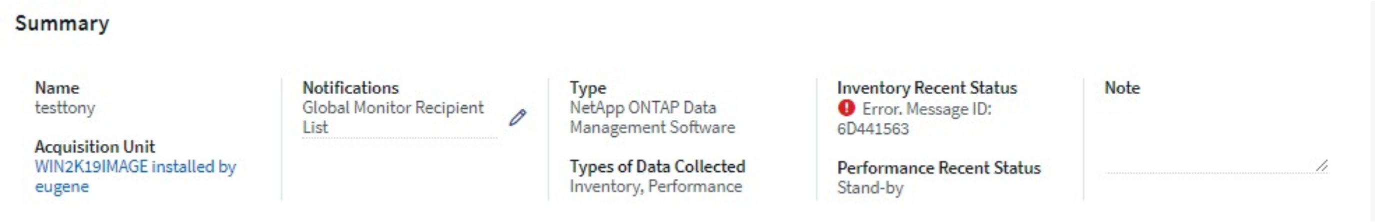
Notify team on: Critical, Warning, Informa... ▾

Send to:
● Global Monitor Recipient List
○ Other Email Recipients

☐ By Webhook — Enable webhook notification to add recipients

When viewing an **ONTAP data collector** landing page, you can modify the notifications by clicking the pencil icon in the "Notifications" field of the data collector summary section.

> ONTAP Data Collector notifications take precedence over any specific Monitor notifications that are relevant to the cluster/data collector. The recipient list you set for the Data Collector itself will receive the data collector alerts. If there are no active data collector alerts, then monitor-generated alerts will be sent to specific monitor recipients.



Summary

Name
testtony

Acquisition Unit
WIN2K19IMAGE installed by eugene

Notifications
Global Monitor Recipient List

Type
NetApp ONTAP Data Management Software

Types of Data Collected
Inventory, Performance

Inventory Recent Status
❗ Error. Message ID: 6D441563

Performance Recent Status
Stand-by

Note

1. Click **Advanced Configuration** to add additional configuration fields. (Not all data collectors require advanced configuration.)
2. Click **Test Configuration** to verify that the data collector is properly configured.
3. Click **Add Collector** to save the configuration and add the data collector to your Cloud Insights tenant.

After adding a new data collector, Cloud Insights initiates three polls:

- 1st inventory poll: immediately
- 1st performance data poll to establish a baseline: immediately after inventory poll
- 2nd performance poll: within 15 seconds after completion of 1st performance poll

Polling then proceeds according to the configured inventory and performance poll intervals.

Determining data collector acquisition status

Because data collectors are the primary source of information for Cloud Insights, it is imperative that you ensure that they remain in a running state.

Data collector status is displayed in the upper right corner of any asset page as the message "Acquired N minutes ago", where N indicates the most recent acquisition time of the asset’s data collector(s). The acquisition time/date is also displayed.

Clicking on the message displays a table with data collector name, status, and last successful acquisition time. If you are signed in as an Administrator, clicking on the data collector name link in the table takes you to detail page for that data collector.

Managing configured data collectors

The Installed Data Collectors page provides access to the data collectors that have been configured for Cloud Insights. You can use this page to modify existing data collectors.

Steps

1. In the Cloud Insights menu, click **Observability > Collectors**

   The Available Data Collectors screen is displayed.

2. Click **Installed Data Collectors**

A list of all of the installed Data Collectors is displayed. The list provides collector name, status, the IP address the collector is accessing, and when data was last acquired from the a device. Action that can be performed on this screen include:

- Control polling
- Change data collector credentials
- Clone data collectors

Controlling Data Collector polling

After making a change to a data collector, you might want it to poll immediately to check your changes, or you might want to postpone the data collection on a data collector for one, three, or five days while you work on a problem.

Steps

1. In the Cloud Insights menu, click **Observability > Collectors**
2. Click **Installed Data Collectors**
3. Select the check box to the left of the Data Collector you want to change
4. Click **Bulk Actions** and select the polling action you want to take.

   Bulk actions can be performed simultaneously on multiple Data Collectors. Select the data collectors, and chose the action to perform from the **Bulk Action** menu.

Editing data collector information

You can edit existing data collector setup information.

To edit a single data collector:

1. In the Cloud Insights menu, click **Observability > Collectors** to open the list of installed Data Collectors.
2. In the options menu to the right of the data collector you want to modify, click **Edit**.

   The Edit Collector dialog is opened.

3. Enter the changes and click **Test Configuration** to test the new configuration or click **Save** to save the configuration.

You can also edit multiple data collectors:

1. Select the check box to the left of each data collector you want to change.
2. Click the **Bulk Actions** button and choose **Edit** to open the Edit data Collector dialog.
3. Modify the fields as above.

   > ⓘ The data collectors selected must be the same vendor and model, and reside on the same Acquisition Unit.

   When editing multiple data collectors, the Data Collector Name field shows “Mixed” and cannot be edited. Other fields such as user name and password show “Mixed” and can be edited. Fields that share the same value across the selected data collectors show the current values and can be edited.

   When editing multiple data collectors, the **Test Configuration** button is not available.

Cloning data collectors

Using the clone facility, you can quickly add a data source that has the same credentials and attributes as another data source. Cloning allows you to easily configure multiple instances of the same device type.

Steps

1. In the Cloud Insights menu, click **Observability > Collectors**.
2. Click **Installed Data Collectors**.
3. Click the check box to the left of the data collector you want to copy.
4. In the options menu to the right of the selected data collector, click **Clone**.

   The Clone Data Collector dialog is displayed.

5. Enter new information in the required fields.
6. Click **Save**.

After you finish

The clone operation copies all other attributes and settings to create the new data collector.

Performing bulk actions on data collectors

You can simultaneously edit some information for multiple data collectors. This feature allows you to initiate a poll, postpone polling, and resume polling on multiple data collectors. In addition, you can delete multiple data collectors.

Steps

1. In the Cloud Insights menu, click **Observability > Collectors**
2. Click **Installed Data Collectors**
3. Click the check box to the left of the data collectors you want to modify.
4. In the options menu to the right, click the option you want to perform.

After you finish

The operation you selected is performed on the data collectors. When you chose to delete data collectors, a dialog is displayed requiring you to conform the action.

Researching a failed data collector

If a data collector has failure message and a High or Medium Impact, you need to research this problem using the data collector summary page with its linked information.

Use the following steps to determine the cause of failed data collectors. Data collector failure messages are displayed on the **Admin** menu and on the **Installed Data Collectors** page.

Steps

1. Click **Admin** > **Data Collectors** > **Installed Data Collectors**.
2. Click the linked Name of the failing data collector to open the Summary page.
3. On the Summary page, check the Comments area to read any notes that might have been left by another engineer who might also be investigating this failure.

4. Note any performance messages.
5. Move your mouse pointer over the segments of the Event Timeline graph to display additional information.
6. Select an error message for a Device and displayed below the Event Timeline and click the Error details icon that displays to the right of the message.

   The Error details include the text of the error message, most likely causes, information in use, and suggestions of what can be tried to correct the problem.

7. In the Devices Reported By This Data Collector area, you might filter the list to display only devices of interest, and you can click the linked **Name** of a device to display the asset page for that device.
8. When you return to the data collector summary page, check the **Show Recent Changes** area at the bottom of the page to see if recent changes could have caused the problem.

Importing from the Dashboard Gallery

Cloud Insights provides a number of Recommended Dashboards to provide business insights into your data. Each dashboard contains widgets designed to help answer a particular question or solve a particular problem relevant to the data currently being collected in your environment.

To import a dashboard from the gallery, do the following:

1. Select **Dashboards > Dashboards**
2. Click on **+From Gallery**

   A list of **Recommended Dashboards** is displayed. Each dashboard is named with a particular question the dashboard can help you solve. Dashboards are available to help answer questions around different types of objects, including AWS, NetApp, Storage, VMware, and others

3. Select one or more dashboards from the list and click **Add Dashboards**. These dashboards now show in your dashboard list.

In addition to the Recommended Dashboards, you can also choose to import **Additional Dashboards** that are not relevant to your current data. For example, if you have no storage data collectors currently installed but are planning on configuring some in the future, you may still choose to import the storage-relevant dashboards. These dashboards will be available for display but may not show any relevant data until at least one storage data collector is configured.

Importing from the dashboard gallery is available to users with Administrator or Account Owner role.

User Accounts and Roles

Cloud Insights provides up to four user account roles: Account Owner, Administrator, User, and Guest. Each account is assigned specific permission levels as noted in the table below. Users are either invited to Cloud Insights and assigned a specific role, or can sign in via Single Sign-On (SSO) Authorization with a default role. SSO Authorization is available as a feature in Cloud Insights Premium Edition.

User logins in Cloud Insights Federal Edition are limited to configured identity providers (with their specified email domains). When a new user is invited to a Cloud Insights Federal environment, their email address must match the domain configured for that environment.

Permission levels

You use an account that has Administrator privileges to create or modify user accounts. Each user account is assigned a role for each Cloud Insights feature from the following permission levels.

Role	Observability	Workload Security	Reporting
Account Owner	Can modify subscriptions, view billing and usage information, and perform all Administrator functions for Observability, Security, and Reporting. Owners can also invite and manage users, as well as manage SSO Authentication and Identity Federation settings. The first Account Owner is created when you register for Cloud Insights. It is strongly recommended to have at least two Account Owners for each Cloud Insights environment.		
Administrator	Can perform all Observability functions, all user functions, as well as management of data collectors, Observability API tokens, and notifications. An Administrator can also invite other users but can only assign Observability roles.	Can perform all Security functions, including those for Alerts, Forensics, data collectors, automated response policies, and API tokens for Security. An Administrator can also invite other users but can only assign Security roles.	Can perform all User/Author functions including managing Reporting API tokens, as well as all administrative tasks such as configuration of reports, and the shutdown and restart of reporting tasks. An Administrator can also invite other users but can only assign Reporting roles.
User	Can view and modify dashboards, queries, alerts, annotations, annotation rules, and applications, and manage device resolution.	Can view and manage Alerts and view Forensics. User role can change alert status, add a note, take snapshots manually, and manage restrict user access.	Can perform all Guest/Consumer functions as well as create and manage reports and dashboards.
Guest	Has read-only access to asset pages, dashboards, alerts, and can view and run queries.	Can view Alerts and Forensics. Guest role cannot change alert status, add a note, take snapshots manually, or restrict user access.	Can view, schedule, and run reports and set personal preferences such as those for languages and time zones. Guests/Consumers cannot create reports or perform administrative tasks.

Best practice is to limit the number of users with Administrator permissions. The greatest number of accounts should be user or guest accounts.

Cloud Insights Permissions by User Role

The following table shows the Cloud Insights permissions granted to each user role.

Feature	Administrator/ Account Owner	User	Guest
Acquisition Units: Add/Modify/Delete	Y	N	N
Alerts*: Create/Modify/Delete	Y	Y	N
Alerts*: View	Y	Y	Y
Annotation Rules: Create/Run/Modify/Delete	Y	Y	N
Annotations: Create/Modify/Assign/View/Remove/Delete	Y	Y	N
API Access*: Create/Rename/Disable/Revoke	Y	N	N
Applications: Create/View/Modify/Delete	Y	Y	N
Asset Pages: Modify	Y	Y	N
Asset Pages: View	Y	Y	Y
Audit: View	Y	N	N
Cloud Cost	Y	N	N
Security	Y	N	N
Dashboards: Create/Modify/Delete	Y	Y	N
Dashboards: View	Y	Y	Y
Data Collectors: Add/Modify/Poll/Delete	Y	N	N
Notifications: View	Y	Y	Y
Notifications: Modify	Y	N	N
Queries: Create/Modify/Delete	Y	Y	N
Queries: View/Run	Y	Y	Y
Device Resolution	Y	Y	N
Reports*: View/Run	Y	Y	Y

Reports*: Create/Modify/Delete/Schedule	Y	Y	N
Subscription: View/Modify	Y	N	N
User Management: Invite/Add/Modify/Deactivate	Y	N	N

*Requires Premium Edition

Creating Accounts by Inviting Users

Creating a new user account is achieved through Cloud Central. A user can respond to the invitation sent through email, but if the user does not have an account with Cloud Central, the user needs to sign up with Cloud Central so that they can accept the invitation.

Before you begin

- The user name is the email address of the invitation.
- Understand the user roles you will be assigning.
- Passwords are defined by the user during the sign up process.

Steps

1. Log into Cloud Insights
2. In the menu, click **Admin > User Management**

   The User Management screen is displayed. The screen contains a list of all of the accounts on the system.

3. Click **+ User**

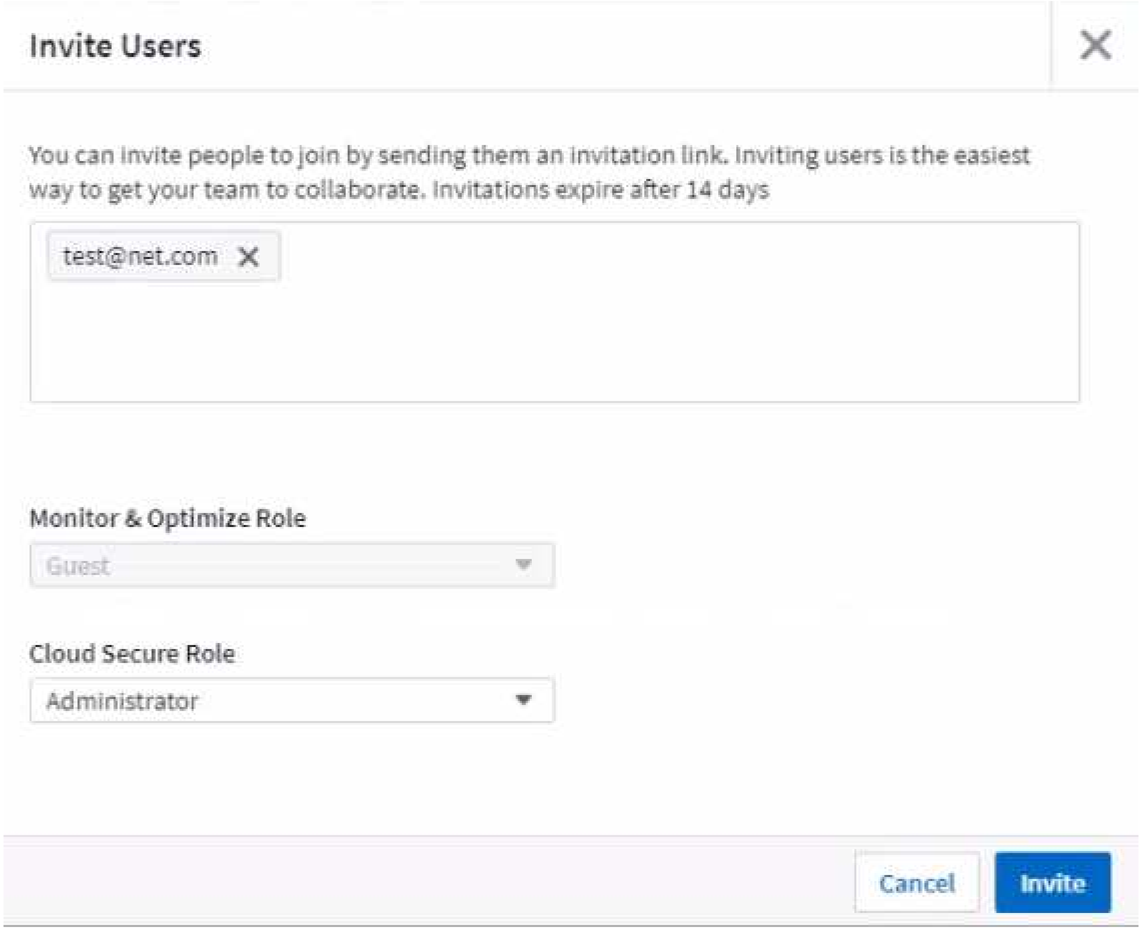
   The **Invite User** screen is displayed.

4. Enter an email address or multiple addresses for invitations.

   Note: When you enter multiple addresses, they are all created with the same role. You can only set multiple users to the same role.

1. Select the user’s role for each feature of Cloud Insights.

> ⓘ The features and roles you can choose from depend on which features you have access to in your particular Administrator role. For example, if you have Admin role only for Reporting, you will be able to assign users to any role in Reporting, but will not be able to assign roles for Observability or Security.


Invite Users

You can invite people to join by sending them an invitation link. Inviting users is the easiest way to get your team to collaborate. Invitations expire after 14 days

test@net.com

Monitor & Optimize Role

Guest

Cloud Secure Role

Administrator

2. Click **Invite**

   The invitation is sent to the user. Users will have 14 days to accept the invitation. Once a user accepts the invitation, they will be taken to the NetApp Cloud Portal, where they will sign up using the email address in the invitation. If they have an existing account for that email address, they can simply sign in and will then be able to access their Cloud Insights environment.

Modifying an existing user’s role

To modify an existing user’s role, including adding them as a **secondary account owner**, follow these steps.

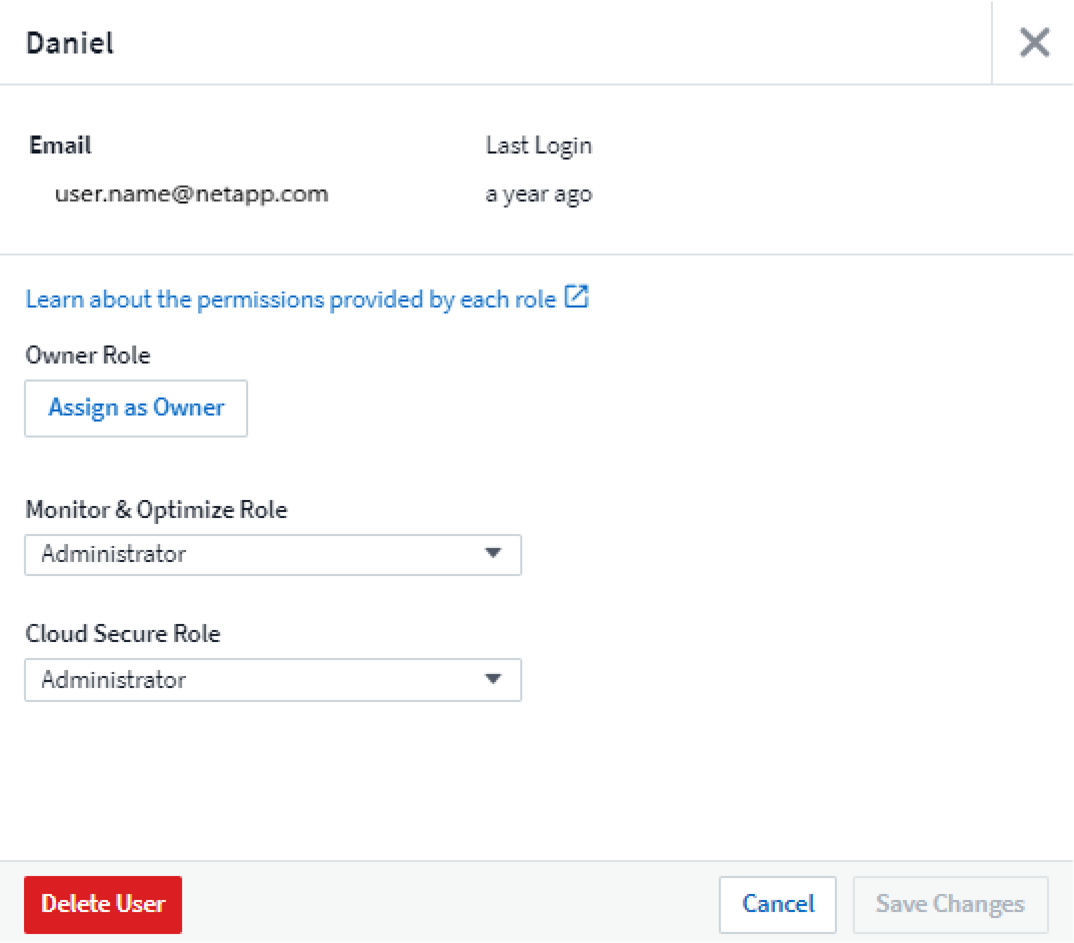
1. Click **Admin > User Management**. The screen displays a list of all of the accounts on the system.
2. Click the user name of the account you want to change.
3. Modify the user’s role in each Cloud Insights feature set as needed.
4. Click *Save Changes*.

To assign a Secondary Account Owner

You must be logged in as an account owner for Observability in order to assign the account owner role to another user.

1. Click **Admin > User Management**.
2. Click the user name of the account you want to change.

3. In the User dialog, click on **Assign as Owner**.
4. Save the changes.



Daniel

Email: user.name@netapp.com

Last Login: a year ago

Monitor & Optimize Role: Administrator

Cloud Secure Role: Administrator

You can have as many account owners as you wish, but best practice is to limit the owner role to only select people.

Deleting Users

A user with the Administrator role can delete a user (for example, someone no longer with the company) by clicking on the user’s name and clicking *Delete User* in the dialog. The user will be removed from the Cloud Insights environment.

Note that any dashboards, queries, etc. that were created by the user will remain available in the Cloud Insights environment even after the user is removed.

Single Sign-On (SSO) and Identity Federation

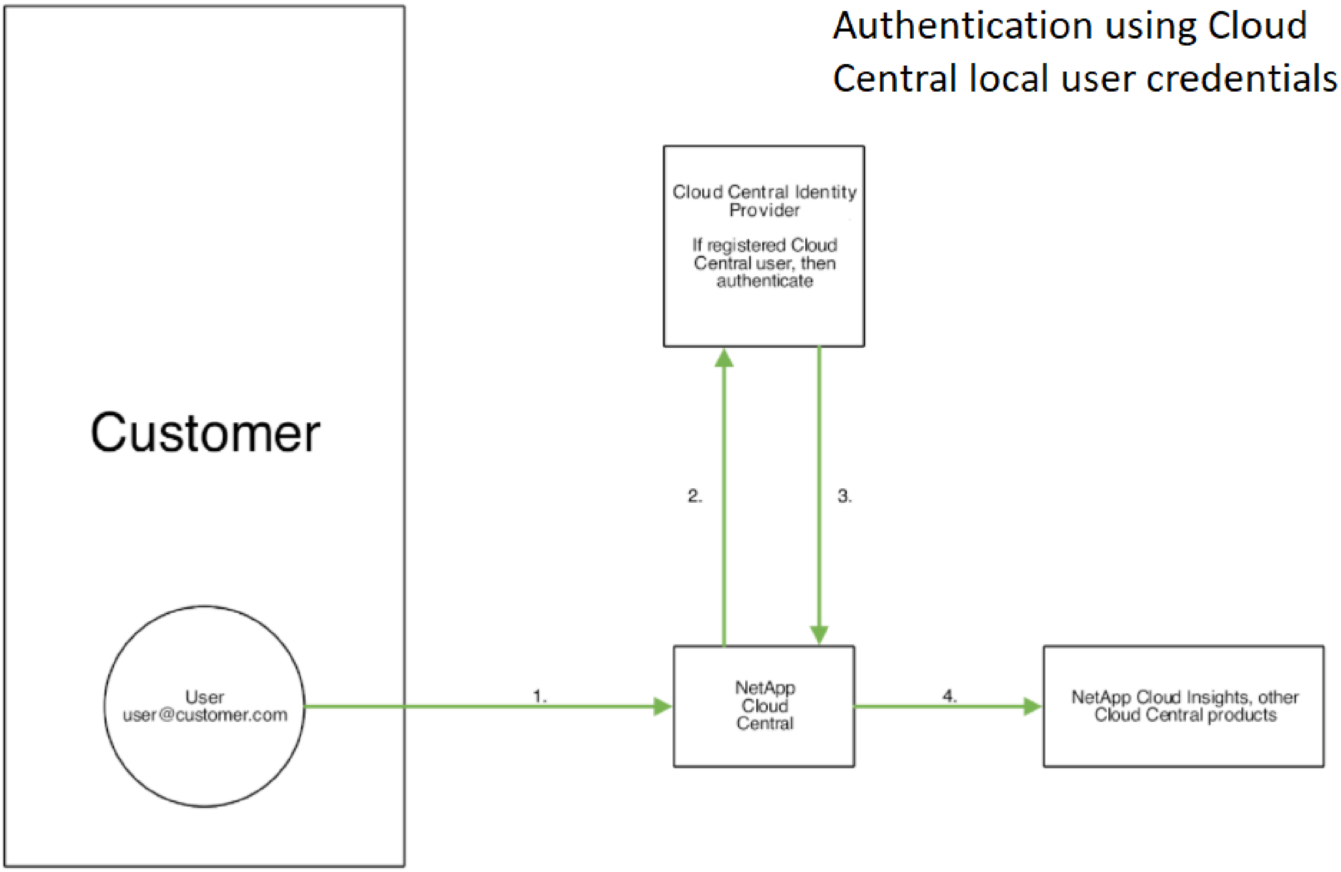
Enabling Identity Federation for SSO In Cloud Insights

With Identity Federation:

- Authentication is delegated to the customer’s identity management system, using the customer’s credentials from your corporate directory, and automatization policies such as Multi-Factor Authentication (MFA).

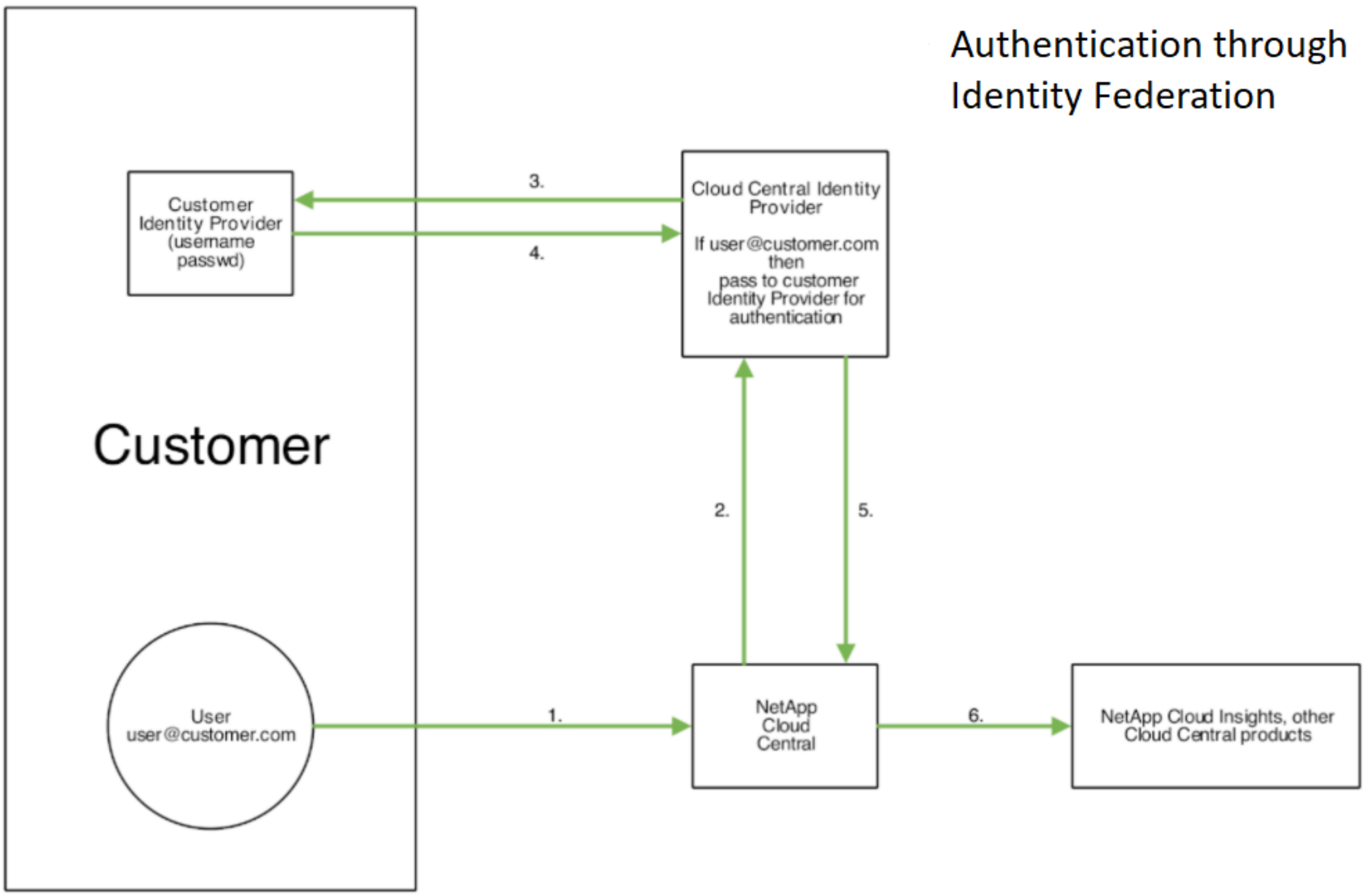
- Users log in once to all NetApp Cloud Services (Single Sign On).

User accounts are managed in NetApp Cloud Central for all Cloud Services. By default, authentication is done using Cloud Central local user profile. Below is a simplified overview of that process:


Authentication using Cloud Central local user credentials
Customer
User
user@customer.com
1.
NetApp Cloud Central
Cloud Central Identity Provider
If registered Cloud Central user, then authenticate
2.
3.
4.
NetApp Cloud Insights, other Cloud Central products

However, some customers would like to use their own identity provider to authenticate their users for Cloud Insights and their other NetApp Cloud Central Services. With Identity Federation, NetApp Cloud Central accounts are authenticated using credentials from your corporate directory.

The following is a simplified example of that process:


Authentication through Identity Federation
Customer
Customer Identity Provider (username passwd)
User user@customer.com
Cloud Central Identity Provider
If user@customer.com then pass to customer Identity Provider for authentication
NetApp Cloud Central
NetApp Cloud Insights, other Cloud Central products
1.
2.
3.
4.
5.
6.

In the above diagram, when a user accesses Cloud Insights, that user is directed to the customer's identity management system for authentication. Once the account is authenticated, the user is directed to the Cloud Insights tenant URL.

Cloud Central uses Auth0 to implement Identity Federation and integrate with services like Active Directory Federation Services (ADFS) and Microsoft Azure Active Directory (AD). For more information on Identity Federation setup and configuration, see Cloud Central documentation on Identity Federation.

It is important to understand that changing identity federation in Cloud Central will apply not only to Cloud Insights but to all NetApp Cloud Services. The customer should discuss this change with the NetApp team of each Cloud Central product they own to make sure the configuration they are using will work with Identity Federation or if adjustments need to be made on any accounts. The customer will need to involve their internal SSO team in the change to identity federation as well.

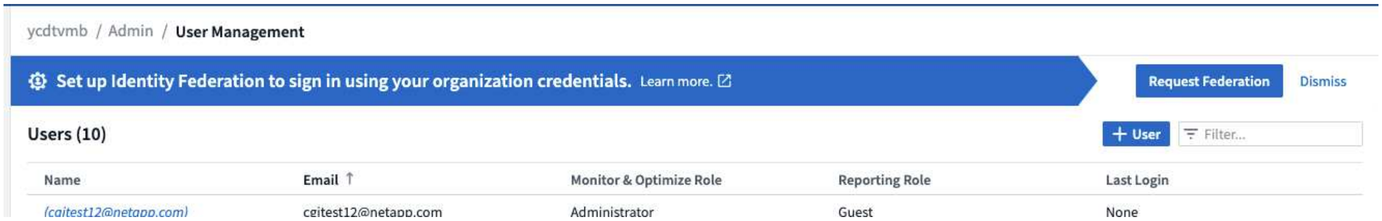
It is also important to realize that once identity federation is enabled, that any changes to the company's identity provider (such moving from SAML to Microsoft AD) will likely require troubleshooting/changes/attention in Cloud Central to update the profiles of the users.

Single Sign-On (SSO) User Auto-Provisioning

In addition to inviting users, administrators can enable **Single Sign-On (SSO) User Auto-Provisioning** access to Cloud Insights for all users in their corporate domain, without having to invite them individually. With SSO enabled, any user with the same domain email address can log into Cloud Insights using their corporate credentials.

SSO User Auto-Provisioning is available in Cloud Insights Premium Edition, and must be configured before it can be enabled for Cloud Insights. SSO User Auto-Provisining configuration includes Identity Federation through NetApp Cloud Central as described in the section above. Federation allows single sign-on users to access your NetApp Cloud Central accounts using credentials from your corporate directory, using open standards such as Security Assertion Markup Language 2.0 (SAML) and OpenID Connect (OIDC).

To configure *SSO User Auto-Provisioning*, on the **Admin > User Management** page, click the **Request Federation** button. Once configured, administrators can then enable SSO user login. When an administrator enables *SSO User Auto-Provisioning*, they choose a default role for all SSO users (such as Guest or User). Users who log in through SSO will have that default role.


ycdtvmb / Admin / User Management
Set up Identity Federation to sign in using your organization credentials. Learn more.
Request Federation
Dismiss
+ User
Filter...

Users (10)

Name	Email ↑	Monitor & Optimize Role	Reporting Role	Last Login
(cgitest12@netapp.com)	cgitest12@netapp.com	Administrator	Guest	None

Occasionally, an administrator will want to promote a single user out of the default SSO role (for example, to make them an administrator). They can accomplish this on the **Admin > User Management** page by clicking on the right-side menu for the user and selecting *Assign Role*. Users who are assigned an explicit role in this way continue to have access to Cloud Insights even if *SSO User Auto-Provisioning* is subsequently disabled.

If the user no longer requires the elevated role, you can click the menu to *Remove User*. The user will be removed from the list. If *SSO User Auto-Provisioning* is enabled, the user can continue log in to Cloud Insights through SSO, with the default role.

You can choose to hide SSO users by unchecking the **Show SSO Users** checkbox.

However, do not enable *SSO User Auto-Provisioning* if either of these are true:

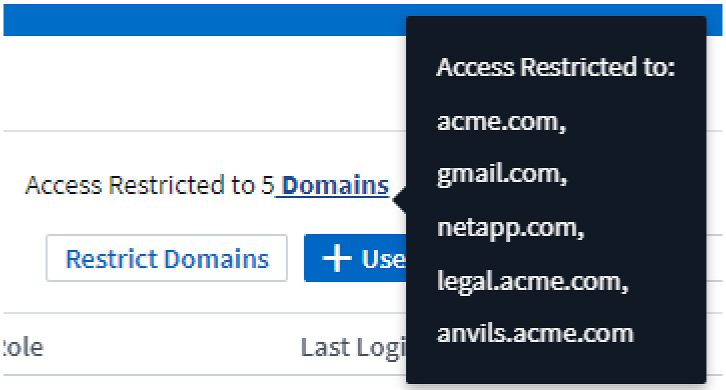
- Your organization has more than one Cloud Insights tenant
- Your organization does not want any/every user in the federated domain to have some level of automatic access to the Cloud Insights tenant. *At this point in time, we do not have the ability to use groups to control role access with this option*.

Restricting Access by Domain

Cloud Insights can restrict user access to only the domains you specify. On the **Admin > User Management** page, select "Restrict Domains".

You are presented with these choices:

- No restrictions: Cloud Insights remains accessible to users regardless of their domain.
- Limit access to default domains: default domains are those used by your Cloud Insights environment account owners. These domains are always accessible.
- Limit access to defaults plus domains you specify. List any domains you want to have access to your Cloud Insights environment, in addition to the default domains.



Access Restricted to:

acme.com,

gmail.com,

netapp.com,

legal.acme.com,

anvils.acme.com

Cloud Insights Data Collector List

Cloud Insights supports a variety of Data Collectors from many vendors and services.

Data Collectors are categorized by these types:

- Infrastructure: Acquired from vendor devices such as storage arrays, switches, hypervisors, or backup devices.
- Service: Acquired from services such as Kubernetes or Docker. Also called *Integration*.

Alphabetical list of Data Collectors supported by Cloud Insights:

Data Collector	Type
Amazon EC2 and EBS	Infrastructure
AWS S3 as Storage	Infrastrusture
Amazon FSx for NetApp ONTAP	Infrastructure
Apache	Service
Azure NetApp Files	Infrastructure
Azure VMs and VHD	Infrastructure
Brocade Network Advisor (BNA)	Infrastructure
Brocade Fibre Channel Switches	Infrastructure
Brocade FOS REST	Infrastructure
Cisco MDS Fabric Switches	Infrastructure
Consul	Service
Couchbase	Service
CouchDB	Service
Cohesity SmartFiles	Infrastructure
Dell EMC Data Domain	Infrastructure
Dell EMC ECS	Infrastructure
Dell EMC PowerScale (previously Isilon)	Infrastructure
Dell EMC Isilon / PowerScale REST	Infrastructure
Dell EMC PowerStore	Infrastructure
Dell EMC Recoverpoint	Infrastructure
Dell EMC ScaleIO/PowerFlex	Infrastructure
Dell EMC Unity	Infrastructure
Dell EMC Unisphere REST	Infrastructure
Dell EMC VMAX/PowerMax Family of Devices	Infrastructure
Dell EMC VNX Block Storage	Infrastructure

Data Collector	Type
Dell EMC VNX File	Infrastructure
Dell EMC VNX Unified	Infrastructure
Dell EMC VPLEX	Infrastructure
Dell EMC XtremIO	Infrastructure
Dell XC Series	Infrastructure
Docker	Service
Elasticsearch	Service
Flink	Service
Fujitsu ETERNUS DX	Infrastructure
Google Compute and Storage	Infrastructure
Hadoop	Service
HAProxy	Service
Hitachi Content Platform (HCP)	Infrastructure
Hitachi Vantara Command Suite	Infrastructure
Hitachi Vantara NAS Platform	Infrastructure
Hitachi Ops Center	Infrastructure
HP Enterprise Alletra 6000 (previously Nimble) Storage	Infrastructure
HP Enterprise Alletra 9000 / Primera (previously 3PAR) Storage	Infrastructure
HP Enterprise Command View	Infrastructure
Huawei OceanStor and Dorado Devices	Infrastructure
IBM Cleversafe	Infrastructure
IBM CS Series	Infrastructure
IBM PowerVM	Infrastructure
IBM SAN Volume Controller (SVC)	Infrastructure
IBM System Storage DS8000 Series	Infrastructure
IBM XIV and A9000 Storages	Infrastructure
Infinidat InfiniBox	Infrastructure
Java	Service
Kafka	Service
Kapacitor	Service
Kibana	Service
Kubernetes	Service

Data Collector	Type
Lenovo HX Series	Infrastructure
Memcached	Service
Microsoft Azure NetApp Files	Infrastructure
Microsoft Hyper-V	Infrastructure
MongoDB	Service
MySQL	Service
NetApp Cloud Volumes ONTAP	Infrastructure
NetApp Cloud Volumes Services for AWS	Infrastructure
NetApp Cloud Connection for ONTAP 9.9+	Infrastructure
NetApp Data ONTAP 7-Mode	Infrastructure
NetApp E-Series	Infrastructure
Amazon FSx for NetApp ONTAP	Infrastructure
NetApp HCI Virtual Center	Infrastructure
NetApp ONTAP Data Management Software	Infrastructure
NetApp ONTAP Select	Infrastructure
NetApp SolidFire All-Flash Array	Infrastructure
NetApp StorageGRID	Infrastructure
Netstat	Service
Nginx	Service
Node	Service
Nutanix NX Series	Infrastructure
OpenStack	Infrastructure
OpenZFS	Service
Oracle ZFS Storage Appliance	Infrastructure
PostgreSQL	Service
Puppet Agent	Service
Pure Storage FlashArray	Infrastructure
Red Hat Virtualization	Infrastructure
Redis	Service
RethinkDB	Service
RHEL & CentOS	Service
Rubrik CDM Storage	Infrastructure
Ubuntu & Debian	Service

Data Collector	Type
VMware vSphere	Infrastructure
Windows	Service
ZooKeeper	Service

Subscribing to Cloud Insights

Getting started with Cloud Insights is as easy as three simple steps:

- Sign up for an account on **NetApp BlueXP** to get access to all of NetApp's Cloud offerings.
- Register for a **free trial** of Cloud Insights to explore the features available.
- **Subscribe** to Cloud Insights for on-going, uninterrupted access to your data via NetApp Sales direct or AWS Marketplace.

During the registration process, you can choose the global region to host your Cloud Insights environment. For more information, read about Cloud Insights Information and Region.

> Unless otherwise noted, the information on this page generally applies to Cloud Insights Commercial Editions. The Federal Edition of Cloud Insights may not contain some of the functionality described on this page.

For a full comparison of the features available in Cloud Insights Basic and Premium Editions, see the Cloud Insights Pricing page.

> Inactive Cloud Insights Basic Edition environments are deleted and their resources are reclaimed. An environment is considered inactive if there is no user activity for 30 consecutive days, of if there is no data ingested for 7 consecutive days. Cloud Insights will send a notification and provide a grace period of four days before an environment is deleted.

While using Cloud Insights, if you see a padlock icon 🔒, it means the feature is not available in your current Edition, or is available in a limited form. Upgrade for full access to the feature.

Trial Edition

When you sign up for Cloud Insights and your environment is active, you enter into a free, 30-day trial of Cloud Insights. During this trial you can explore the features that Cloud Insights has to offer, in your own environment.

At any time during your trial period, you can subscribe to Cloud Insights. Subscribing to Cloud Insights ensures uninterrupted access to your data as well as extended **product support** options.

Cloud Insights displays a banner when your free trial is nearing its end. Within that banner is a *View Subscription* link, which opens the **Admin** → **Subscription** page. Non-Admin users will see the banner but will not be able to go to the Subscription page.

> If you need additional time to evaluate Cloud Insights and your trial is set to expire in 4 days or less, you can extend your trial for an additional 30 days. You can extend the trial only once. You cannot extend if your trial has expired.

Trial through AWS Marketplace

You may also sign up for a free trial through the AWS Marketplace. The AWS Marketplace free trial gives you access to Cloud Insights for a trial period of 33 days, and allows up to 499 Managed Units (MUs).

Note: If you configure more than 499 MUs, you will enter "breached" state. While your trial is in breached state, you will lose access to some Cloud Insights functionality until the breach is resolved, either by reducing the number of MUs configured, or by subscribing to Cloud Insights.

The AWS Marketplace free trial cannot be extended. At any time during your trial, you can downgrade to a Cloud Insights Basic Edition subscription or change to a paid Cloud Insights subscription by visiting the **Admin → Subscription** page.

What if My Trial has Expired?

If your free trial has expired and you have not yet subscribed to Cloud Insights, you will have limited functionality until you subscribe.

Module Trials

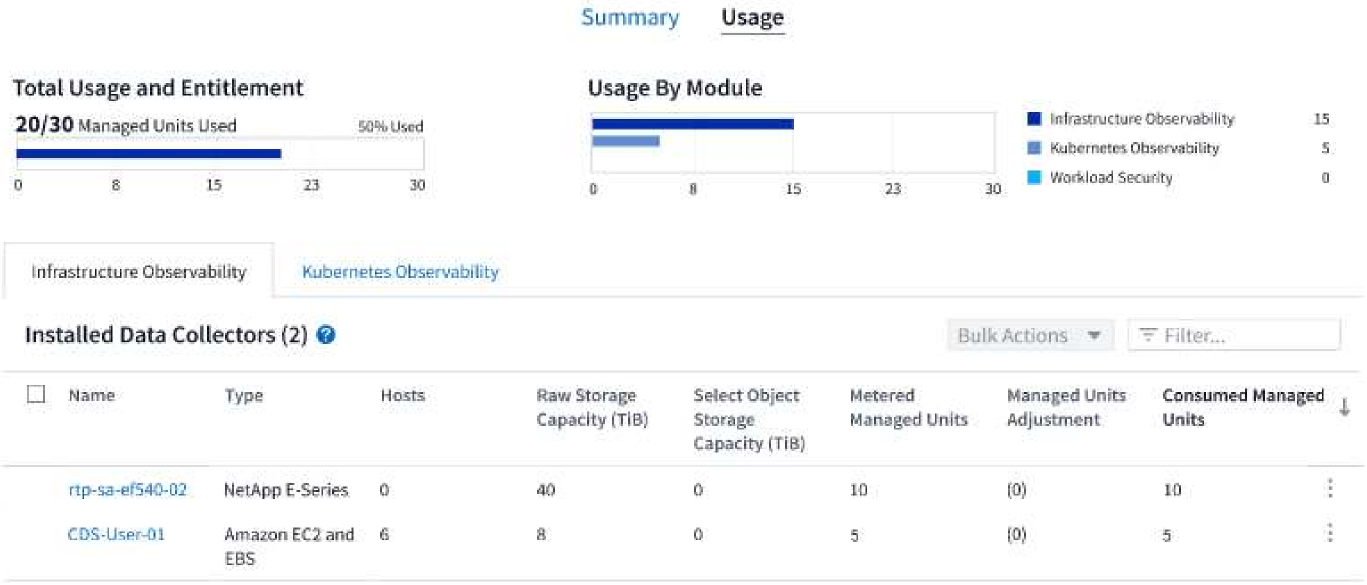
Coming Soon!

> Module Trial is considered Preview functionality and is therefore subject to change.

In addition to your initial trial of Cloud Insights, you may also take advantage of **Module Trials**. For example, if you are already subscribed to Infrastructure Observability but are adding Kubernetes to your environment, you will automatically enter into a 30-day trial of Kubernetes Observability, starting from when you install the NetApp Kubernetes Monitoring Operator. You will only be charged for your Kubernetes Observability managed unit usage at the end of the trial period.

> Keep in mind that you will be charged for new managed unit (MU) usage following the trial period, so be sure to plan accordingly. When your module trial is ending, you will be notified if you will need to add more MUs to avoid service interruption.

You can monitor your managed unit usage on the **Admin > Subscription** page in the **Usage** tab.



Module	MUs
Infrastructure Observability	15
Kubernetes Observability	5
Workload Security	0

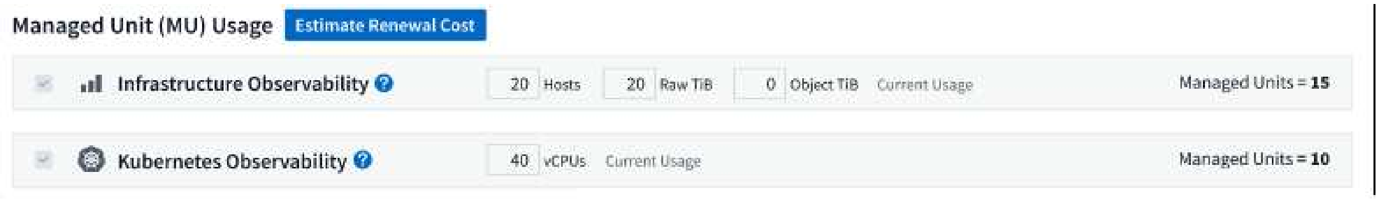
Installed Data Collectors (2)

☐	Name	Type	Hosts	Raw Storage Capacity (TiB)	Select Object Storage Capacity (TiB)	Metered Managed Units	Managed Units Adjustment	Consumed Managed Units
	rtp-sa-ef540-02	NetApp E-Series	0	40	0	10	(0)	10
	CDS-User-01	Amazon EC2 and EBS	6	8	0	5	(0)	5

Estimator

During a module trial, you are not changed MU usage for resources consumed for the module, but you can open the **Estimator** (on the *Summary* tab) to see how MUs will be charged following the trial, as well as play with "What if" scenarios with the number of MUs you may need in the future. Reset the numbers by exiting the

Estimator.



Managed Unit (MU) Usage

☑ Infrastructure Observability 20 Hosts 20 Raw TiB 0 Object TiB Current Usage Managed Units = **15**

☑ Kubernetes Observability 40 vCPUs Current Usage Managed Units = **10**

Select the checkbox next to a module to add or remove the entire module's MU's from the estimated cost.

The Estimator also allow you to see how the numbers stack up for either an Add On - where you keep your current subscription term and increase the number of managed units licensed - or a Renew option for a the renewal subscription you would purchase when your current subscription term ends.

Note that customers are only eligible for a module trial once per subscription.

Subscription Options

To subscribe, go to **Admin** → **Subscription**. In addition to the **Subscribe** buttons, you will be able to see your installed data collectors and calculate your estimated pricing. For a typical environment, you can click the self-serve AWS Marketplace button. If your environment includes or is expected to include 1,000 or more Managed Units, you are eligible for Volume Pricing.

Pricing

Cloud Insights is priced per **Managed Unit**. Usage of your Managed Units is calculated based on the number of **hosts or virtual machines** and amount of **unformatted capacity** being managed in your infrastructure environment.

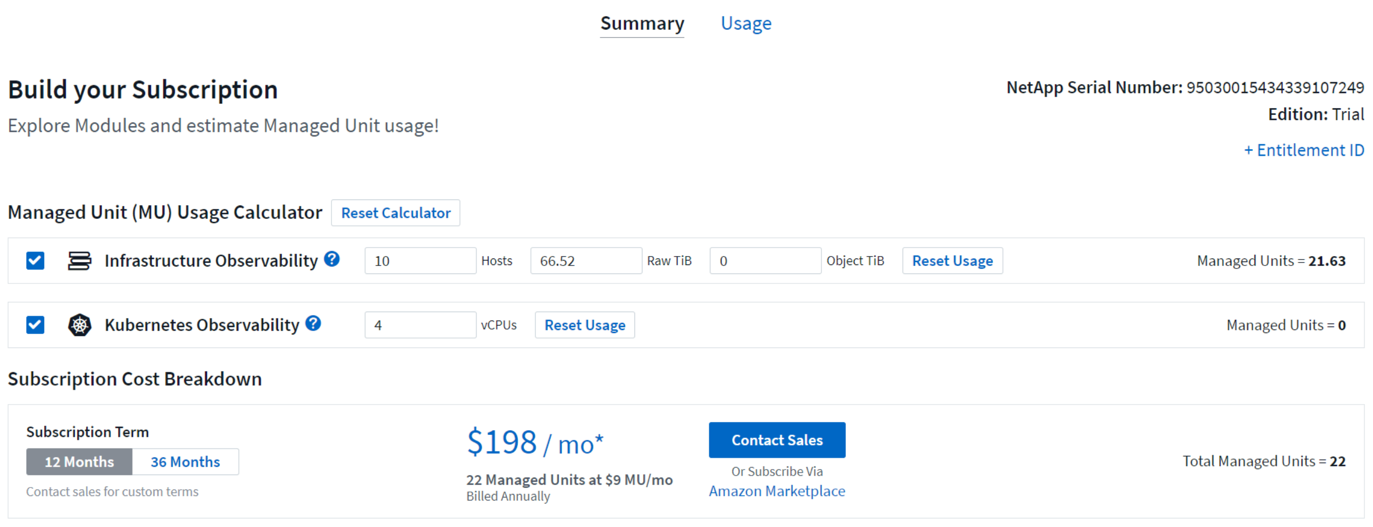
- 1 Managed Unit = 2 hosts (any virtual or physical machine)
- 1 Managed Unit = 4 TiB of unformatted capacity of physical or virtual disks
- 1 Managed Unit = 40 TiB of unformatted capacity of select secondary storage: AWS S3, Cohesity SmartFiles, Dell EMC Data Domain, Dell EMC ECS, Hitachi Content Platform, IBM Cleversafe, NetApp StorageGRID, Rubrik.
- 1 Managed Unit = 4 vCPUs of Kuberentes

If your environment includes or is expected to include 1,000 or more Managed Units, you are eligible for **Volume Pricing** and will be prompted to Contact NetApp Sales to subscribe. See below for more details.

Estimate Your Subscription Cost

The Subscription Calculators help you estimate your Cloud Insights subscription cost based on the number of Managed Units needed. The current values are pre-populated, and you can adjust those values to assist you with planning for estimated future growth. You can adjust values for Infrastructure, Kubernetes, or both.

Your estimated list price cost will change based on your subscription term.
NOTE: The calculators are for estimation only. Your exact pricing will be set when you subscribe.



Summary Usage

Build your Subscription

Explore Modules and estimate Managed Unit usage!

NetApp Serial Number: 95030015434339107249

Edition: Trial

+ Entitlement ID

Managed Unit (MU) Usage Calculator Reset Calculator

☑ Infrastructure Observability 10 Hosts 66.52 Raw TiB 0 Object TiB Reset Usage Managed Units = 21.63

☑ Kubernetes Observability 4 vCPUs Reset Usage Managed Units = 0

Subscription Cost Breakdown

Subscription Term

12 Months 36 Months

Contact sales for custom terms

$198 / mo*

22 Managed Units at $9 MU/mo

Billed Annually

Contact Sales

Or Subscribe Via

Amazon Marketplace

Total Managed Units = 22

How Do I Subscribe?

If your Managed Unit count is less than 1,000, you can subscribe via NetApp Sales, or self-subscribe via AWS Marketplace.

Subscribe through NetApp Sales direct

If your expected Managed Unit count is 1,000 or greater, click on the **Contact Sales** button to subscribe though the NetApp Sales Team.

You must provide your Cloud Insights **Serial Number** to your NetApp sales representative so that your paid subscription can be applied to your Cloud Insights environment. The Serial Number uniquely identifies your Cloud Insights trial environment and can be found on the **Admin > Subscription** page.

Self-Subscribe through AWS Marketplace

> You must be an Account Owner or Administrator in order to apply an AWS Marketplace subscription to your existing Cloud Insights trial account. Additionally, you must have an Amazon Web Services (AWS) account.

Clicking on the Amazon Marketplace link opens the AWS Cloud Insights subscription page, where you can complete your subscription. Note that values you entered in the calculator are not populated in the AWS subscription page; you will need to enter the total Managed Units count on this page.

After you have entered the total Managed Units count and chosen either 12-month or 36-month subscription term, click on **Set Up Your Account** to finish the subscription process.

Once the AWS subscription process is complete, you will be taken back to your Cloud Insights environment. Or, if the environment is no longer active (for example, you have logged out), you will be taken to the NetAPp BlueXP sign-in page. When you sign in to Cloud Insights again, your subscription will be active.

> After clicking on **Set Up Your account** on the AWS Marketplace page, you must complete the AWS subscription process within one hour. If you do not complete it within one hour, you will need to click on **Set Up Your Account** again to complete the process.

If there is a problem and the subscription process fails to complete correctly, you will still see the "Trial Version" banner when you log into your environment. In this event, you can go to **Admin > Subscription** and repeat the subscription process.

View Your Subscription Status

Once your subscription is active, you can view your subscription status and Managed Unit usage from the **Admin > Subscription** page.

The Subscription Summary tab displays the following:

- Current Edition
- Subscription Serial Number
- Current MU usage and "what if?" cost estimators
- Links to modify your subscription
- Views of your Managed Unit usage

View your Usage Management

The Usage Management tab shows an overview of Managed Unit usage, as well as tabs breaking down Managed Unit consumption by collector or Kubernetes Cluster.

> ⓘ The Unformatted Capacity Managed Unit count reflects a sum of the total raw capacity in the environment and is rounded up to the nearest Managed Unit.

> ⓘ The sum of Managed Units may differ slightly from the Data Collectors count in the summary section. This is because Managed Unit counts are rounded up to the nearest Managed Unit. The sum of these numbers in the Data Collectors list may be slightly higher than the total Managed Units in the status section. The summary section reflects your actual Managed Unit count for your subscription.

In the event that your usage is nearing or exceeding your subscribed amount, you can reduce usage by deleting data collectors or stopping monitoring of Kubernetes Clusters. Delete an item in this list by clicking on the "three dots" menu and selecting *Delete*.

What Happens if I Exceed My Subscribed Usage?

Warnings are displayed when your Managed Unit usage exceeds 80%, 90%, and 100% of your total subscribed amount:

When usage exceeds:	This happens / Recommended action:
80%	An informational banner is displayed. No action is necessary.
90%	A warning banner is displayed. You may want to increase your subscribed Managed Unit count.

100%	An error banner is displayed and you will have limited functionality until you do one of the following: * Remove Data Collectors so that your Managed Unit usage is at or below your subscribed amount * Modify your subscription to increase the subscribed Managed Unit count

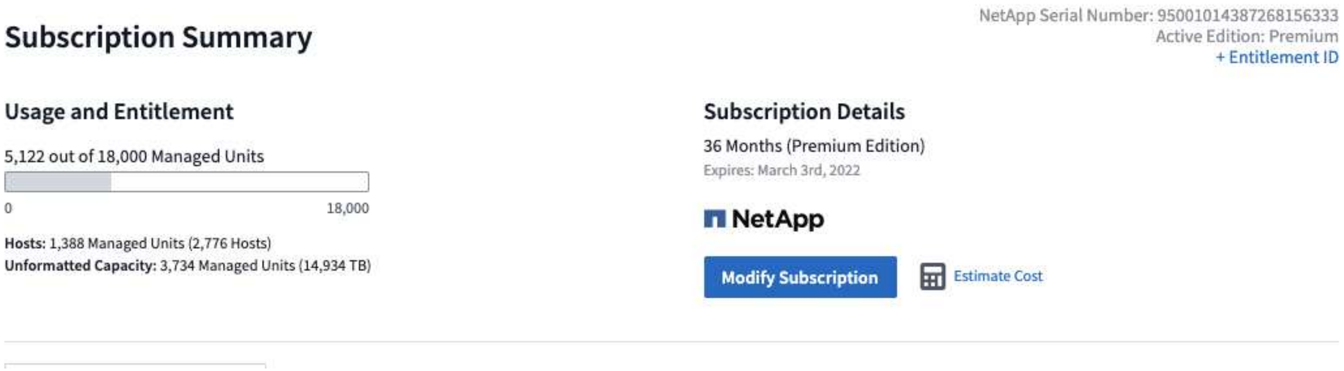
Subscribe Directly and Skip the Trial

You can also subscribe to Cloud Insights directly from the AWS Marketplace, without first creating a trial environment. Once your subscription is complete and your environment is set up, you will immediately be subscribed.

Adding an Entitlement ID

If you own a valid NetApp product that is bundled with Cloud Insights, you can add that product serial number to your existing Cloud Insights subscription. For example, if you have purchased NetApp Astra Control Center, the Astra Control Center license serial number can be used to identify the subscription in Cloud Insights. Cloud Insights refers to this an *Entitlement ID*.

To add an entitlement ID to your Cloud Insights subscription, on the **Admin > Subscription** page, click *+Entitlement ID*.



Subscription Summary

NetApp Serial Number: 95001014387268156333
Active Edition: Premium

Usage and Entitlement

5,122 out of 18,000 Managed Units

Hosts: 1,388 Managed Units (2,776 Hosts)
Unformatted Capacity: 3,734 Managed Units (14,934 TB)

Subscription Details

36 Months (Premium Edition)
Expires: March 3rd, 2022

Automatic Device Resolution

Automatic Device Resolution Overview

You need to identify all of the devices you want to monitor with Cloud Insights. Identification is necessary in order to accurately track performance and inventory in your environment. Typically the majority of devices discovered in your environment are identified through *Automatic Device Resolution*.

After you configure data collectors, devices in your environment including switches, storage arrays, and your virtual infrastructure of hypervisors and VMs are identified. However, this does not normally identify 100% of the devices in your environment.

After data collector type devices have been configured, best practice is to leverage device resolution rules to help identify the remaining unknown devices in your environment. Device resolution can help you resolve unknown devices as the following device types:

- Physical hosts
- Storage arrays
- Tapes

Devices remaining as unknown after device resolution are considered generic devices, which you can also show in queries and on dashboards.

The rules created in turn will automatically identify new devices with similar attributes as they are added to your environment. In some cases, device resolution also allows for manual identification bypassing the device resolution rules for undiscovered devices within Cloud Insights.

Incomplete identification of devices can result in issues including:

- Incomplete paths
- Unidentified multipath connections
- The inability to group applications
- Inaccurate topology views
- Inaccurate data in the Data warehouse and reporting

The device resolution feature (Manage > Device resolution) includes the following tabs, each of which plays a role in device resolution planning and viewing results:

- **Fibre Channel Identify** contains a list WWNs and port information of Fibre Channel devices that were not resolved through automatic device resolution. The tab also identifies the percentage of devices that have been identified.
- **IP Address Identify** contains a list of devices accessing CIFS shares and NFS shares that were not identified through automatic device resolution. The tab also identifies the percentage of devices that have been identified.
- **Auto resolution rules** contains the list of rules that are run when performing Fibre channel device resolution. These are rules you create to resolve unidentified Fibre channel devices.
- **Preferences** provides configuration options that you use to customize device resolution for your

environment.

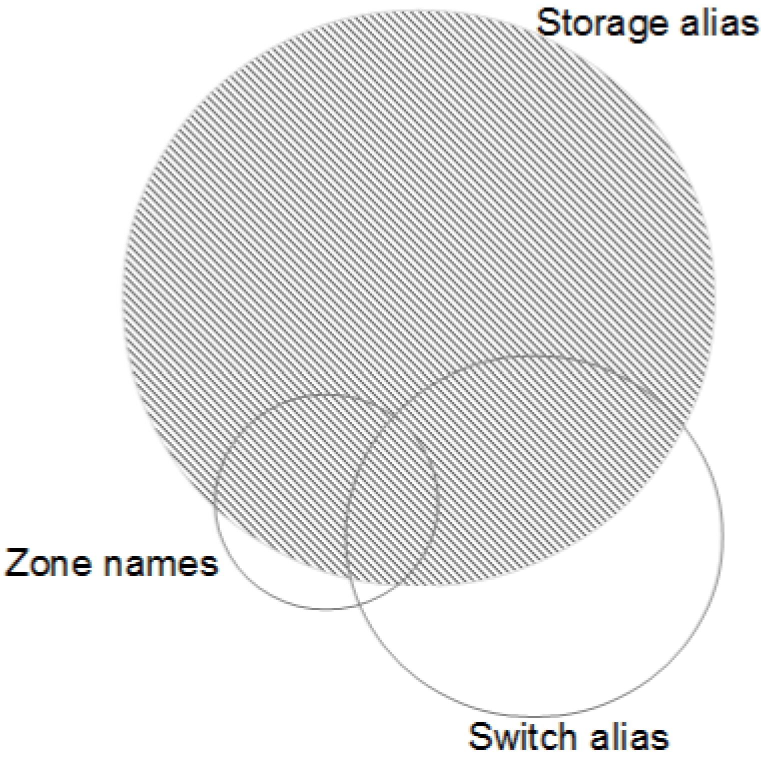
Before You Begin

You need to know how your environment is configured before you define the rules for identifying devices. The more you know about your environment the easier it will be to identify devices.

You need to answer questions similar to the following to help you create accurate rules:

- Does your environment have naming standards for zones or hosts and what percentage of these are accurate?
- Does your environment use a switch alias or storage alias and do they match the host name?
- How often do naming schemes change in your environment?
- Have there been any acquisitions or mergers that introduced different naming schemes?

After analyzing your environment, you should be able to identify what naming standards exist that you can expect to reliability encounter. The information you gathered might be represented graphically in a figure similar to the following:



In this example the largest number of devices are reliably represented by storage aliases. Rules that identify hosts using storage aliases should be written first, rules using switch aliases should be written next , and the last rules created should use zone aliases. Due to the overlap of the use of zone aliases and switch aliases, some storage alias rules might identify additional devices, leaving less rules required for zone aliases and switch aliases.

Steps to Identifying devices

Typically, you would use a workflow similar to the following to identify devices in your environment. Identification is an iterative process and might require multiple steps of planning and refining rules.

- Research environment
- Plan rules
- Create/Revise rules
- Review results
- Create additional rules or Manually Identify devices
- Done

> ⓘ If you have unidentified devices (otherwise known as unknown or generic devices) in your environment and you subsequently configure a data source that identifies those devices upon polling, they will no longer be displayed or counted as generic devices.

Related:
Creating Device Resolution Rules
Fibre Channel Device Resolution
IP Device Resolution
Setting Device Resolution Preferences

Device Resolution rules

You create device resolution rules to identify hosts, storage, and tapes that are not automatically identified currently by Cloud Insights. The rules that you create identify devices currently in your environment and also identify similar devices as they are added to your environment.

Creating Device Resolution Rules

When you create rules you start by identifying the source of information that the rule runs against, the method used to extract information, and whether DNS lookup is applied to the results of the rule.

Source that is used to identify the device	* SRM aliases for hosts * Storage alias containing an embedded host or tape name * Switch alias containing an embedded host or tape name * Zone names containing an embedded host name
Method that is used to extract the device name from the source	* As is (extract a name from an SRM) * Delimiters * Regular expressions
DNS lookup	Specifies if you use DNS to verify the host name

You create rules in the Auto Resolution Rules tab. The following steps describe the rule creation process.

Procedure

1. Click **Manage > Device Resolution**
2. In the **Auto resolution rules** tab, click **+ Host Rule** or **+ Tape Rule**.

   The **Resolution Rule** screen is displayed.

   > ⓘ Click the *View matching criteria* link for help with and examples for creating regular expressions.

3. In the **Type** list select the device you want to identify.

   You can select *Host* or *Tape*.

4. In the **Source** list, select the source you want to use to identify the host.

   Depending on the source you chose, Cloud Insights displays the following response:

   a. **Zones** lists the zones and WWN that need to be identified by Cloud Insights.
   b. **SRM** lists the unidentified aliases that need to be identified by Cloud Insights
   c. **Storage alias** lists storage aliases and WWN that need to be identified by Cloud Insights
   d. **Switch alias** lists the switch aliases that need to be identified by Cloud Insights

5. In the **Method** list select the method you want to employ to identify the host.

Source	Method
SRM	As is, Delimiters, Regular expressions
Storage alias	Delimiters, Regular expressions
Switch alias	Delimiters, Regular expressions
Zones	Delimiters, Regular expressions

   - Rules using Delimiters require the delimiters and the minimum length of the host name.
     The minimum length of the host name is number of characters that Cloud Insights should use to identify a host. Cloud Insights performs DNS lookups only for host names that are this long or longer.

     For rules using Delimiters, the input string is tokenized by the delimiter and a list of host name candidates is created by making several combinations of the adjacent token. The list is then sorted, largest to smallest. For example, for an input sring of *vipsnq03_hba3_emc3_12ep0* the list would result in the following:

     - vipsnq03_hba3_emc3_12ep0
     - vipsnq03_hba3_emc3
     - hba3 emc3_12ep0
     - vipsnq03_hba3
     - emc3_12ep0
     - hba3_emc3
     - vipsnq03
     - 12ep0

        - emc3
        - hba3
    - Rules using Regular expressions require a regular expression, the format, and cases sensitivity selection.

6. Click **Run AR** to run all rules, or click the down-arrow in the button to run the rule you created (and any other rules that have been created since the last full run of AR).

   The results of the rule run are displayed in the **FC identify** tab.

Starting an automatic device resolution update

A device resolution update commits manual changes that have been added since the last full automatic device resolution run. Running an update can be used to commit and run only the new manual entries made to the device resolution configuration. No full device resolution run is performed.

Procedure

1. Log into the Cloud Insights web UI.
2. Click **Manage > Device Resolution**
3. In the **Device Resolution** screen, click the down-arrow in the **Run AR** button.
4. Click **Update** to start the update.

Rule-assisted manual identification

This feature is used for special cases where you want to run a specific rule or a list of rules (with or without a one-time reordering) to resolve unknown hosts, storage, and tape devices.

Before you begin

You have a number of devices that have not been identified and you also have multiple rules that successfully identified other devices.

> ⓘ If your source only contains part of a host or device name, use a regular expression rule and format it to add the missing text.

Procedure

1. Log into the Cloud Insights web UI.
2. Click **Manage > Device Resolution**
3. Click the **Fibre Channel Identify** tab.

   The system displays the devices along with their resolution status.

4. Select multiple unidentified devices.
5. Click **Bulk Actions** and select **Set host resolution** or **Set tape resolution**.

   The system displays the Identify screen which contains a list of all of the rules that successfully identified devices.

6. Change the order of the rules to an order that meets your needs.

   The order of the rules are changed in the Identify screen, but are not changed globally.

7. Select the method that that meets your needs.

Cloud Insights executes the host resolution process in the order in which the methods appear, beginning with those at the top.

When rules that apply are encountered, rule names are shown in the rules column and identified as manual.

Related:
Fibre Channel Device Resolution
IP Device Resolution
Setting Device Resolution Preferences

Fibre Channel device resolution

The Fibre Channel Identify screen displays the WWN and WWPN of fibre channel devices whose hosts have not been identified by automatic device resolution. The screen also displays any devices that have been resolved by manual device resolution.

Devices that have been resolved by manual resolution contain a status of *OK* and identify the rule used to identify the device. Missing devices have a status of *Unidentified*. Devices that are specifically excluded from identification have a status of *Excluded*. The total coverage for identification of devices is listed on this page.

You perform bulk actions by selecting multiple devices on the left-hand side of the Fibre Channel Identify screen. Actions can be performed on a single device by hovering over a device and selecting the *Identify* or *Unidentify* buttons on the far right of the list.

The *Total Coverage* link displays a list of the number of devices identified/number of devices available for your configuration:

- SRM alias
- Storage alias
- Switch alias
- Zones
- User defined

Adding a Fibre Channel device manually

You can manually add a fibre channel device to Cloud Insights using the *Manual Add* feature available in the device resolution Fibre Channel Identify tab. This process might be used for pre-identification of a device that is expected to be discovered in the future.

Before you begin

To successfully add a device identification to the system you need to know the WWN or IP address and the device name.

About this task

You can add a Host, Storage, Tape or Unknown fibre channel device manually.

Procedure

1. Log in to the Cloud Insights web UI

2. Click **Manage > Device Resolution**
3. Click the **Fibre Channel Identify** tab.
4. Click the **Add** button.

   The **Add Device** dialog is displayed

5. Enter the WWN or IP address, the device name, and select the device type.

   The device you enter is added to the list of devices in the Fibre Channel Identify tab. The Rule is identified as *Manual*.

Importing Fibre Channel device identification from a .CSV file

You can manually import fibre channel device identification into Cloud Insights device resolution using a list of devices in a .CSV file.

1. Before you begin

You must have a correctly formatted .CSV file in order to import device identifications directly into device resolution. The .CSV file for fibre channel devices requires the following information:

WWN	IP	Name	Type

The data fields must be enclosed in quotes, as shown in the example below.

```
"WWN","IP","Name","Type"
"WWN:2693","ADDRESS2693|IP2693","NAME-2693","HOST"
"WWN:997","ADDRESS997|IP997","NAME-997","HOST"
"WWN:1860","ADDRESS1860|IP1860","NAME-1860","HOST"
```

> ⓘ As a best practice, it is recommended to first export the Fibre Channel Identify information to a .CSV file, make your desired changes in that file, and then import the file back into Fibre Channel Identify. This ensures that the expected columns are present and in the proper order.

To import Fibre Channel Identify information:

1. Log into the Cloud Insights web UI.
2. Click **Manage > Device Resolution**
3. Select the **Fibre Channel Identify** tab.
4. Click the **Identify > Identify from file** button.
5. Navigate to the folder containing your .CSV files for import and select the desired file.

   The devices you enter are added to the list of devices in the Fibre Channel Identify tab. The “Rule” is identified as Manual.

Exporting Fibre Channel device identifications to a .CSV file

You can export existing fibre channel device identifications to a .CSV file from the Cloud Insights device resolution feature. You might want to export a device identification so that you can modify it and then import it back into Cloud Insights where it is then used to identify devices that are similar to those originally matching the exported identification.

About this task

This scenario might be used when devices have similar attributes that can be easily edited in the .CSV file and then imported back into the system.

When you export a Fibre Channel device identification to a .CSV file, the file contains the following information in the order shown:

WWN	IP	Name	Type

Procedure

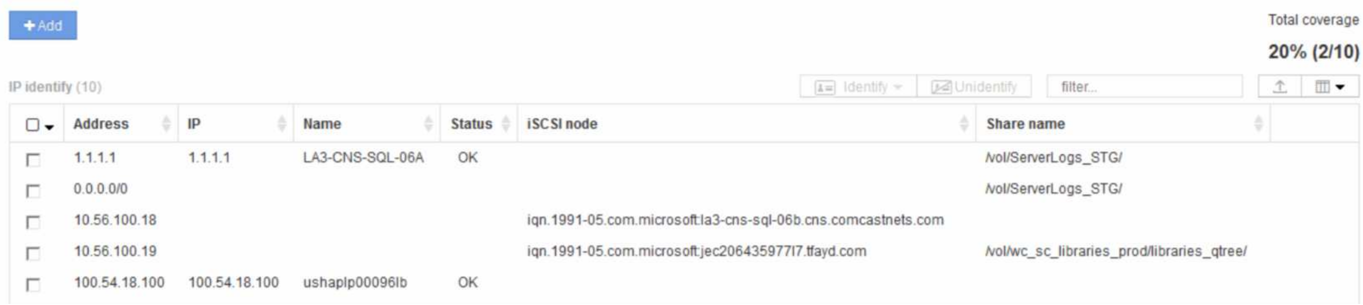
1. Log into the Cloud Insights web UI.
2. Click **Manage > Device Resolution**
3. Select the **Fibre Channel Identify** tab.
4. Select the Fibre Channel device or devices whose identification you want to export.
5. Click the **Export** CSV button.

   Select whether to open the .CSV file or save the file.

Related:
IP Device Resolution
Creating Device Resolution Rules
Setting Device Resolution Preferences

IP device resolution

The IP Identify screen displays any iSCSI and CIFS or NFS shares that have been identified by automatic device resolution or by manual device resolution. Unidentified devices are also shown. The screen includes the IP address, Name, Status, iSCSI node, and share name for devices. The percentage of devices that have been successfully identified is also displayed.



□	Address	IP	Name	Status	iSCSI node	Share name
□	1.1.1.1	1.1.1.1	LA3-CNS-SQL-06A	OK		/vol/ServerLogs_STG/
□	0.0.0.0/0					/vol/ServerLogs_STG/
□	10.56.100.18				iqn.1991-05.com.microsoft:la3-cns-sql-06b.cns.comcastnets.com	
□	10.56.100.19				iqn.1991-05.com.microsoft:jec206435977l7.tfayd.com	/vol/wc_sc_libraries_prod/libraries_qtree/
□	100.54.18.100	100.54.18.100	ushaplp00096lb	OK		

Adding IP devices manually

You can manually add an IP device to Cloud Insights using the manual add feature available in the IP Identify screen.

Procedure

1. Log in to the Cloud insights web UI.
2. Click **Manage > Device resolution**
3. Click the **IP Address Identify** tab.
4. Click the **Add** button.

   The Add Device dialog is displayed

5. Enter the address, IP address, and a unique device name.

Result

The device you enter is added to the list of devices in the IP Address Identify tab.

Importing IP device identification from a .CSV file

You can manually import IP device identifications into the Device Resolution feature using a list of device identifications in a .CSV file.

1. Before you begin

You must have a correctly formatted .CSV file in order to import device identifications directly into the Device Resolution feature. The .CSV file for IP devices requires the following information:

Address	IP	Name

The data fields must be enclosed in quotes, as shown in the example below.

```
"Address","IP","Name"
"ADDRESS6447","IP6447","NAME-6447"
"ADDRESS3211","IP3211","NAME-3211"
"ADDRESS593","IP593","NAME-593"
```

> ⓘ As a best practice, it is recommended to first export the IP Address Identify information to a .CSV file, make your desired changes in that file, and then import the file back into IP Address Identify. This ensures that the expected columns are present and in the proper order.

Exporting IP device identification to a .CSV file

You can export existing IP device identifications to a .CSV file from the Cloud Insights device resolution feature. You might want to export a device identification so that you can modify it and then import it back into Cloud Insights where it is then used to identify devices that are similar to those originally matching the exported identification.

About this task

.
This scenario might be used when devices have similar attributes that can be easily edited in the .CSV file and then imported back into the system.

When you export an IP device identification to a .CSV file, the file contains the following information in the order shown:

Address	IP	Name

Procedure

1. Log into the Cloud Insights web UI.
2. Click **Manage > Device Resolution**
3. Select the **IP Address Identify** tab.
4. Select the IP device or devices whose identification you want to export.
5. Click the **Export** CSV button.

   Select whether to open the .CSV file or save the file.

Related:
Fibre Channel device resolution
Creating Device Resolution Rules
Setting Device Resolution Preferences

Setting options in the Preferences tab

The device resolution preferences tab lets you create an auto resolution schedule, specify storage and tape venders to include or exclude from identification, and set DNS lookup options.

Auto resolution schedule

An auto resolution schedule can specify when automatic device resolution is run:

Option	Description
Every	Use this option to run automatic device resolution on intervals of days, hours, or minutes.
Every day	Use this option to run automatic device resolution daily at a specific time.
Manually	Use this option to only run automatic device resolution manually.
On every environment change	Use this option to run automatic device resolution whenever there is a change in the environment.

If you specify *Manually*, nightly automatic device resolution is disabled.

DNS processing options

DNS processing options allow you to select the following features:

- When DNS lookup result processing is enabled, you can add a list of DNS names to append to resolved devices.
- You can select Auto resolution of IPs: to enables automatic host resolution for iSCSI initiators and hosts accessing NFS shares by using DNS lookup. If this is not specified, only FC-based resolution is performed.
- You can choose to allow underscores in host names and to use a "connected to" alias instead of the standard port alias in results.

Including or excluding specific storage and tape vendors

You can include or exclude specific storage and tape vendors for automatic resolution. You might want to exclude specific vendors if you know, for example, that a specific host will become a legacy host and should be excluded from your new environment. You can also re-add vendors that you earlier excluded but no longer want excluded.

> Device resolution rules for tape only work for WWNs where the Vendor for that WWN is set to *Included as Tape only* in the Vendors preferences.

See also: Regular Expression Examples

Regular expression examples

If you have selected the regular expression approach as your source naming strategy, you can use the regular expression examples as guides for your own expressions used in the Cloud Insights automatic resolution methods.

Formatting regular expressions

When creating regular expressions for Cloud Insights automatic resolution, you can configure output format by entering values in a field named *FORMAT*.

The default setting is \1, which means that a zone name that matches the regular expression is replaced by the contents of the first variable created by the regular expression. In a regular expression, variable values are created by parenthetical statements. If multiple parenthetical statements occur, the variables are referenced numerically, from left to right. The variables can be used in the output format in any order. Constant text can also be inserted in the output, by adding it to the FORMAT field.

For example, you might have the following zone names for this zone naming convention:

```
[Zone number]_[data center]_[hostname]_[device type]_[interface number]
```

- S123_Miami_hostname1_filer_FC1
- S14_Tampa_hostname2_switch_FC4
- S3991_Boston_hostname3_windows2K_FC0
- S44_Raleigh_hostname4_solaris_FC1

And you might want the output to be in the following format:

```
[hostname]-[data center]-[device type]
```

To do this, you need to capture the host name, data center, and device type fields in variables, and use them in the output. The following regular expression would do this:

```
.*?_([a-zA-Z0-9]+)_([a-zA-Z0-9]+)_([a-zA-Z0-9]+)_.*
```

Because there are three sets of parentheses, the variables \1, \2 and \3 would be populated.

You could then use the following format to receive output in your preferred format:

```
\2-\1-\3
```

Your output would be as follows:

```
hostname1-Miami-filer
hostname2-Tampa-switch
hostname3-Boston-windows2K
hostname4-Raleigh-solaris
```

The hyphens between the variables provide an example of constant text that is inserted in the formatted output.

Examples

Example 1 showing zone names

In this example, you use the regular expression to extract a host name from the zone name. You could create a regular expression if you have something similar to the following zone names:

- S0032_myComputer1Name-HBA0
- S0434_myComputer1Name-HBA1
- S0432_myComputer1Name-HBA3

The regular expression that you could use to capture the host name would be:

```
S[0-9]+_([a-zA-Z0-9]*)[_-]HBA[0-9]
```

The outcome is a match of all zones beginning with S that are followed by any combination of digits , followed by an underscore, the alphanumeric hostname (myComputer1Name), an underscore or hyphen, the capital letters HBA, and a single digit (0-9). The hostname alone is stored in the **\1** variable.

The regular expression can be broken into its components:

- "S" represents the zone name and begins the expression. This matches only an "S" at the beginning of the zone name.
- The characters [0-9] in brackets indicate that what follows "S" must be a digit between 0 and 9, inclusive.
- The + sign indicates that the occurrence of the information in the preceding brackets has to exist 1 or more times.
- The _ (underscore) means that the digits after S must be followed immediately by only an underscore character in the zone name. In this example, the zone naming convention uses the underscore to separate the zone name from the host name.
- After the required underscore, the parentheses indicate that the pattern contained within will be stored in the \1 variable.
- The bracketed characters [a-zA-Z0-9] indicate that the characters being matched are all letters (regardless of case) and numbers.
- The * (asterisk) following the brackets indicates that the bracketed characters occur 0 or more times.
- The bracketed characters [_-] (underscore and dash) indicate that the alphanumeric pattern must be followed by an underscore or a dash.
- The letters HBA in the regular expression indicate that this exact sequence of characters must occur in the zone name.
- The final set of bracketed characters [0-9] match a single digit from 0 through 9, inclusive.

Example 2

In this example, skip up to the first underscore "", then match E and everything after that up to the second """, and then skip everything after that.

Zone: Z_E2FHDBS01_E1NETAPP

Hostname: E2FHDBS01

RegExp: .?(E.?).*?

Example 3

The parentheses "( )" around the last section in the Regular Expression (below) identifies which part is the hostname. If you wanted VSAN3 to be the host name, it would be: _([a-zA-Z0-9]).*

Zone: A_VSAN3_SR48KENT_A_CX2578_SPA0

Hostname: SR48KENT

RegExp: _[a-zA-Z0-9]+_([a-zA-Z0-9]).*

Example 4 showing a more complicated naming pattern

You could create a regular expression if you have something similar to the following zone names:

- myComputerName123-HBA1_Symm1_FA3
- myComputerName123-HBA2_Symm1_FA5
- myComputerName123-HBA3_Symm1_FA7

The regular expression that you could use to capture these would be:

```
([a-zA-Z0-9]*)_.*
```

The \1 variable would contain only *myComputerName123* after being evaluated by this expression.

The regular expression can be broken into its components:

- The parentheses indicate that the pattern contained within will be stored in the \1 variable.
- The bracketed characters [a-zA-Z0-9] mean that any letter (regardless of case) or digit will match.
- The * (asterisk) following the brackets indicates that the bracketed characters occur 0 or more times.
- The _ (underscore) character in the regular expression means that the zone name must have an underscore immediately following the alphanumeric string matched by the preceding brackets.
- The . (period) matches any character (a wildcard).
- The * (asterisk) indicates that the preceding period wildcard may occur 0 or more times.

  In other words, the combination .* indicates any character, any number of times.

Example 5 showing zone names without a pattern

You could create a regular expression if you have something similar to the following zone names:

- myComputerName_HBA1_Symm1_FA1
- myComputerName123_HBA1_Symm1_FA1

The regular expression that you could use to capture these would be:

```
(.*?)_.*
```

The \1 variable would contain *myComputerName* (in the first zone name example) or *myComputerName123* (in the second zone name example). This regular expression would thus match everything prior to the first underscore.

The regular expression can be broken into its components:

- The parentheses indicate that the pattern contained within will be stored in the \1 variable.
- The .* (period asterisk) match any character, any number of times.
- The * (asterisk) following the brackets indicates that the bracketed characters occur 0 or more times.
- The ? character makes the match non-greedy. This forces it to stop matching at the first underscore, rather than the last.
- The characters _.* match the first underscore found and all characters that follow it.

Example 6 showing computer names with a pattern

You could create a regular expression if you have something similar to the following zone names:

- Storage1_Switch1_myComputerName123A_A1_FC1
- Storage2_Switch2_myComputerName123B_A2_FC2
- Storage3_Switch3_myComputerName123T_A3_FC3

The regular expression that you could use to capture these would be:

```
.*?_.*?_([a-zA-Z0-9]*[ABT])_.*
```

Because the zone naming convention has more of a pattern, we could use the above expression, which will match all instances of a hostname (myComputerName in the example) that ends with either an A, a B, or a T, placing that hostname in the \1 variable.

The regular expression can be broken into its components:

- The .* (period asterisk) match any character, any number of times.
- The ? character makes the match non-greedy. This forces it to stop matching at the first underscore, rather than the last.
- The underscore character matches the first underscore in the zone name.
- Thus, the first .*?_ combination matches the characters Storage1_ in the first zone name example.
- The second .*?_ combination behaves like the first, but matches Switch1_ in the first zone name example.
- The parentheses indicate that the pattern contained within will be stored in the \1 variable.
- The bracketed characters [a-zA-Z0-9] mean that any letter (regardless of case) or digit will match.
- The * (asterisk) following the brackets indicates that the bracketed characters occur 0 or more times.
- The bracketed characters in the regular expression [ABT] match a single character in the zone name which must be A, B, or T.
- The _ (underscore) following the parentheses indicates that the [ABT] character match must be followed up an underscore.
- The .* (period asterisk) match any character, any number of times.

The result of this would therefore cause the \1 variable to contain any alphanumeric string which:

- was preceded by some number of alphanumeric characters and two underscores
- was followed by an underscore (and then any number of alphanumeric characters)
- had a final character of A, B or T, prior to the third underscore.

Example 7

Zone: myComputerName123_HBA1_Symm1_FA1

Hostname: myComputerName123

RegExp: ([a-zA-Z0-9]+)_.*

Example 8

This example finds everything before the first _.

Zone: MyComputerName_HBA1_Symm1_FA1

MyComputerName123_HBA1_Symm1_FA1

Hostname: MyComputerName

RegExp: (.?)_.

Example 9

This example finds everything after the 1st _ and up to the second _.

Zone: Z_MyComputerName_StorageName

Hostname: MyComputerName

RegExp: .?(.?).*?

Example 10

This example extracts "MyComputerName123" from the zone examples.

Zone: Storage1_Switch1_MyComputerName123A_A1_FC1

Storage2_Switch2_MyComputerName123B_A2_FC2

Storage3_Switch3_MyComputerName123T_A3_FC3

Hostname: MyComputerName123

RegExp: .?.?([a-zA-Z0-9]+)[ABT]_.

Example 11

Zone: Storage1_Switch1_MyComputerName123A_A1_FC1

Hostname: MyComputerName123A

RegExp: .?.?([a-zA-z0-9]+).*?

Example 12

The ^ (circumflex or caret) **inside square brackets** negates the expression, for example, [^Ff] means anything except uppercase or lowercase F, and [^a-z] means everything except lowercase a to z, and in the case above, anything except the _. The format statement adds in the "-" to the output host name.

Zone: mhs_apps44_d_A_10a0_0429

Hostname: mhs-apps44-d

RegExp: ()_([AB]).*Format in Cloud Insights: \1-\2 ([^_])_
()_([^_]).*Format in Cloud Insights: \1-\2-\3

Example 13

In this example, the storage alias is delimited by "\" and the expression needs to use "\\" to define that there are actually "\" being used in the string, and that those are not part of the expression itself.

Storage Alias: \Hosts\E2DOC01C1\E2DOC01N1

Hostname: E2DOC01N1

RegExp: \\.**?\\.**?\\(.*?)

Example 14

This example extracts "PD-RV-W-AD-2" from the zone examples.

Zone: PD_D-PD-RV-W-AD-2_01

Hostname: PD-RV-W-AD-2

RegExp: -(.*-\d).*

Example 15

The format setting in this case adds the "US-BV-" to the hostname.

Zone: SRV_USBVM11_F1

Hostname: US-BV-M11

RegExp: SRV_USBV([A-Za-z0-9]+)_F[12]

Format: US-BV-\1

Creating Dashboards

Dashboards Overview

Cloud Insights provides users the flexibility to create operational views of infrastructure data, by allowing you to create custom dashboards with a variety of widgets, each of which provides extensive flexibility in displaying and charting your data.

> ⓘ The examples in these sections are for explanation purposes only and do not cover every possible scenario. The concepts and steps herein can be used to create your own dashboards to highlight the data specific to your particular needs.

Creating a Dashboard

You create a new dashboard in one of two places:

- **Dashboards > [+New dashboard]**
- **Dashboards > Show all dashboards >** click the **[+Dashboard]** button

Dashboard Controls

The Dashboard screen has several controls:

- **Time selector**: allows you to view dashboard data for a range of time from the last 15 minutes to the last 30 days, or a custom time range of up to 31 days. You can choose to override this global time range in individual widgets.
- **Edit** button: Selecting this will enable Edit mode, which allows you to make changes to the dashboard. New dashboards open in Edit mode by default.
- **Save** button: Allows you to save or delete the dashboard.

  You can rename the current dashboard by typing a new name before clicking **Save**.

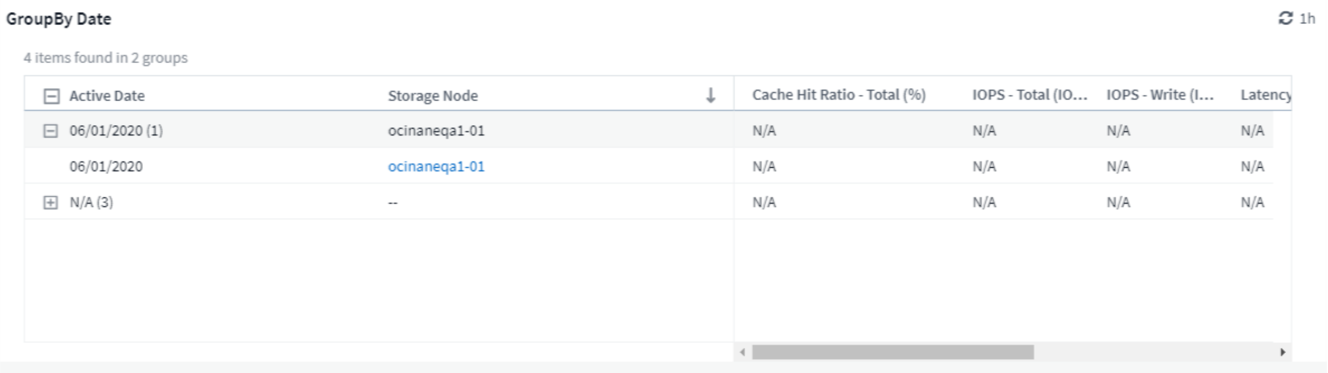
- **Add Widget** button, which allows you to add any number of tables, charts, or other widgets to the dashboard.

  Widgets can be resized and relocated to different positions within the dashboard, to give you the best view of your data according to your current needs.

Widget types

You can choose from the following widget types:

- **Table widget**: A table displaying data according to filters and columns you choose. Table data can be combined in groups that can be collapsed and expanded.



GroupBy Date

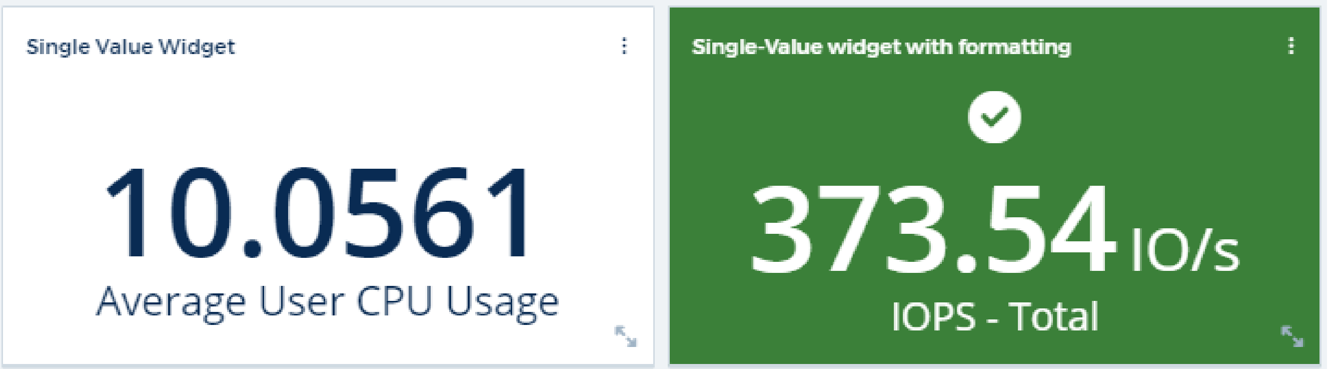
1h

4 items found in 2 groups

Active Date	Storage Node	Cache Hit Ratio - Total (%)	IOPS - Total (IO...	IOPS - Write (I...	Latency
⊟ 06/01/2020 (1)	ocinaneqa1-01	N/A	N/A	N/A	N/A
06/01/2020	ocinaneqa1-01	N/A	N/A	N/A	N/A
⊞ N/A (3)	--	N/A	N/A	N/A	N/A

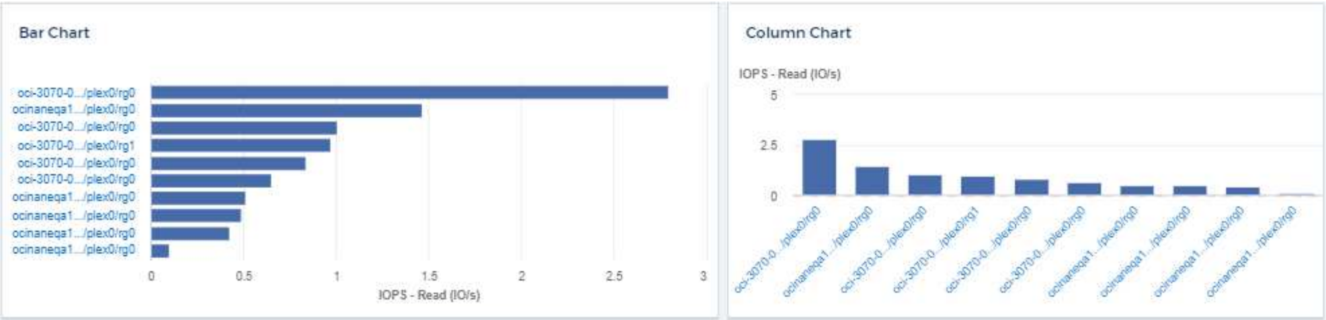
- **Line, Spline, Area, Stacked Area Charts**: These are time-series chart widgets on which you can display performance and other data over time.

- **Single Value widget**: A widget allowing you to display a single value that can be derived either directly from a counter or calculated using a query or expression. You can define color formatting thresholds to show whether the value is in expected, warning, or critical range.

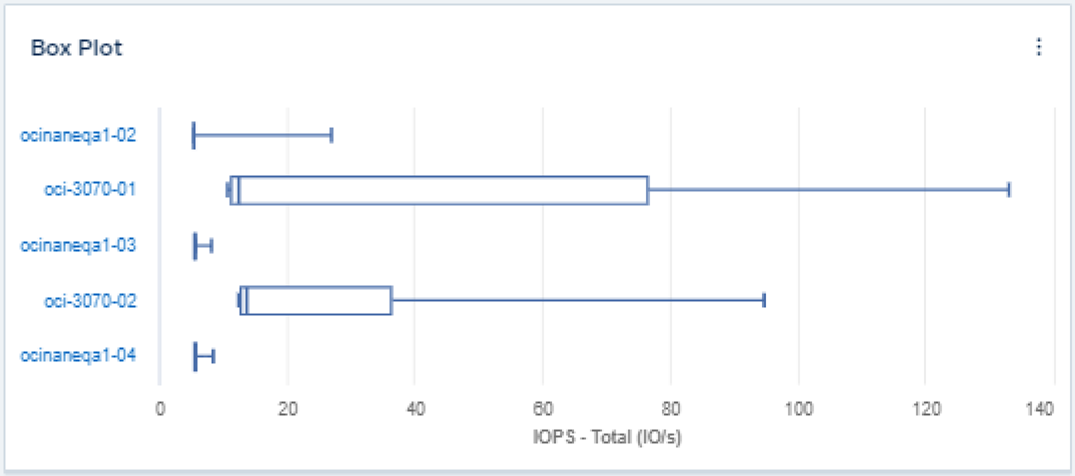


- **Gauge widget**: Displays single-value data in a traditional (solid) gauge or bullet gauge, with colors based on "Warning" or "Critical" values you customize.

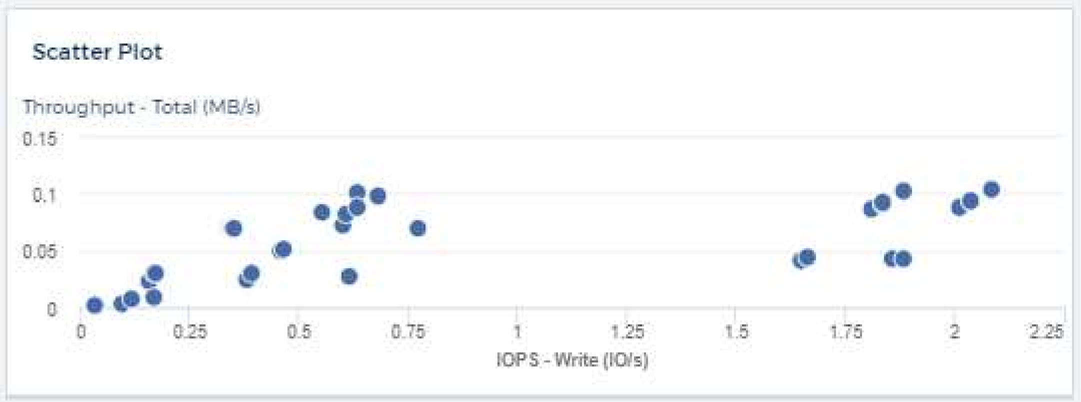
- **Bar, Column Charts**: Displays top or bottom N values, for example, Top 10 storages by capacity or bottom 5 volumes by IOPS.



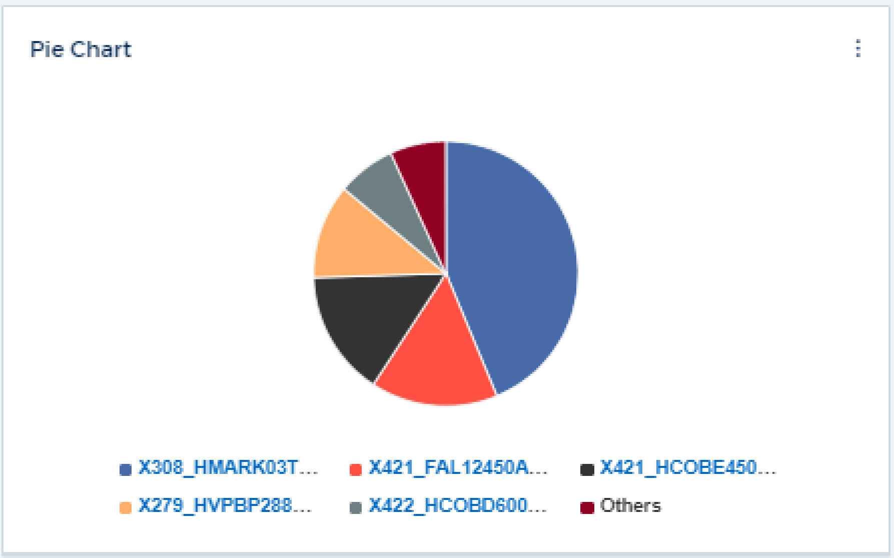
- **Box Plot Chart**: A plot of the min, max, median, and the range between lower and upper quartile of data in a single chart.



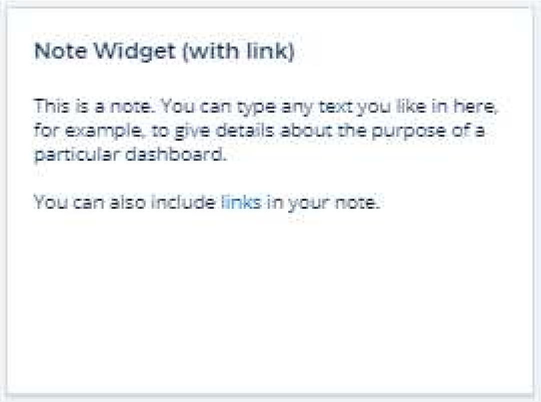
- **Scatter Plot Chart**: Plots related data as points, for example, IOPS and latency. In this example, you can quickly locate assets with high throughput and low IOPS.



- **Pie Chart**: a traditional pie chart to display data as a piece of the total.



- **Note widget**: Up to 1000 characters of free text.



Note Widget (with link)

This is a note. You can type any text you like in here, for example, to give details about the purpose of a particular dashboard.

You can also include links in your note.

- **Alerts Table**: Displays up to the last 1,000 alerts.

For more detailed explanations of these and other Dashboard Features, click here.

Setting a Dashboard as your Home Page

You can choose which dashboard to set as your environment's **home page** using either of the following methods:

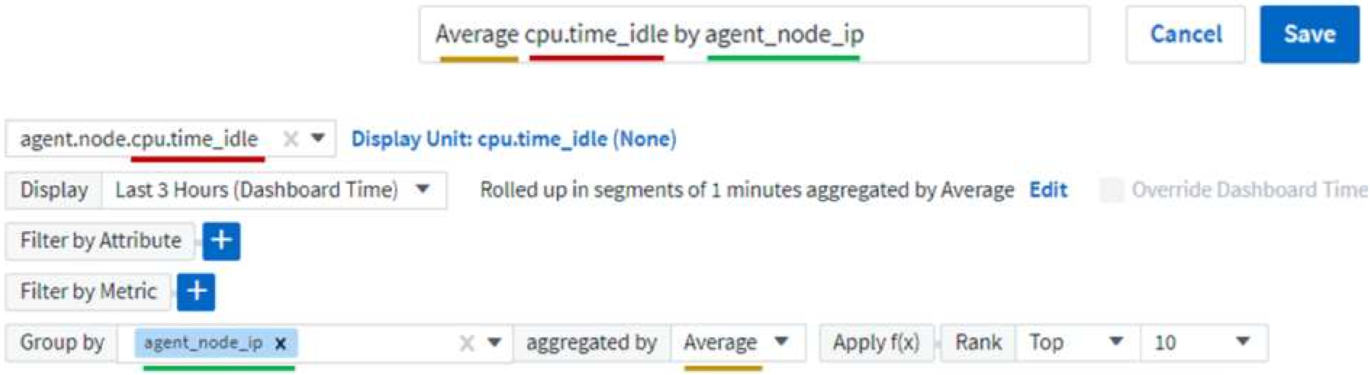
- Go to **Dashboards > Show All Dashboards** to display the list of dashboards in your environment. Click on the options menu to the right of the desired dashboard and select **Set as Home Page**.
- Click on a dashboard from the list to open the dashboard. Click the drop-down menu in the upper corner and select **Set as Home Page**.

Dashboard Features

Dashboards and widgets allow great flexibility in how data is displayed. Here are some concepts to help you get the most from your custom dashboards.

Widget Naming

Widgets are automatically named based on the object, metric, or attribute selected for the first widget query. If you also choose a grouping for the widget, the "Group by" attributes are included in the automatic naming (aggregation method and metric).



Average cpu.time_idle by agent_node_ip

agent.node.cpu.time_idle

Display Unit: cpu.time_idle (None)

Display: Last 3 Hours (Dashboard Time)

Rolled up in segments of 1 minutes aggregated by Average

Group by: agent_node_ip

aggregated by: Average

Rank: Top 10

Selecting a new object or grouping attribute updates the automatic name.

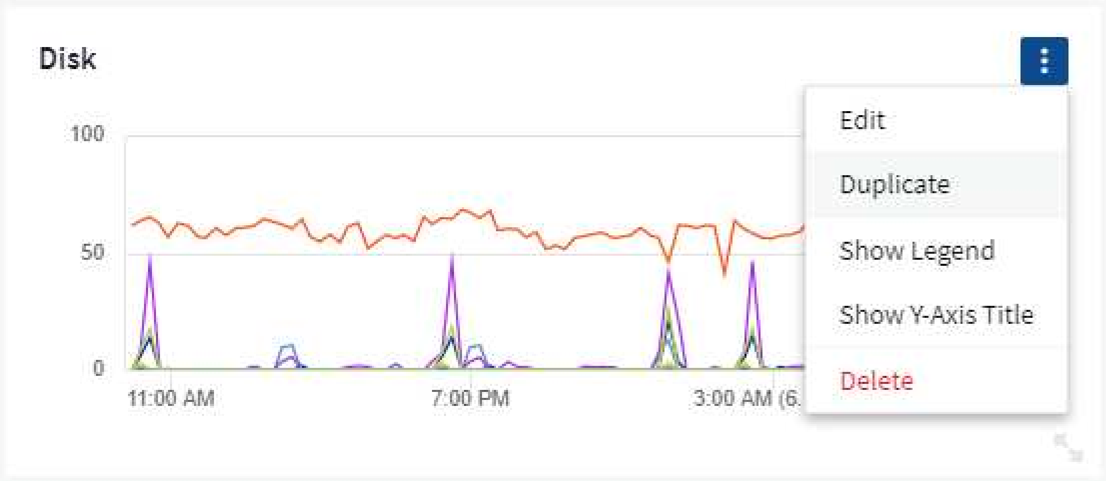
If you do not want to use the automatic widget name, you can simply type a new name.

Widget Placement and Size

All dashboard widgets can be positioned and sized according to your needs for each particular dashboard.

Duplicating a Widget

In dashboard Edit mode, click the menu on the widget and select **Duplicate**. The widget editor is launched, pre-filled with the original widget's configuration and with a "copy" suffix in the widget name. You can easily make any necessary changes and Save the new widget. The widget will be placed at the bottom of your dashboard, and you can position it as needed. Remember to Save your dashboard when all changes are complete.



Displaying Widget Legends

Most widgets on dashboards can be displayed with or without legends. Legends in widgets can be turned on or off on a dashboard by either of the following methods:

- When displaying the dashboard, click the **Options** button on the widget and select **Show Legends** in the menu.

As the data displayed in the widget changes, the legend for that widget is updated dynamically.

When legends are displayed, if the landing page of the asset indicated by the legend can be navigated to, the legend will display as a link to that asset page. If the legend displays "all", clicking the link will display a query page corresponding to the first query in the widget.

Transforming Metrics

Cloud Insights provides different **transform** options for certain metrics in widgets (specifically, those metrics called "Custom" or Integration Metrics, such as from Kubernetes, ONTAP Advanced Data, Telegraf plugins, etc.), allowing you to display the data in a number of ways. When adding transformable metrics to a widget, you are presented with a drop-down giving the following transform choices:

None
Data is displayed as is, with no manipulation.

Rate
Current value divided by the time range since the previous observation.

Cumulative

The accumulation of the sum of previous values and the current value.

Delta

The difference between the previous observation value and the current value.

Delta rate

Delta value divided by the time range since the previous observation.

Cumulative Rate

Cumulative value divided by the time range since the previous observation.

Note that transforming metrics does not change the underlying data itself, but only the way that data is displayed.

Dashboard widget queries and filters

Queries

The Query in a dashboard widget is a powerful tool for managing the display of your data. Here are some things to note about widget queries.

Some widgets can have up to five queries. Each query will plot its own set of lines or graphs in the widget. Setting rollup, grouping, top/bottom results, etc. on one query does not affect any other queries for the widget.

You can click on the eye icon to temporarily hide a query. The widget display updates automatically when you hide or show a query. This allows you to check your displayed data for individual queries as you build your widget.

The following widget types can have multiple queries:

- Area chart
- Stacked area chart
- Line chart
- Spline chart
- Single value widget

The remaining widget types can have only a single query:

- Table
- Bar chart
- Box plot
- Scatter plot

Filtering in dashboard widget queries

Here are some things you can do to get the most out of your filters.

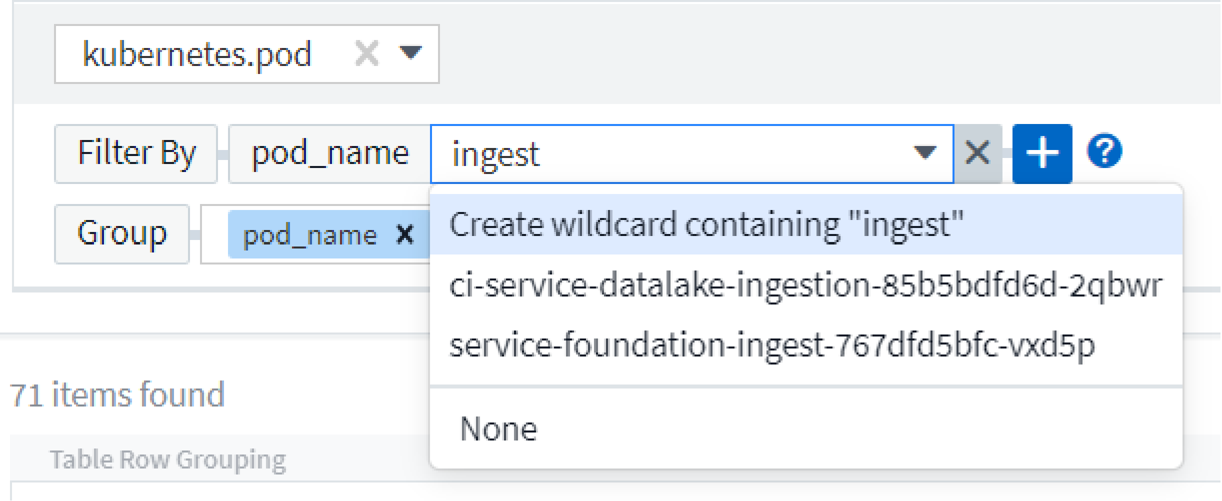
Exact Match Filtering

If you enclose a filter string in double quotes, Insight treats everything between the first and last quote as an exact match. Any special characters or operators inside the quotes will be treated as literals. For example, filtering for "*" will return results that are a literal asterisk; the asterisk will not be treated as a wildcard in this case. The operators AND, OR, and NOT will also be treated as literal strings when enclosed in double quotes.

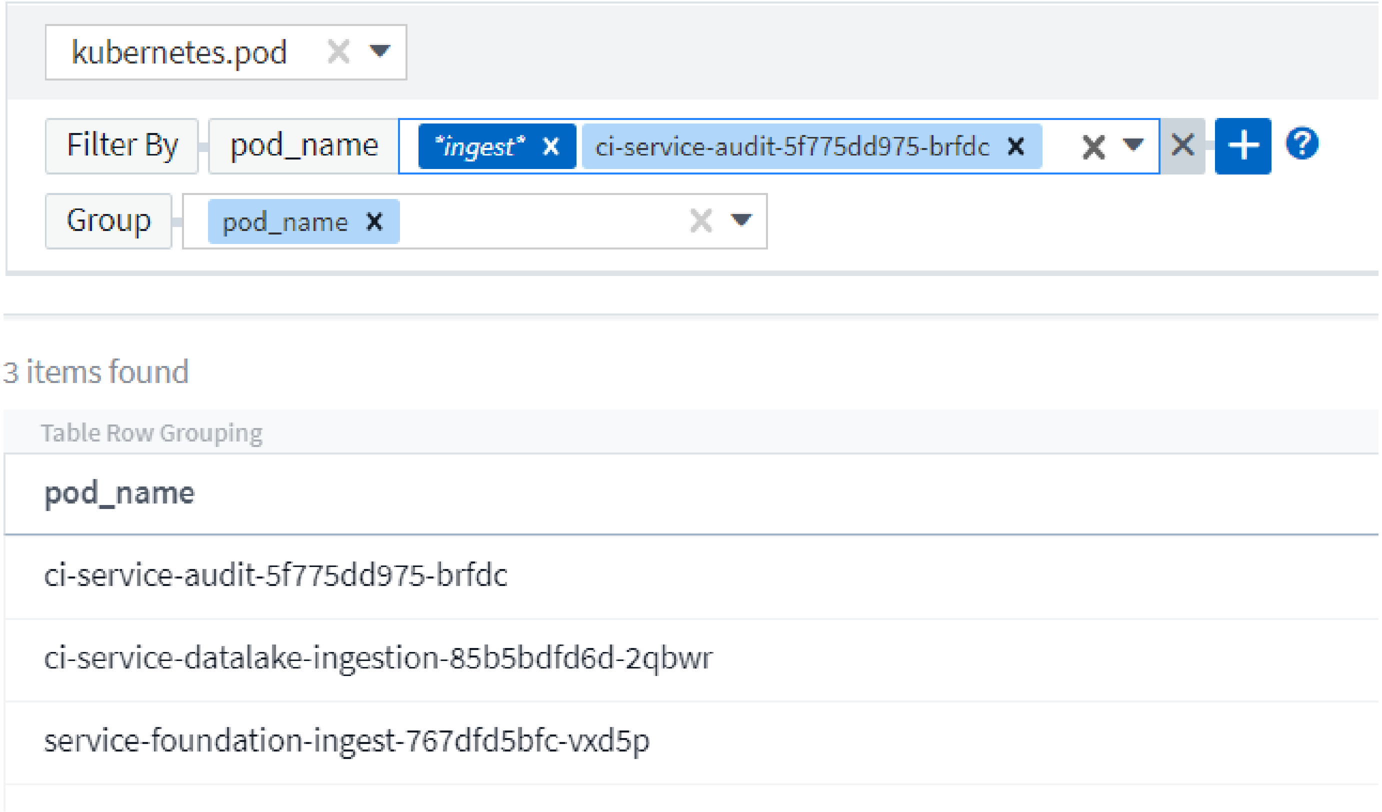
You can use exact match filters to find specific resources, for example hostname. If you want to find only the hostname 'marketing' but exclude 'marketing01', 'marketing-boston', etc., simply enclose the name "marketing" in double quotes.

Wildcards and Expressions

When you are filtering for text or list values in queries or dashboard widgets, as you begin typing you are presented with the option to create a **wildcard filter** based on the current text. Selecting this option will return all results that match the wildcard expression. You can also create **expressions** using NOT or OR, or you can select the "None" option to filter for null values in the field.


kubernetes.pod
Filter By
pod_name
ingest
Group
pod_name
Create wildcard containing "ingest"
ci-service-datalake-ingestion-85b5bdfd6d-2qbwr
service-foundation-ingest-767dfd5bfc-vxd5p
None
71 items found
Table Row Grouping

Filters based on wildcards or expressions (e.g. NOT, OR, "None", etc.) display in dark blue in the filter field. Items that you select directly from the list are displayed in light blue.



kubernetes.pod

Filter By pod_name *ingest* ci-service-audit-5f775dd975-brfdc

Group pod_name

3 items found

Table Row Grouping

pod_name
ci-service-audit-5f775dd975-brfdc
ci-service-datalake-ingestion-85b5bdfd6d-2qbwr
service-foundation-ingest-767dfd5bfc-vxd5p

Note that Wildcard and Expression filtering works with text or lists but not with numerics, dates or booleans.

Advanced Text Filtering with Contextual Type-Ahead Suggestions

Filtering in widget queries is *contextual*; when you select a filter value or values for a field, the other filters for that query will show values relevant to that filter.
For example, when setting a filter for a specific object *Name*, the field to filter for *Model* will only show values relevant to that object Name.

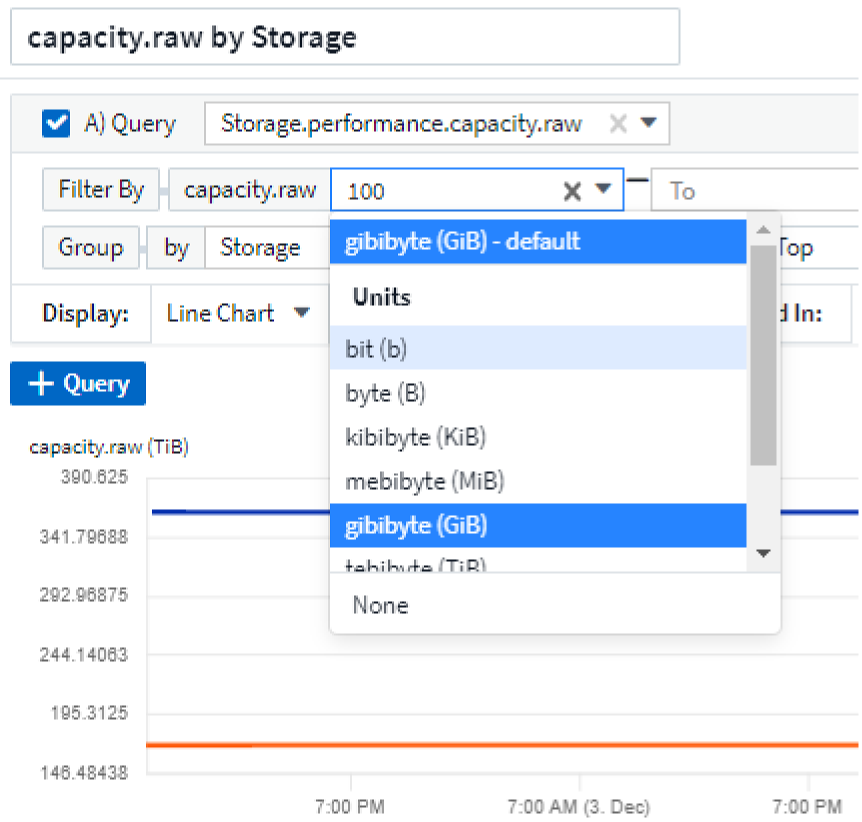
Contextual filtering also applies to dashboard page variables (text-type attributes or annotations only). When you select a filer value for one variable, any other variables using related objects will only show possible filter values based on the context of those related variables.

Note that only Text filters will show contextual type-ahead suggestions. Date, Enum (list), etc. will not show type-ahead suggestions. That said, you *can* set a filter on an Enum (i.e. list) field and have other text fields be filtered in context. For example, selecting a value in an Enum field like Data Center, then other filters will show only the models/names in that data center), but not vice-versa.

The selected time range will also provide context for the data shown in filters.

Choosing the filter units

As you type a value in a filter field, you can select the units in which to display the values on the chart. For example, you can filter on raw capacity and choose to display in the deafult GiB, or select another format such as TiB. This is useful if you have a number of charts on your dashboard showing values in TiB and you want all your charts to show consistent values.



Additional Filtering Refinements

The following can be used to further refine your filters.

- An asterisk enables you to search for everything. For example,

  ```
  vol*rhel
  ```

  displays all resources that start with "vol" and end with "rhel".

- The question mark enables you to search for a specific number of characters. For example,

  ```
  BOS-PRD??-S12
  ```

  displays *BOS-PRD12-S12*, *BOS-PRD13-S12*, and so on.

- The OR operator enables you to specify multiple entities. For example,

  ```
  FAS2240 OR CX600 OR FAS3270
  ```

  finds multiple storage models.

- The NOT operator allows you to exclude text from the search results. For example,

```
NOT EMC*
```

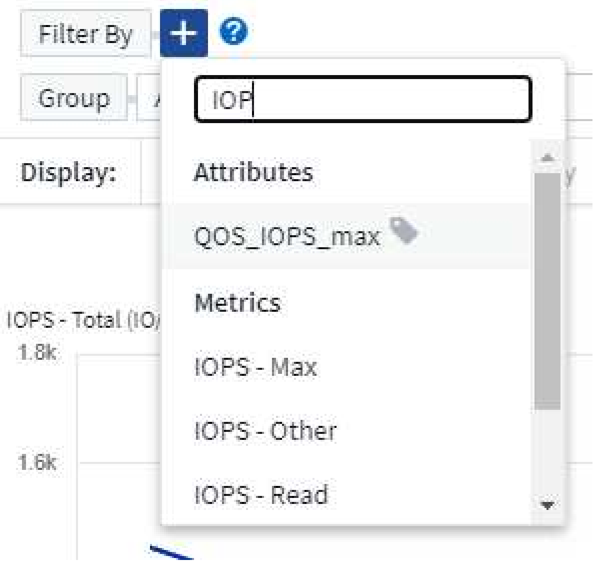
finds everything that does not start with "EMC". You can use

```
NOT *
```

to display fields that contain no value.

Identifying objects returned by queries and filters

The objects returned by queries and filters look similar to those shown in the following illustration. Objects with 'tags' assigned to them are annotations while the objects without tags are performance counters or object attributes.



Grouping and Aggregation

Grouping (Rolling Up)

Data displayed in a widget is grouped (sometimes called rolled-up) from the underlying data points collected during acquisition. For example, if you have a line chart widget showing Storage IOPS over time, you might want to see a separate line for each of your data centers, for a quick comparison. You can choose to group this data in one of several ways:

- **Average**: displays each line as the *average* of the underlying data.
- **Maximum**: displays each line as the *maximum* of the underlying data.
- **Minimum**: displays each line as the *minimum* of the underlying data.
- **Sum**: displays each line as the *sum* of the underlying data.
- **Count**: displays a *count* of objects that have reported data within the specified time frame. You can choose the *Entire Time Window* as determined by the dashboard time range (or the widget time range, if set to override the dashboard time), or a *Custom Time Window* that you select.

Steps

To set the grouping method, do the following.

1. In your widget’s query, choose an asset type and metric (for example, *Storage*) and metric (such as *Performance IOPS Total*).
2. For **Group**, choose a roll up method (such as *Average*) and select the attributes or metrics by which to roll up the data (for example, *Data Center*).

   The widget updates automatically and shows data for each of your data centers.

You can also choose to group *all* of the underlying data into the chart or table. In this case, you will get a single line for each query in the widget, which will show the average, min, max, sum, or count of the chosen metric or metrics for all of the underlying assets.

Clicking the legend for any widget whose data is grouped by "All" opens a query page showing the results of the first query used in the widget.

If you have set a filter for the query, the data is grouped based on the filtered data.

Note that when you choose to group a widget by any field (for example, *Model*), you will still need to Filter by that field in order to properly display the data for that field on the chart or table.

Aggregating data

You can further align your time-series charts (line, area, etc.) by aggregating data points into minute, hour, or day buckets before that data is subsequently rolled up by attribute (if chosen). You can choose to aggregate data points according to their *Average, Maximum, Minimum, Sum*, or *Count*.

A small interval combined with a long time range may result in an "Aggregation interval resulted in too many data points." warning. You might see this if you have a small interval and increase the dashboard time frame to 7 days. In this case, Insight will temporarily increase the aggregation interval until you select a smaller time frame.

You can also aggregate data in the bar chart widget and single-value widget.

Most asset counters aggregate to *Average* by default. Some counters aggregate to *Max, Min*, or *Sum* by default. For example, port errors aggregate to *Sum* by default, where storage IOPS aggregate to *Average*.

Showing Top/Bottom Results

In a chart widget, you can show either the **Top** or **Bottom** results for rolled up data, and choose the number of results shown from the drop-down list provided. In a table widget, you can sort by any column.

Chart widget top/bottom

In a chart widget, when you choose to rollup data by a specific attribute, you have the option of viewing either the top N or bottom N results. Note that you cannot choose the top or bottom results when you choose to rollup by *all* attributes.

You can choose which results to display by choosing either **Top** or **Bottom** in the query’s **Show** field, and selecting a value from the list provided.

Table widget show entries

In a table widget, you can select the number of results shown in the table results. You are not given the option to choose top or bottom results because the table allows you to sort ascending or descending by any column on demand.

You can choose the number of results to show in the table on the dashboard by selecting a value from the query's **Show entries** field.

Grouping in Table Widget

Data in a table widget can be grouped by any available attribute, allowing you to see an overview of your data, and to drill-down into it for more detail. Metrics in the table are rolled up for easy viewing in each collapsed row.

Table widgets allow you to group your data based on the attributes you set. For example, you might want your table to show total storage IOPS grouped by the data centers in which those storages live. Or you might want to display a table of virtual machines grouped according to the hypervisor that hosts them. From the list, you can expand each group to view the assets in that group.

Grouping is only available in the Table widget type.

Grouping example (with rollup explained)

Table widgets allow you to group data for easier display.

In this example, we will create a table widget showing all VMs grouped by Data Center.

Steps

1. Create or open a dashboard, and add a **Table** widget.
2. Select *Virtual Machine* as the asset type for this widget.
3. Click on the Column Selector and choose *Hypervisor name* and *IOPS - Total*.

   Those columns are now displayed in the table.

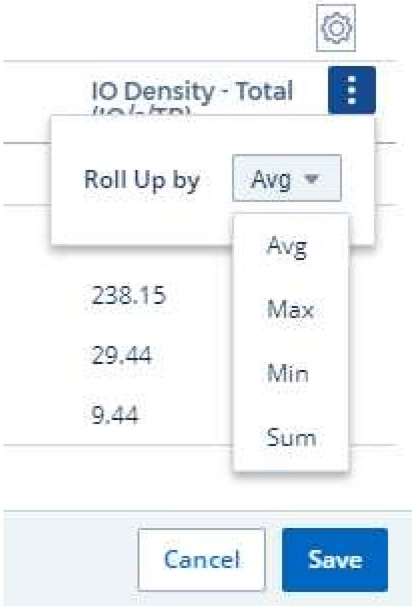
4. Let's disregard any VM's with no IOPS, and include only VMs that have total IOPS greater than 1. Click the **Filter by [+]** button and select *IOPS - Total*. Click on *Any*, and in the **from** field, type **1**. Leave the **to** field empty. Hit Enter ot click off the filter field to apply the filter.

   The table now shows all VMs with Total IOPS greater than or equal to 1. Notice that there is no grouping in the table. All VMs are shown.

5. Click the **Group by [+]** button.

   You can group by any attribute or annotation shown. Choose *All* to display all VMs in a single group.

   Any column header for a performance metric displays a "three dot" menu containing a **Roll up** option. The default roll up method is *Average*. This means that the number shown for the group is the average of all the Total IOPS reported for each VM inside the group. You can choose to roll this column up by *Average, Sum, Minimum* or *Maximum*. Any column that you display that contains performance metrics can be rolled up individually.



6. Click *All* and select *Hypervisor name*.

   The VM list is now grouped by Hypervisor. You can expand each hypervisor to view the VMs hosted by it.

7. Click **Save** to save the table to the dashboard. You can resize or move the widget as desired.
8. Click **Save** to save the dashboard.

Performance data roll up

If you include a column for performance data (for example, *IOPS - Total*) in a table widget, when you choose to group the data you can then choose a roll up method for that column. The default roll up method is to display the average (*avg*) of the underlying data in the group row. You can also choose to display the sum, minimum, or maximum of the data.

Dashboard time range selector

You can select the time range for your dashboard data. Only data relevant to the selected time range will be displayed in widgets on the dashboard. You can select from the following time ranges:

- Last 15 Minutes
- Last 30 Minutes
- Last 60 Minutes
- Last 2 Hours
- Last 3 Hours (this is the default)
- Last 6 Hours
- Last 12 Hours
- Last 24 Hours
- Last 2 Days
- Last 3 Days
- Last 7 Days

- Last 30 Days
- Custom time range

  The Custom time range allows you to select up to 31 consecutive days. You can also set the Start Time and End Time of day for this range. The default Start Time is 12:00 AM on the first day selected and the default End Time is 11:59 PM on the last day selected. Clicking **Apply** will apply the custom time range to the dashboard.

Overriding Dashboard Time in Individual widgets

You can override the main dashboard time range setting in individual widgets. These widgets will display data based on their set time frame, not the dashboard time frame.

To override the dashboard time and force a widget to use its own time frame, in the widget's edit mode set the **Override dashboard time** to **On** (check the box), and select a time range for the widget. **Save** the widget to the dashboard.

The widget will display its data according to the time frame set for it, regardless of the time frame you select on the dashboard itself.

The time frame you set for one widget will not affect any other widgets on the dashboard.

Primary and Secondary Axis

Different metrics use different units of measurements for the data they report in a chart. For example, when looking at IOPS, the unit of measurement is the number of I/O operations per second of time (IO/s), while Latency is purely a measure of time (milliseconds, microseconds, seconds, etc.). When charting both metrics on a single line chart using a single set a values for the Y-Axis, the latency numbers (typically a handful of milliseconds) are charted on the same scale with the IOPS (typically numbering in the thousands), and the latency line gets lost at that scale.

But it is possible to chart both sets of data on a single meaningful graph, by setting one unit of measurement on the primary (left-side) Y-axis, and the other unit of measurement on the secondary (right-side) Y-axis. Each metric is charted at its own scale.

Steps

This example illustrates the concept of Primary and Secondary axes in a chart widget.

1. Create or open a dashboard. Add a line chart, spline chart, area chart or stacked area chart widget to the dashboard.
2. Select an asset type (for example *Storage*) and choose *IOPS - Total* for your first metric. Set any filters you like, and choose a roll-up method if desired.

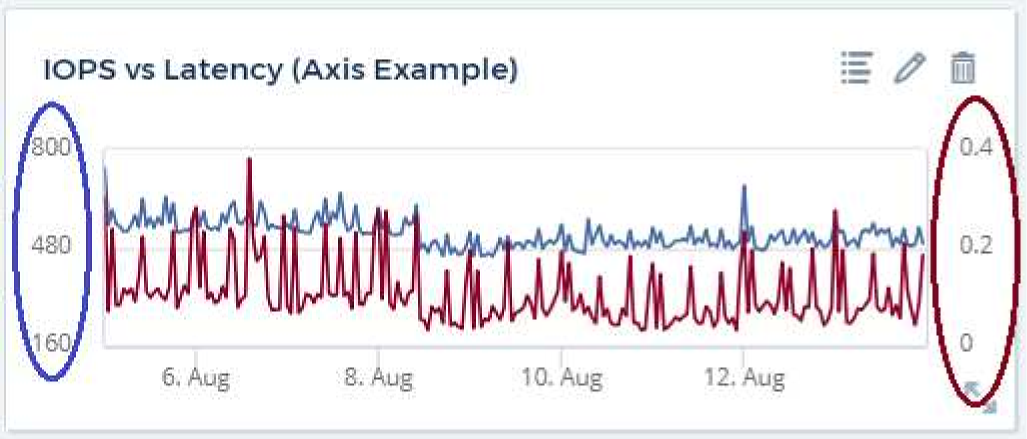
   The IOPS line is displayed on the chart, with its scale shown on the left.

3. Click **[+Query]** to add a second line to the chart. For this line, choose *Latency - Total* for the metric.

   Notice that the line is displayed flat at the bottom of the chart. This is because it is being drawn *at the same scale* as the IOPS line.

4. In the Latency query, select **Y-Axis: Secondary**.

   The Latency line is now drawn at its own scale, which is displayed on the right side of the chart.



Expressions in widgets

In a dashboard, any time series widget (line, spline, area, stacked area) bar chart, column chart, pie chart, or table widget allows you to build expressions from metrics you choose, and show the result of those expressions in a single graph (or column in the case of the table widget). The following examples use expressions to solve specific problems. In the first example, we want to show Read IOPS as a percentage of Total IOPS for all storage assets in our environment. The second example gives visibility into the "system" or "overhead" IOPS that occur in your environment—those IOPS that are not directly from reading or writing data.

You can use variables in expressions (for example, *$Var1 * 100*)

Expressions Example: Read IOPS percentage

In this example, we want to show Read IOPS as a percentage of Total IOPS. You can think of this as the following formula:

```
Read Percentage = (Read IOPS / Total IOPS) x 100
```

This data can be shown in a line graph on your dashboard. To do this, follow these steps:

Steps

1. Create a new dashboard, or open an existing dashboard in edit mode.
2. Add a widget to the dashboard. Choose **Area chart**.

   The widget opens in edit mode. By default, a query is displayed showing *IOPS - Total* for *Storage* assets. If desired, select a different asset type.

3. Click the **Convert to Expression** link on the right.

   The current query is converted to Expression mode. Notice that you cannot change the asset type while in Expression mode. While you are in Expression mode, the link changes to **Revert to Query**. Click this if you wish to switch back to Query mode at any time. Be aware that switching between modes will reset fields to their defaults.

   For now, stay in Expression mode.

4. The **IOPS - Total** metric is now in the alphabetic variable field "**a**". In the "**b**" variable field, click **Select** and choose **IOPS - Read**.

You can add up to a total of five alphabetic variables for your expression by clicking the + button following the variable fields. For our Read Percentage example, we only need Total IOPS ("**a**") and Read IOPS ("**b**").

5. In the **Expression** field, you use the letters corresponding to each variable to build your expression. We know that Read Percentage = (Read IOPS / Total IOPS) x 100, so we would write this expression as:

   ```
   (b / a) * 100
   ```

6. The **Label** field identifies the expression. Change the label to "Read Percentage", or something equally meaningful for you.
7. Change the **Units** field to "%" or "Percent".

   The chart displays the IOPS Read percentage over time for the chosen storage devices. If desired, you can set a filter, or choose a different rollup method. Be aware that if you select Sum as the rollup method, all percentage values are added together, which potentially may go higher than 100%.

8. Click **Save** to save the chart to your dashboard.

Expressions example: "System" I/O

Example 2: Among the metrics collected from data sources are read, write, and total IOPS. However, the total number of IOPS reported by a data source sometimes includes "system" IOPS, which are those IO operations that are not a direct part of data reading or writing. This system I/O can also be thought of as "overhead" I/O, necessary for proper system operation but not directly related to data operations.

To show these system I/Os, you can subtract read and write IOPS from the total IOPS reported from acquisition. The formula might look like this:

```
System IOPS = Total IOPS - (Read IOPS + Write IOPS)
```

This data can then be shown in a line graph on your dashboard. To do this, follow these steps:

Steps

1. Create a new dashboard, or open an existing dashboard in edit mode.
2. Add a widget to the dashboard. Choose **Line chart**.

   The widget opens in edit mode. By default, a query is displayed showing *IOPS - Total* for *Storage* assets. If desired, select a different asset type.

3. In the **Roll Up** field, choose *Sum* by *All*.

   The Chart displays a line showing the sum of total IOPS.

4. Click the *Duplicate this Query* icon ⧉ to create a copy of the query.

   A duplicate of the query is added below the original.

5. In the second query, click the **Convert to Expression** button.

   The current query is converted to Expression mode. Click **Revert to Query** if you wish to switch back to

Query mode at any time. Be aware that switching between modes will reset fields to their defaults.

For now, stay in Expression mode.

6. The *IOPS - Total* metric is now in the alphabetic variable field "**a**". Click on *IOPS - Total* and change it to *IOPS - Read*.
7. In the "**b**" variable field, click **Select** and choose *IOPS - Write*.
8. In the **Expression** field, you use the letters corresponding to each variable to build your expression. We would write our expression simply as:

   ```
   a + b
   ```

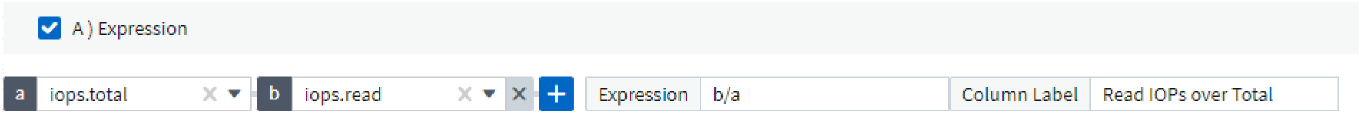
   In the Display section, choose **Area chart** for this expression.
9. The **Label** field identifies the expression. Change the label to "System IOPS", or something equally meaningful for you.

   The chart displays the total IOPS as a line chart, with an area chart showing the combination of read and write IOPS below that. The gap between the two shows the IOPS that are not directly related to data read or write operations. These are your "system" IOPS.
10. Click **Save** to save the chart to your dashboard.

To use a variable in an expression, simply type the variable name, for example, *$var1 * 100*. Only numeric variables can be used in expressions.

Expressions in a Table Widget

Table widgets handle expressions a little differently. You can have up to five expressions in a single table widget, each of which is added as a new column to the table. Each expression can include up to five values on which to perform its calculation. You can easily name the column something meaningful.



☑ A) Expression

a: iops.total | b: iops.read | Expression: b/a | Column Label: Read IOPs over Total

Variables

Variables allow you to change the data displayed in some or all widgets on a dashboard at once. By setting one or more widgets to use a common variable, changes made in one place cause the data displayed in each widget to update automatically.

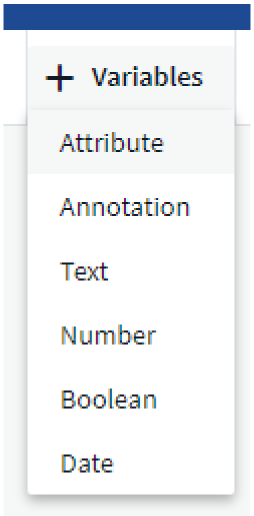
Dashboard variables come in several types, can be used across different fields, and must follow rules for naming. These concepts are explained here.

Variable types

A variable can be one the following types:

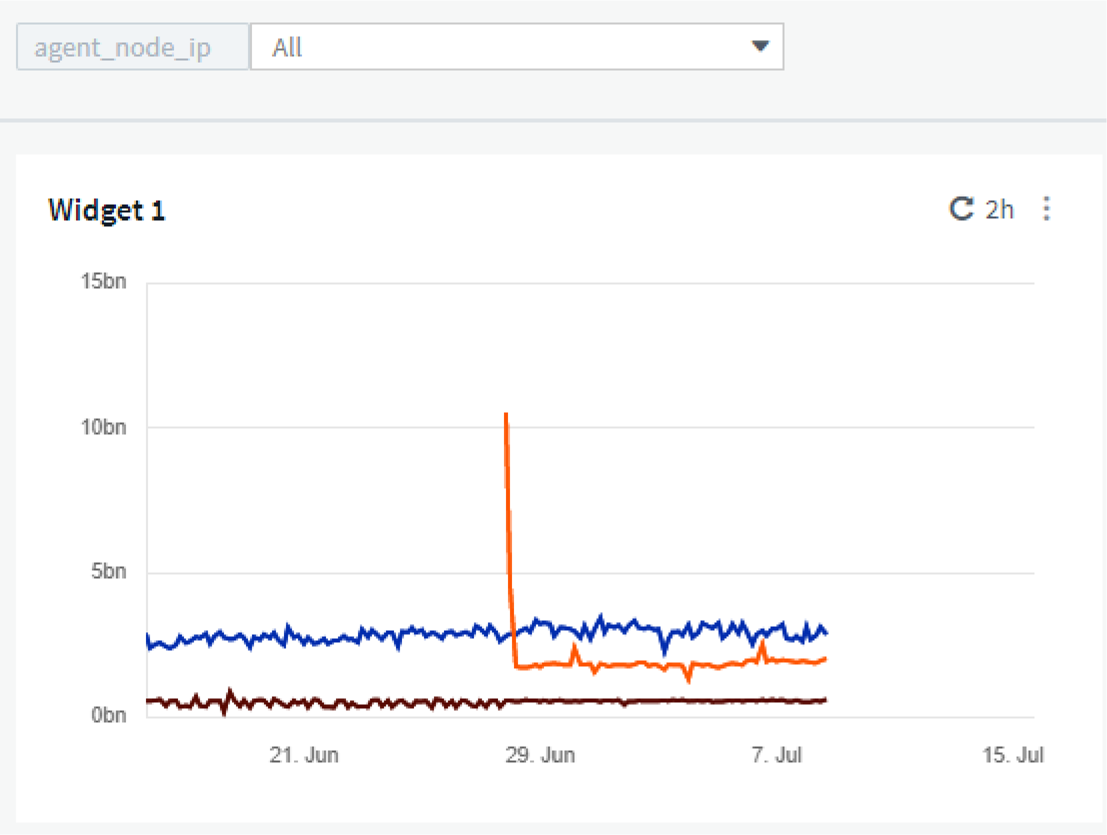
- **Attribute**: Use an object’s attributes or metrics to filter

- **Annotation**: Use a pre-defined Annotation to filter widget data.
- **Text**: An alphanumeric string.
- **Numerical**: A number value. Use by itself, or as a "from" or "to" value, depending on your widget field.
- **Boolean**: Use for fields with values of True/False, Yes/No, etc. For the boolean variable, the choices are Yes, No, None, Any.
- **Date**: A date value. Use as a "from" or "to" value, depending on your widget's configuration.

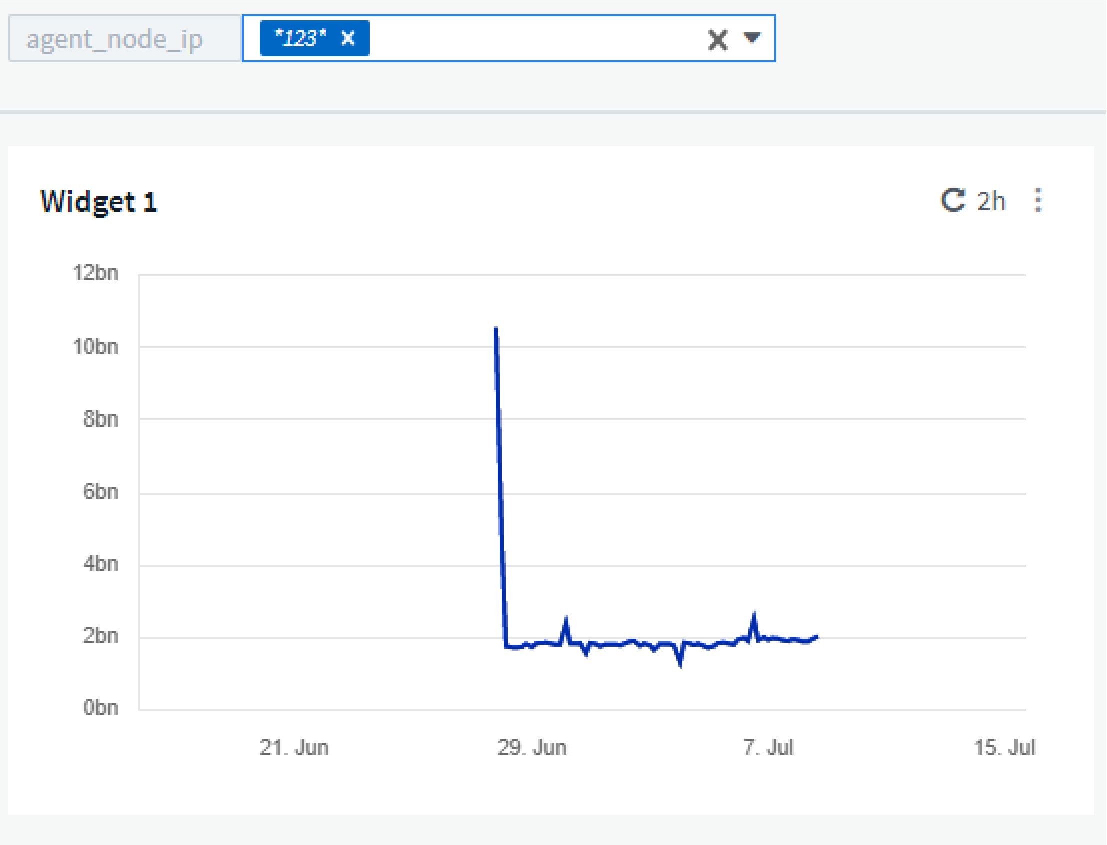


Attribute variables

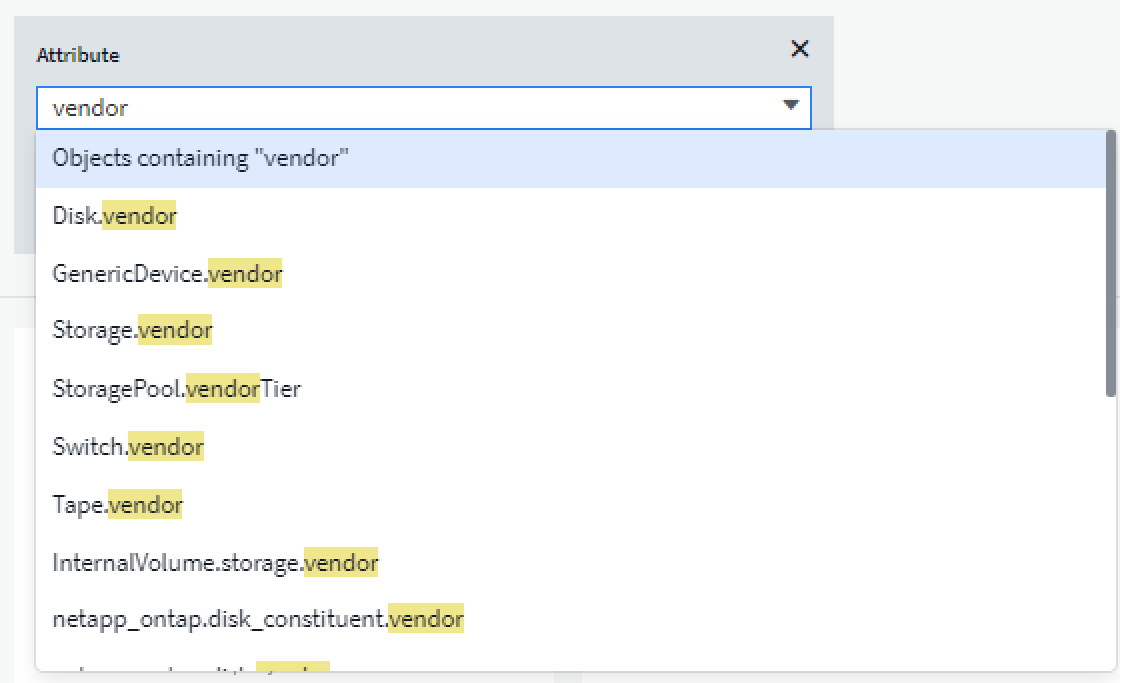
Selecting an Attribute type variable allows you to filter for widget data containing the specified attribute value or values. The example below shows a line widget displaying free memory trends for Agent nodes. We have created a variable for Agent Node IPs, currently set to show all IPs:



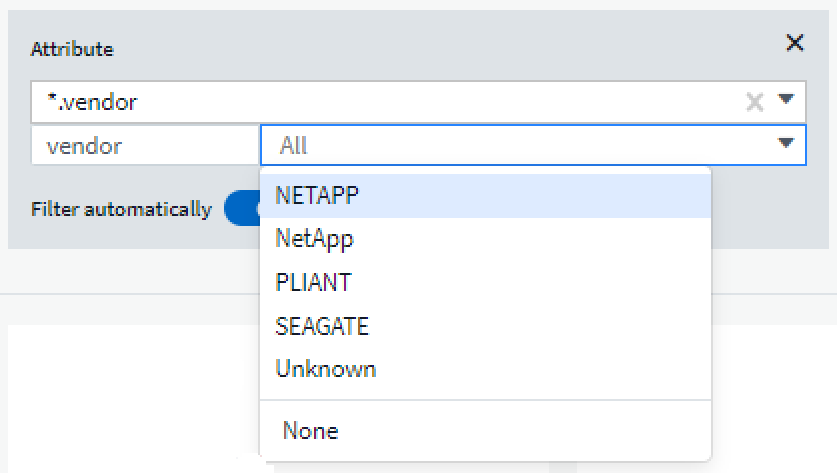
But if you temporarily want to see only nodes on individual subnets in your environment, you can set or change the variable to a specific Agent Node IP or IPs. Here we are viewing only the nodes on the "123" subnet:



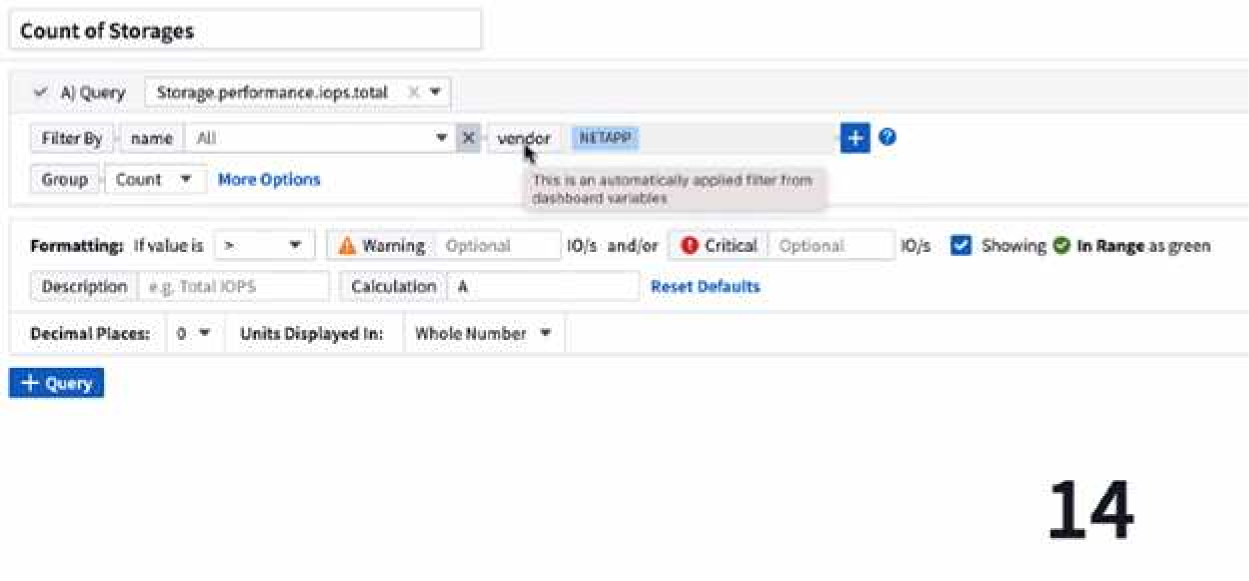
You can also set a variable to filter on *all* objects with a particular attribute regardless of object type, for example objects with an attribute of "vendor", by specifying **.vendor* in the variable field. You do not need to type the "*."; Cloud Insights will supply this if you select the wildcard option.



When you drop-down the list of choices for the variable value, the results are filtered so show only the available vendors based on the objects on your dashboard.



If you edit a widget on your dashboard where the attribute filter is relevant (meaning, the widget’s objects contain any **.vendor attribute*), it shows you that the attribute filter is automatically applied.



Count of Storages

A) Query Storage.performance.iops.total

Filter By name All vendor NETAPP

This is an automatically applied filter from dashboard variables

Group Count

Formatting: If value is > Warning Optional IO/s and/or Critical Optional IO/s ☑ Showing In Range as green

Description e.g. Total IOPS Calculation A

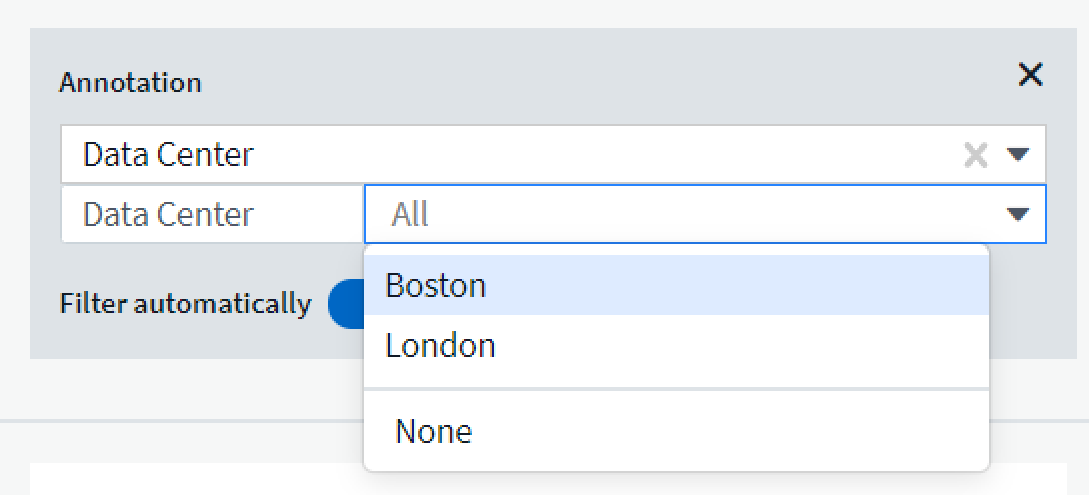
Decimal Places: 0 Units Displayed In: Whole Number

14

Applying variables is as easy as changing the attribute data of your choice.

Annotation variables

Choosing an Annotation variable allows you to filter for objects associated with that annotation, for example, those belonging to the same Data Center.



Annotation

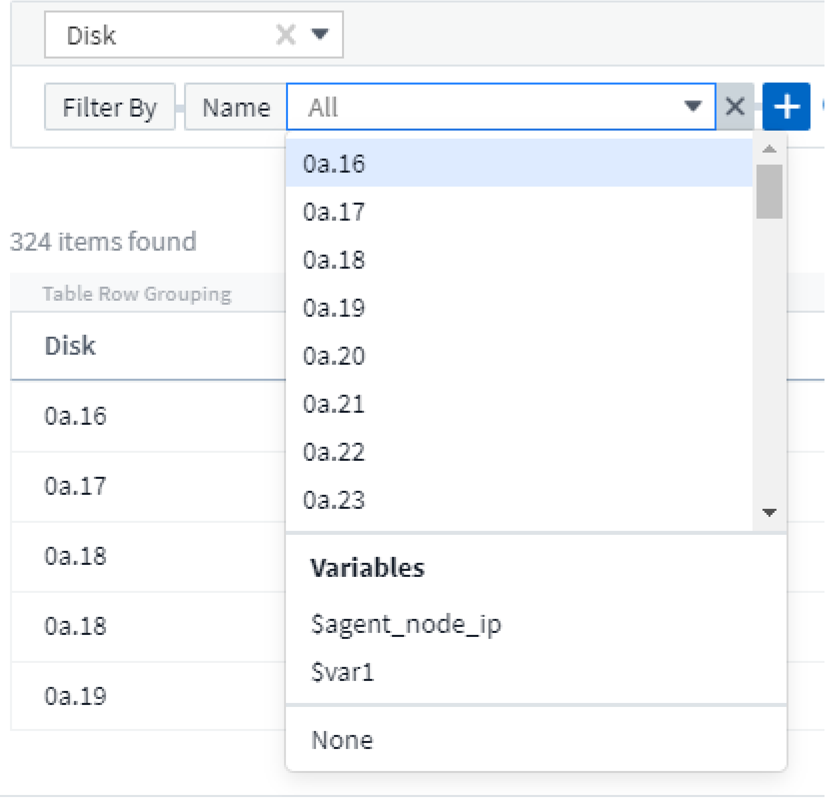
Data Center

Data Center All

Filter automatically

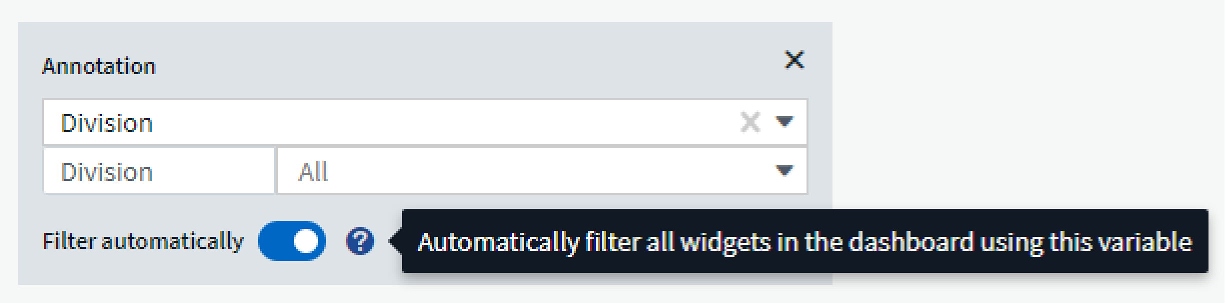
Text, Number, Date, or Boolean variable

You can create generic variables that are not associated with a particular attribute by selecting a variable type of *Text*, *Number*, *Boolean*, or *Date*. Once the variable has been created, you can select it in a widget filter field. When setting a filter in a widget, in addition to specific values that you can select for the filter, any variables that have been created for the dashboard are displayed in the list—these are grouped under the "Variables" section in the drop-down and have names starting with "$". Choosing a variable in this filter will allow you to search for values that you enter in the variable field on the dashboard itself. Any widgets using that variable in a filter will be updated dynamically.



Variable Filter Scope

When you add an Annotation or Attribute variable to your dashboard, the variable can be applied to *all* widgets on the dashboard, meaning that all widgets on your dashboard will display results filtered according to the value you set in the variable.


Annotation
Division
Division
All
Filter automatically
Automatically filter all widgets in the dashboard using this variable

Note that only Attribute and Annotation variables can be filtered automatically like this. Non-Annotation or -Attribute variables cannot be automatically filtered. Individual widgets must each be configured to use variables of these types.

To disable automatic filtering so that the variable only applies to the widgets where you have specifically set it, click the "Filter automatically" slider to disable it.

To set a variable in an individual widget, open the widget in edit mode and select the specific annotation or attribute in the *Filter By* field. With an Annotation variable, you can select one or more specific values, or select the Variable name (indicated by the leading "$") to allow typing in the variable at the dashboard level. The same applies to Attribute variables. Only those widgets for which you set the variable will show the filtered results.

Filtering in variables is *contextual*; when you select a filter value or values for a variable, the other variables on

your page will show only values relevant to that filter.
For example, when setting a variable filter to a specific storage *Model*, any variables set to filter for storage *Name* will only show values relevant to that Model.

To use a variable in an expression, simply type the variable name as part of the expression, for example, *$var1 * 100*. Only Numeric variables can be used in expressions. You cannot use numeric Annotation or Attribute variables in expressions.

Filtering in variables is *contextual*; when you select a filter value or values for a variable, the other variables on your page will show only values relevant to that filter.
For example, when setting a variable filter to a specific storage *Model*, any variables set to filter for storage *Name* will only show values relevant to that Model.

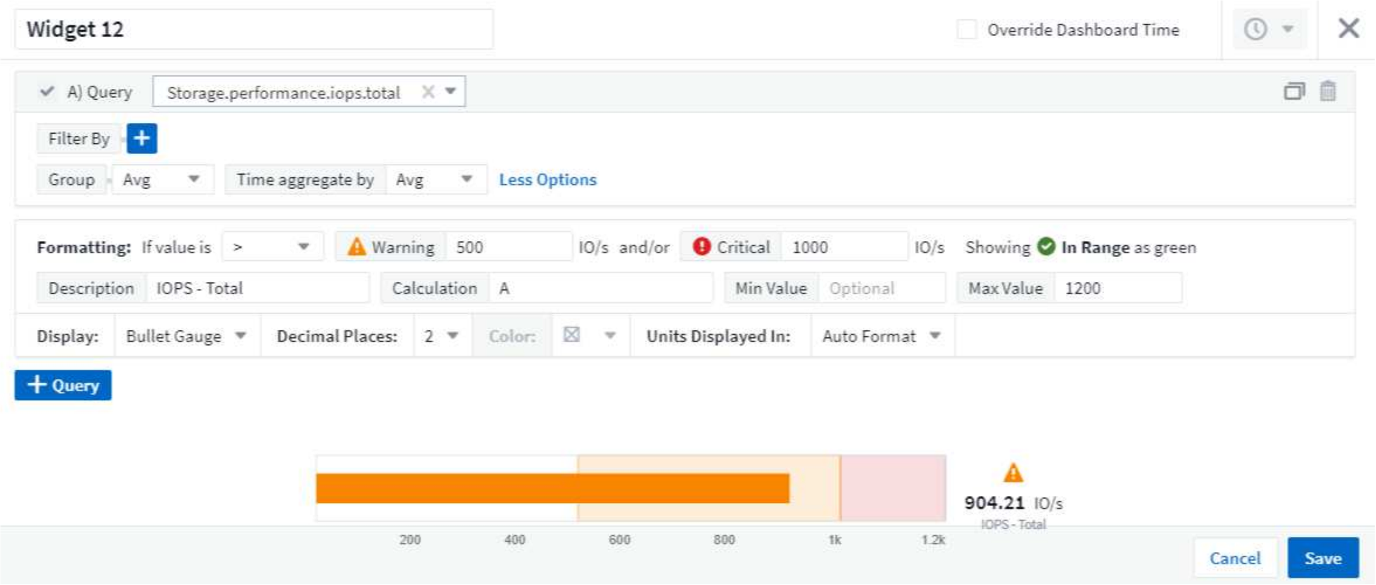
Variable naming

Variables names:

- Must include only the letters a-z, the digits 0-9, period (.), underscore (_), and space ( ).
- Cannot be longer than 20 characters.
- Are case-sensitive: $CityName and $cityname are different variables.
- Cannot be the same as an existing variable name.
- Cannot be empty.

Formatting Gauge Widgets

The Solid and Bullet Gauge widgets allow you to set thresholds for *Warning* and/or *Critical* levels, providing clear representation of the data you specify.



Widget 12

☐ Override Dashboard Time

✓ A) Query: Storage.performance.iops.total

Filter By +

Group: Avg | Time aggregate by: Avg | Less Options

Formatting: If value is > | Warning 500 IO/s and/or Critical 1000 IO/s | Showing ✓ In Range as green

Description: IOPS - Total | Calculation: A | Min Value: Optional | Max Value: 1200

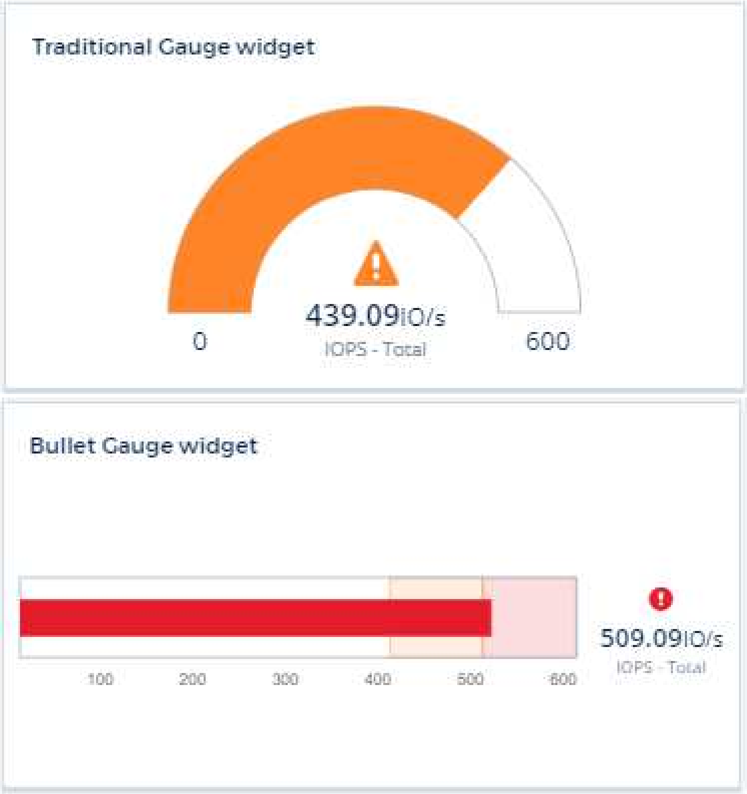
Display: Bullet Gauge | Decimal Places: 2 | Color: ☒ | Units Displayed In: Auto Format

To set formatting for these widgets, follow these steps:

1. Choose whether you want to highlight values greater than (>) or less than (<) your thresholds. In this example, we will highlight values greater than (>) the threshold levels.
2. Choose a value for the "Warning" threshold. When the widget displays values greater than this level, it displays the gauge in orange.

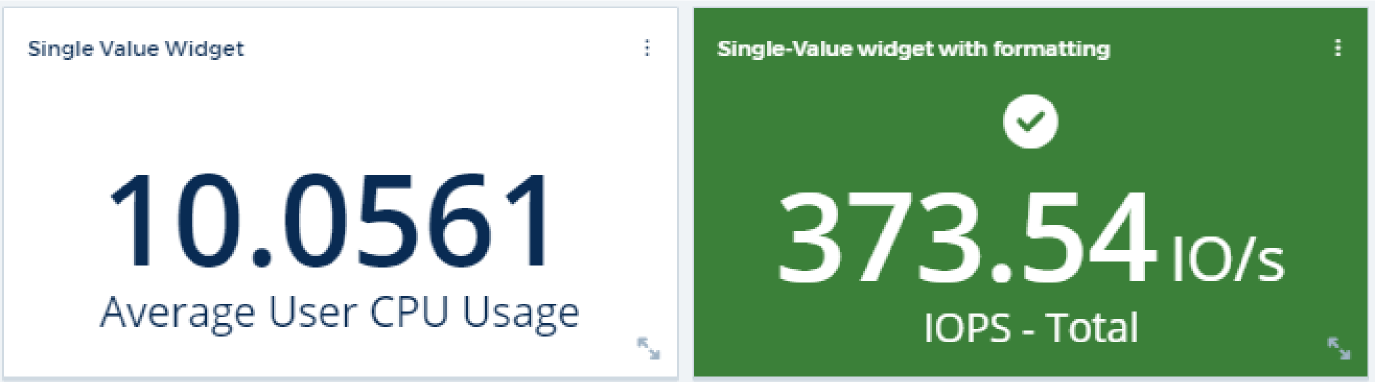
3. Choose a value for the "Critical" threshold. Values greater than this level will cause the gauge to display in red.

You can optionally choose a minimum and maximum value for the gauge. Values below minimum will not display the gauge. Values above maximum will display a full gauge. If you do not choose minimum or maximum values, the widget selects optimal min and max based on the widget’s value.



Formatting Single-Value Widget

in the Single-Value widget, in addition to setting Warning (orange) and Critical (red) thresholds, you can choose to have "In Range" values (those below Warning level) shown with either green or white background.



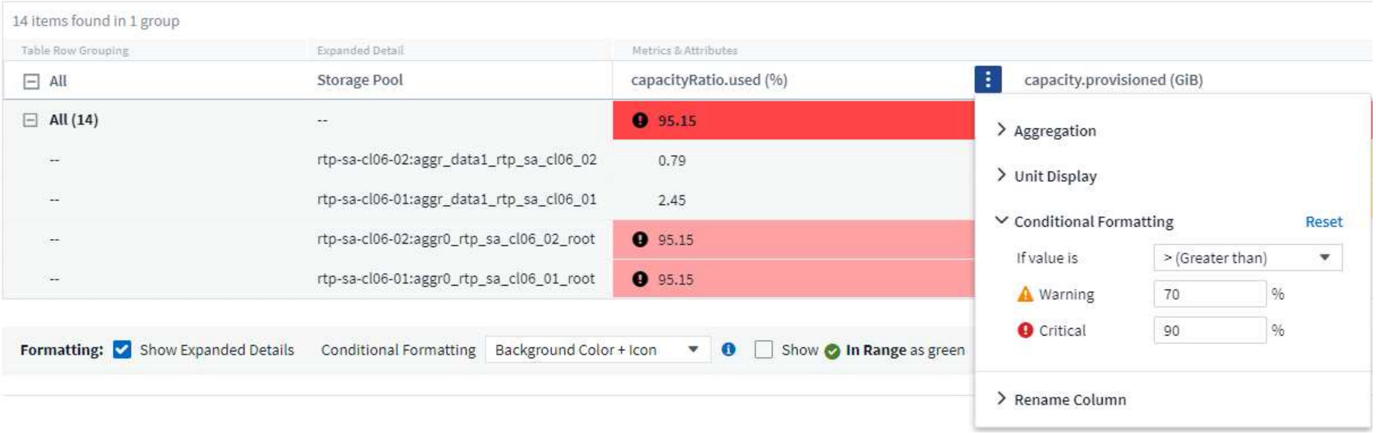
Clicking the link in either a single-value widget or a gauge widget will display a query page corresponding to the first query in the widget.

Formatting Table Widgets

Like single-value and gauge widgets, you can set conditional formatting in table widgets, allowing you to highlight data with colors and/or special icons.

> ⓘ Conditional Formatting is not currently available in Cloud Insights Federal Edition.

Conditional Formatting allows you to set and highlight Warning-level and Critical-level thresholds in table widgets, bringing instant visibility to outliers and exceptional data points.



14 items found in 1 group

Table Row Grouping	Expanded Detail	Metrics & Attributes	
⊟ All	Storage Pool	capacityRatio.used (%)	capacity.provisioned (GiB)
⊟ All (14)	--	❗ 95.15	
--	rtp-sa-cl06-02:aggr_data1_rtp_sa_cl06_02	0.79	
--	rtp-sa-cl06-01:aggr_data1_rtp_sa_cl06_01	2.45	
--	rtp-sa-cl06-02:aggr0_rtp_sa_cl06_02_root	❗ 95.15	
--	rtp-sa-cl06-01:aggr0_rtp_sa_cl06_01_root	❗ 95.15	

Formatting: ☑ Show Expanded Details Conditional Formatting Background Color + Icon ▾ ℹ ☐ Show ✓ **In Range** as green

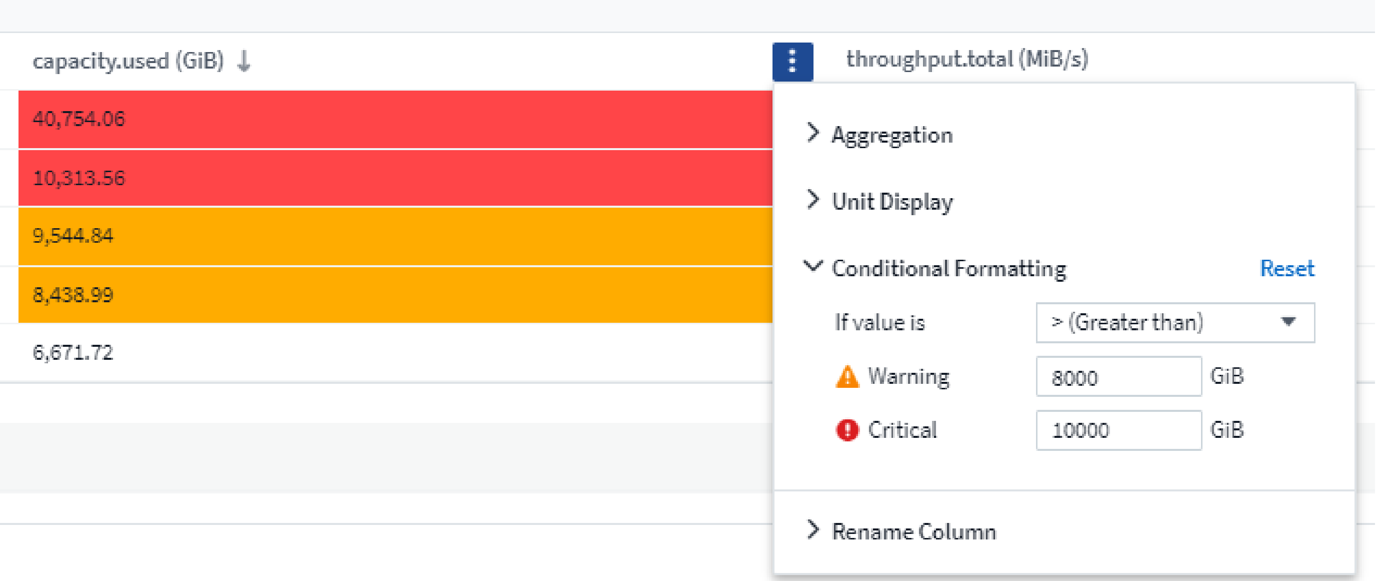
If value is: > (Greater than)

⚠ Warning: 70 %

❗ Critical: 90 %

Conditional formatting is set separately for each column in a table. For example, you can choose one set of thresholds for a capacity column, and another set for a throughput column.

If you change the Unit Display for a column, the conditional formatting remains and reflects the change in values. The images below show the same conditional formatting even though the display unit is different.

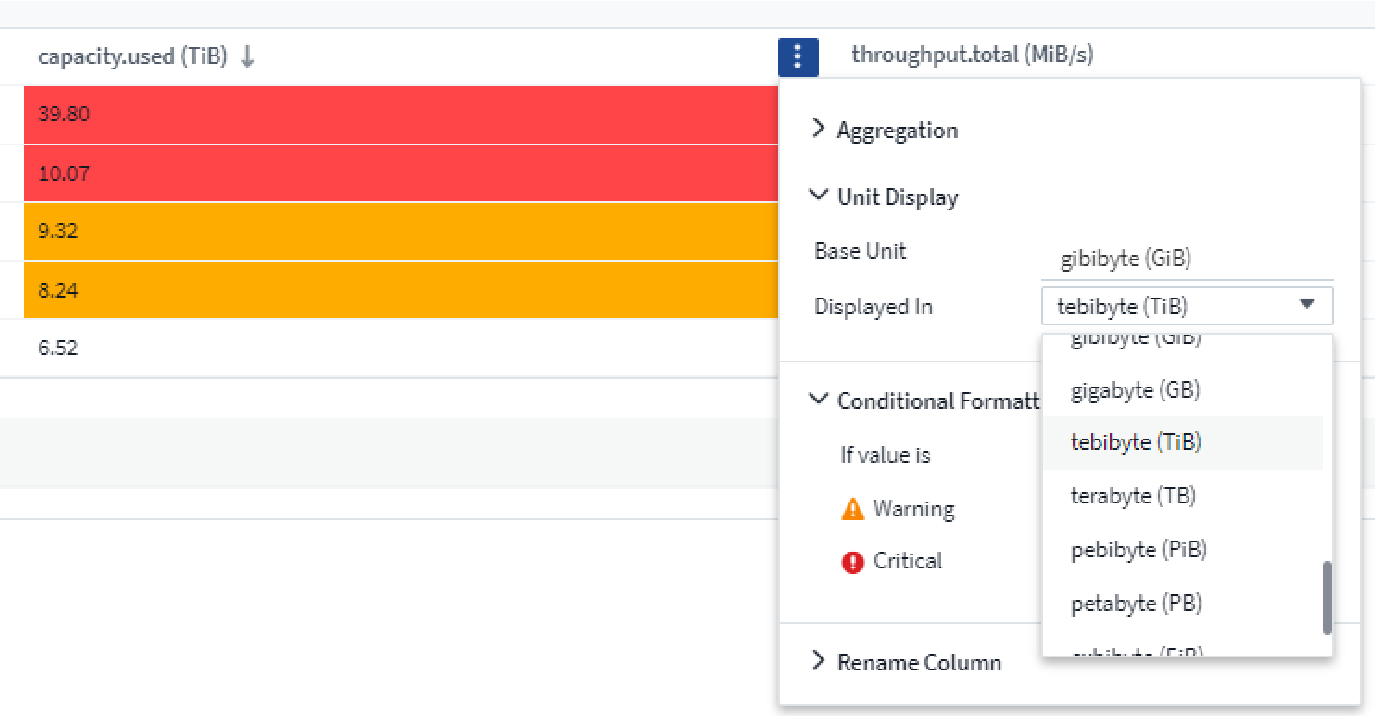


capacity.used (GiB) ↓	throughput.total (MiB/s)
40,754.06	
10,313.56	
9,544.84	
8,438.99	
6,671.72	

If value is: > (Greater than)

⚠ Warning: 8000 GiB

❗ Critical: 10000 GiB



capacity.used (TiB) ↓

capacity.used (TiB)
39.80
10.07
9.32
8.24
6.52

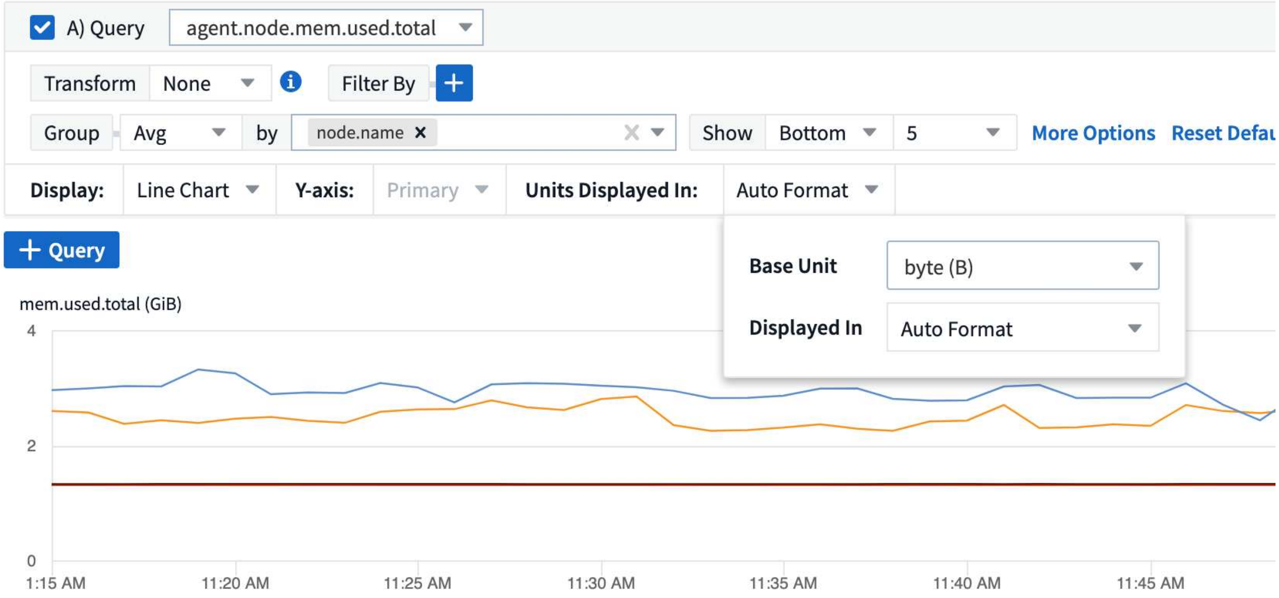
throughput.total (MiB/s)

You can choose whether to display condition formatting as color, icons, or both.

Choosing the Unit for Displaying Data

Most widgets on a dashboard allow you to specify the Units in which to display values, for example *Megabytes*, *Thousands*, *Percentage*, *Milliseconds (ms)*, etc. In many cases, Cloud Insights knows the best format for the data being acquired. In cases where the best format is not known, you can set the format you want.

In the line chart example below, the data selected for the widget is known to be in *bytes* (the base IEC Data unit: see the table below), so the Base Unit is automatically selected as 'byte (B)'. However, the data values are large enough to be presented as gibibytes (GiB), so Cloud Insights by default auto-formats the values as GiB. The Y-axis on the graph shows 'GiB' as the display unit, and all values are displayed in terms of that unit.



☑ A) Query: agent.node.mem.used.total

Transform: None | Filter By

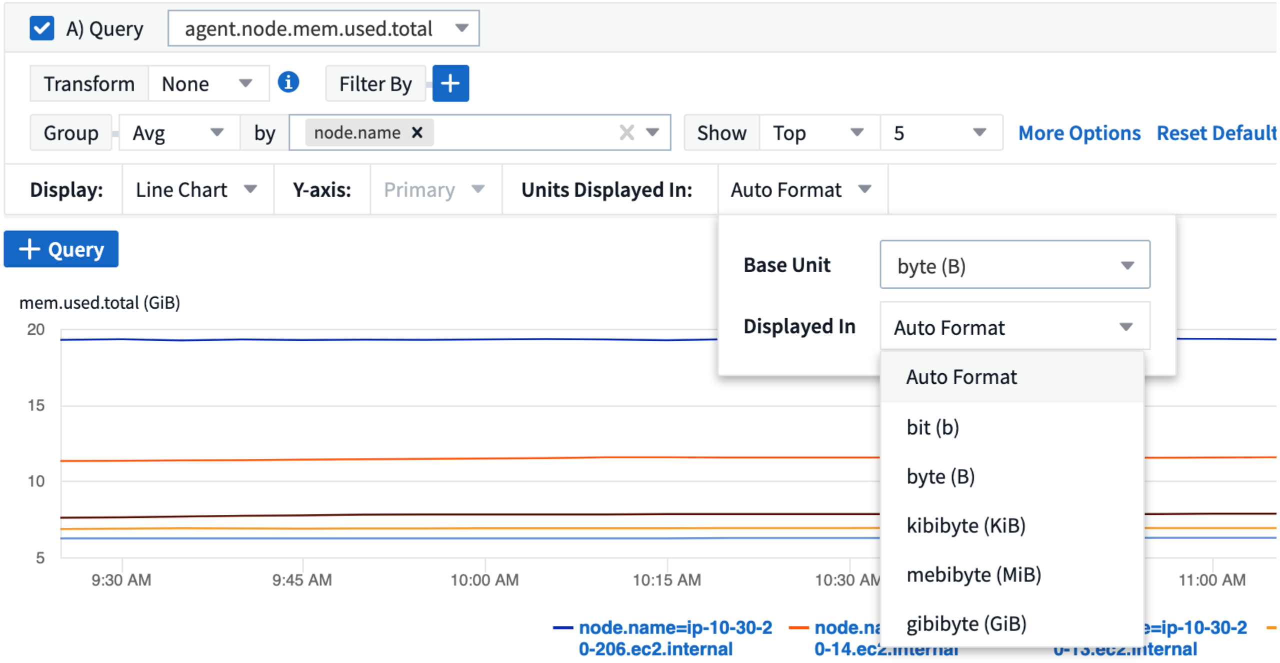
Group: Avg by node.name | Show: Bottom 5

Display: Line Chart | Y-axis: Primary | Units Displayed In: Auto Format

Base Unit: byte (B)

Displayed In: Auto Format

If you want to display the graph in a different unit, you can choose another format in which to display the values. Since the base unit in this example is *byte*, you can choose from among the supported "byte-based" formats: bit (b), byte (B), kibibyte (KiB), mebibyte (MiB), gibibyte (GiB). The Y-Axis label and values change according to the format you choose.



☑ A) Query agent.node.mem.used.total

Transform None

Group Avg by node.name

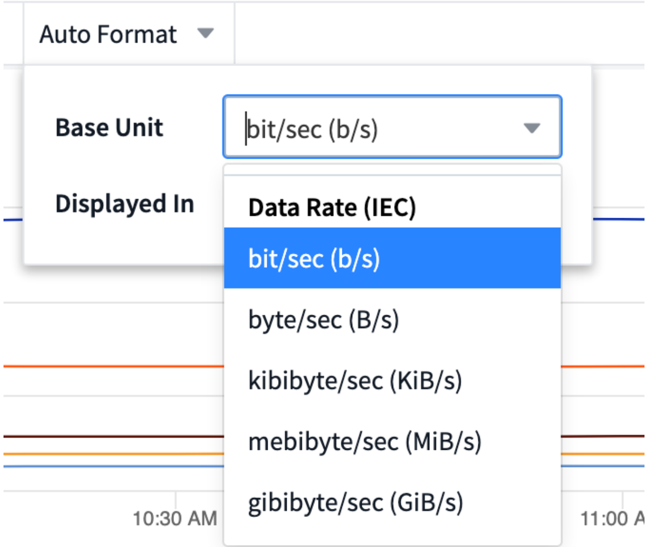
Show Top 5

Display: Line Chart Y-axis: Primary Units Displayed In: Auto Format

Base Unit byte (B)

Displayed In Auto Format

In cases where the base unit is not known, you can assign a unit from among the available units, or type in your own. Once you assign a base unit, you can then select to display the data in one of the appropriate supported formats.



Auto Format

Base Unit bit/sec (b/s)

Displayed In

To clear out your settings and start again, click on **Reset Defaults**.

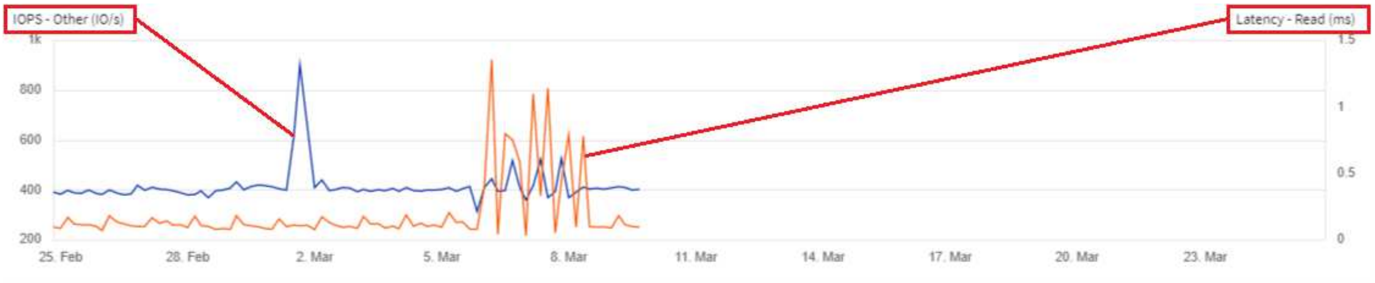
A word about Auto-Format

Most metrics are reported by data collectors in the smallest unit, for example as a whole number such as 1,234,567,890 bytes. By default, Cloud Insights will automatically format the value for the most readable display. For example a data value of 1,234,567,890 bytes would be auto formatted to 1.23 *Gibibytes*. You can choose to display it in another format, such as *Mebibytes*. The value will display accordingly.

Cloud Insights uses American English number naming standards. American "billion" is equivalent to "thousand million".

Widgets with multiple queries

If you have a time-series widget (i.e. line, spline, area, stacked area) that has two queries where both are plotted the primary Y-Axis, the base unit is not shown at the top of the Y-Axis. However, if your widget has a query on the primary Y-Axis and a query on the secondary Y-Axis, the base units for each are shown.



If your widget has three or more queries, base units are not shown on the Y-Axis.

Available Units

The following table shows all the available units by category.

Category	Units
Currency	cent dollar
Data(IEC)	bit byte kibibyte mebibyte gibibyte tebibyte pebibyte exbibyte
DataRate(IEC)	bit/sec byte/sec kibibyte/sec mebibyte/sec gibibyte/sec tebibyte/sec pebibyte/sec
Data(Metric)	kilobyte megabyte gigabyte terabyte petabyte exabyte

DataRate(Metric)	kilobyte/sec megabyte/sec gigabyte/sec terabyte/sec petabyte/sec exabyte/sec
IEC	kibi mebi gibi tebi pebi exbi
Decimal	whole number thousand million bilion trillion
Percentage	percentage
Time	nanosecond microsecond millisecond second minute hour
Temperature	celsius fahrenheit
Frequency	hertz kilohertz megahertz gigahertz
CPU	nanocores microcores millicores cores kilocores megacores gigacores teracores petacores exacores
Throughput	I/O ops/sec ops/sec requests/sec reads/sec writes/sec ops/min reads/min writes/min

TV Mode and Auto-Refresh

Data in widgets on Dashboards and Asset Landing Pages auto-refresh according a refresh interval determined by the Dashboard Time Range selected (or widget time range, if set to override the dashboard time). The refresh interval is based on whether the widget is time-series (line, spline, area, stacked area chart) or non-time-series (all other charts).

Dashboard Time Range	Time-Series Refresh Interval	Non-Time-Series Refresh Interval
Last 15 Minutes	10 Seconds	1 Minute
Last 30 Minutes	15 Seconds	1 Minute
Last 60 Minutes	15 Seconds	1 Minute
Last 2 Hours	30 Seconds	5 Minutes
Last 3 Hours	30 Seconds	5 Minutes
Last 6 Hours	1 Minute	5 Minutes
Last 12 Hours	5 Minutes	10 Minutes
Last 24 Hours	5 Minutes	10 Minutes
Last 2 Days	10 Minutes	10 Minutes
Last 3 Days	15 Minutes	15 Minutes
Last 7 Days	1 Hour	1 Hour
Last 30 Days	2 Hours	2 Hours

Each widget displays its auto-refresh interval in the upper-right corner of the widget.

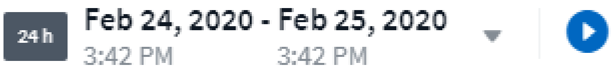
Auto-refresh is not available for Custom dashboard time range.

When combined with **TV Mode**, auto-refresh allows for near-real-time display of data on a dashboard or asset page. TV Mode provides an uncluttered display; the navigation menu is hidden, providing more screen real estate for your data display, as is the Edit button. TV Mode ignores typical Cloud Insights timeouts, leaving the display live until logged out manually or automatically by authorization security protocols.

> ⓘ Because NetApp Cloud Central has its own user login timeout of 7 days, Cloud Insights must log out with that event as well. You can simply log in again and your dashboard will continue to display.

- To activate TV Mode, click the 🖵 TV Mode button.
- To disable TV Mode, click the **Exit** button in the upper left of the screen. 🖵 Exit

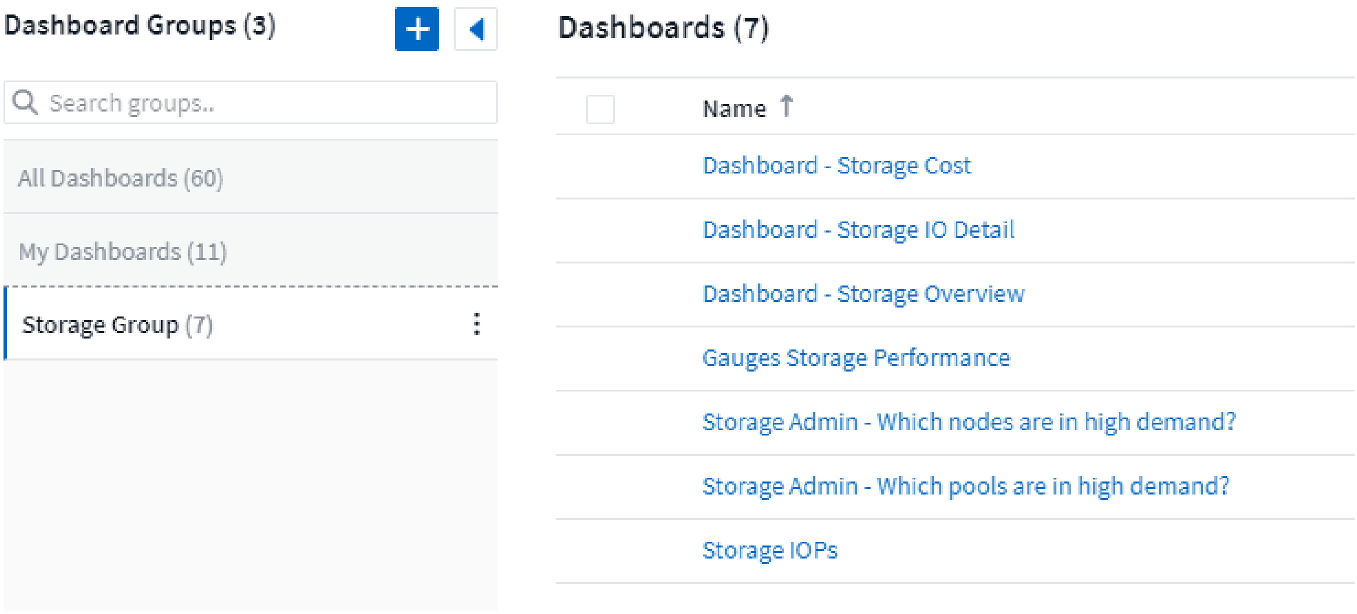
You can temporarily suspend auto-refresh by clicking the Pause button in the upper right corner. While paused, the dashboard time range field will display the paused data's active time range. Your data is still being acquired and updated while auto-refresh is paused. Click the Resume button to continue auto-refreshing of data.



24 h Feb 24, 2020 - Feb 25, 2020
3:42 PM 3:42 PM

Dashboard Groups

Grouping allows you to view and manage related dashboards. For example, you can have a dashboard group dedicated to the storage in your environment. Dashboard groups are managed on the **Dashboards > Show All Dashboards** page.



Dashboard Groups (3)

All Dashboards (60)

My Dashboards (11)

Storage Group (7)

Dashboards (7)

□	Name ↑
	Dashboard - Storage Cost
	Dashboard - Storage IO Detail
	Dashboard - Storage Overview
	Gauges Storage Performance
	Storage Admin - Which nodes are in high demand?
	Storage Admin - Which pools are in high demand?
	Storage IOPs

Two groups are shown by default:

- **All Dashboards** lists all the dashboards that have been created, regardless of owner.
- **My Dashboards** lists only those dashboards created by the current user.

The number of dashboards contained in each group is shown next to the group name.

To create a new group, click the **"+" Create New Dashboard Group** button. Enter a name for the group and click **Create Group**. An empty group is created with that name.

To add dashboards to the group, click the *All Dashboards* group to show all dashboards in your environment, of click *My Dashboards* if you only want to see the dashboards you own, and do one of the following:

- To add a single dashboard, click the menu to the right of the dashboard and select *Add to Group*.
- To add multiple dashboards to a group, select them by clicking the checkbox next to each dashboard, then click the **Bulk Actions** button and select *Add to Group*.

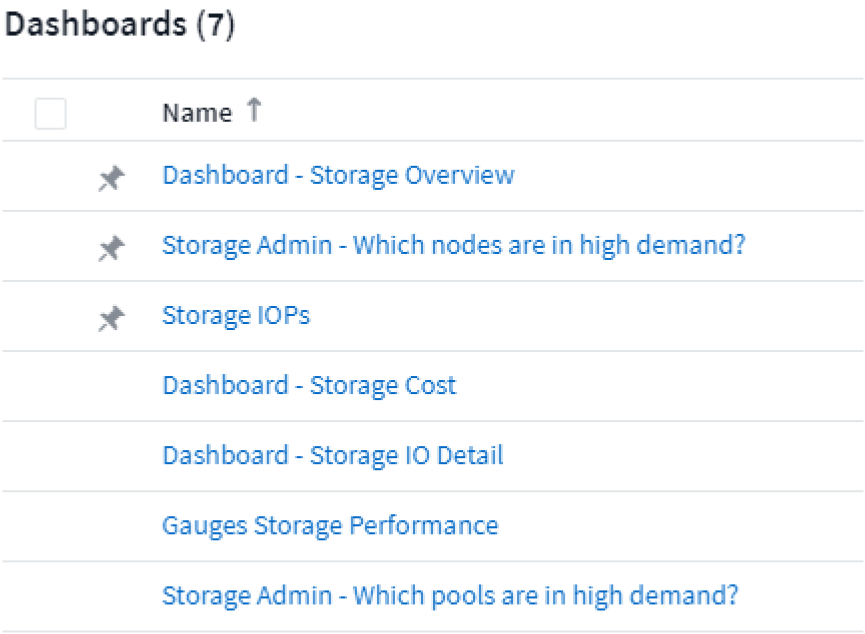
Remove dashboards from the current group in the same manner by selecting *Remove From Group*. You can not remove dashboards from the *All Dashboards* or *My Dashboards* group.

> Removing a dashboard from a group does not delete the dashboard from Cloud Insights. To completely remove a dashboard, select the dashboard and click *Delete*. This removes it from any groups to which it belonged and it is no longer available to any user.

Pin your Favorite Dashboards

You can further manage your dashboards by pinning favorite ones to the top of your dashboard list. To pin a dashboard, simply click the thumbtack button displayed when you hover over a dashboard in any list.

Dashboard pin/unpin is an individual user preference and independent of the group (or groups) to which the dashboard belongs.



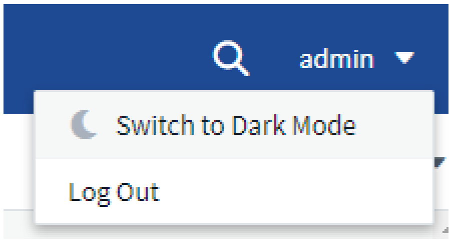
Dashboards (7)

☐		Name ↑
	📌	Dashboard - Storage Overview
	📌	Storage Admin - Which nodes are in high demand?
	📌	Storage IOPs
		Dashboard - Storage Cost
		Dashboard - Storage IO Detail
		Gauges Storage Performance
		Storage Admin - Which pools are in high demand?

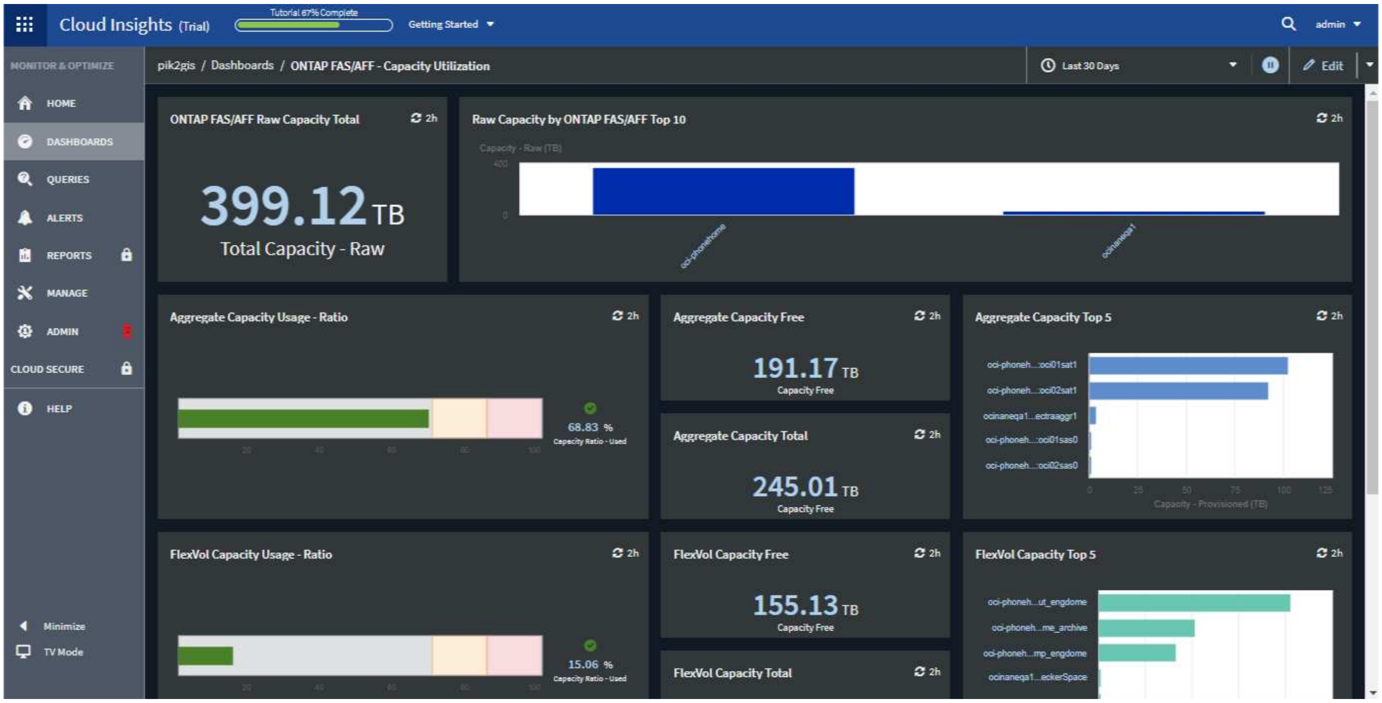
Dark Theme

You can choose to display Cloud Insights using either a light theme (the default), which displays most screens using a light background with dark text, or a dark theme which displays most screens using a dark background with light text.

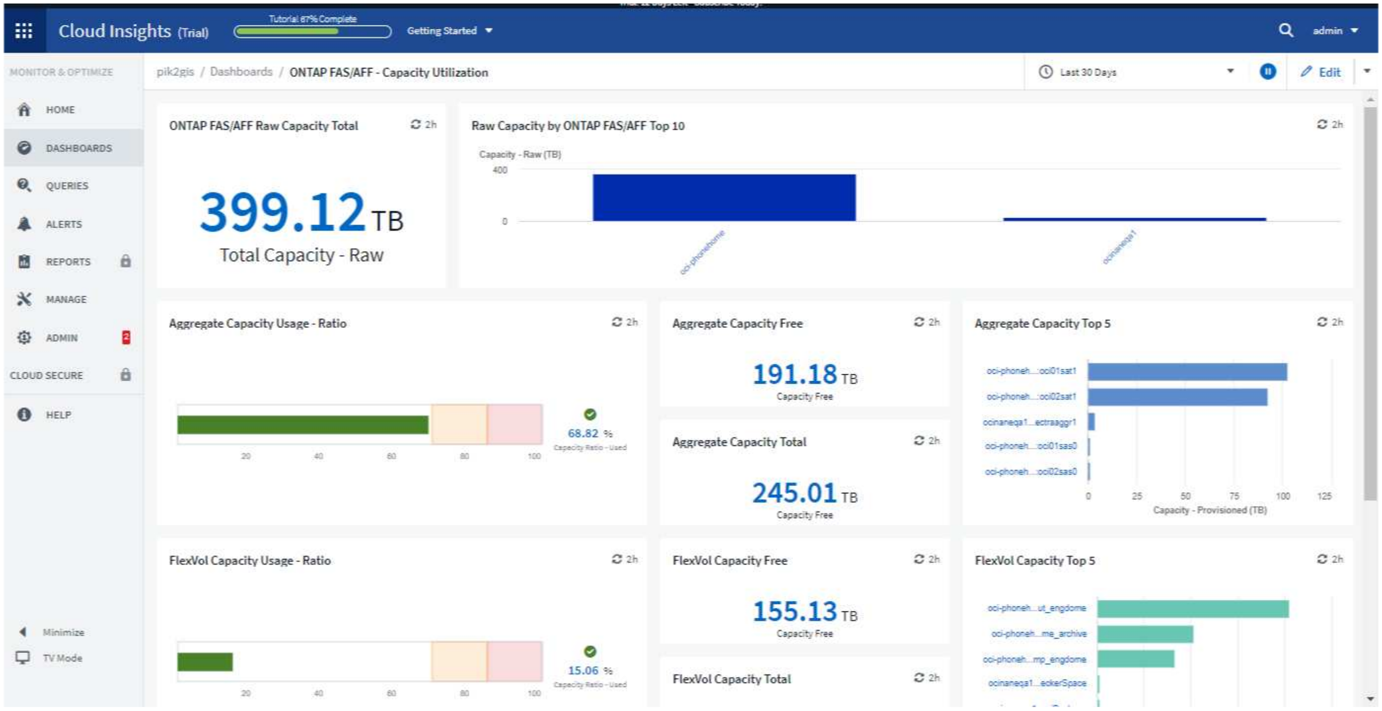
To switch between light and dark themes, click the username button in the upper right corner of the screen and choose the desired theme.



Dark Theme Dashboard view:



Light Theme Dashboard view:



Some screen areas, such as certain widget charts, still show light backgrounds even while viewed in dark theme.

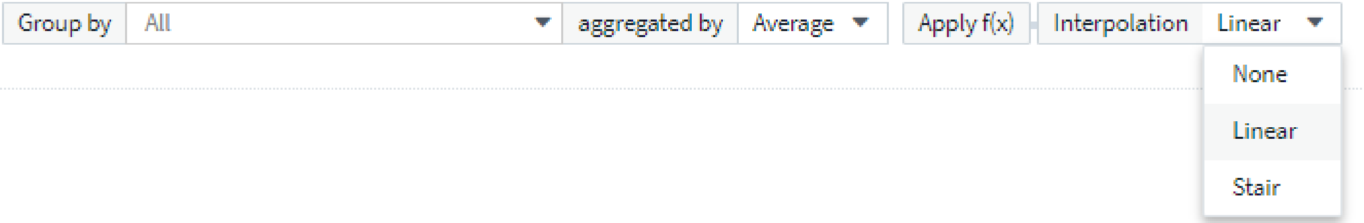
Line Chart interpolation

Different data collectors often poll their data at different intervals. For example, data collector A may poll every 15 minutes while data collector B polls every five minutes. When a line chart widget (also spline, area, and stacked area charts) is aggregating this data from multiple data collectors into a single line (for example, when the widget is grouping by "all"), and refreshing the line every five minutes, data from collector B may be shown accurately while data from collector A may have gaps, thus affecting the aggregate until collector A polls again.

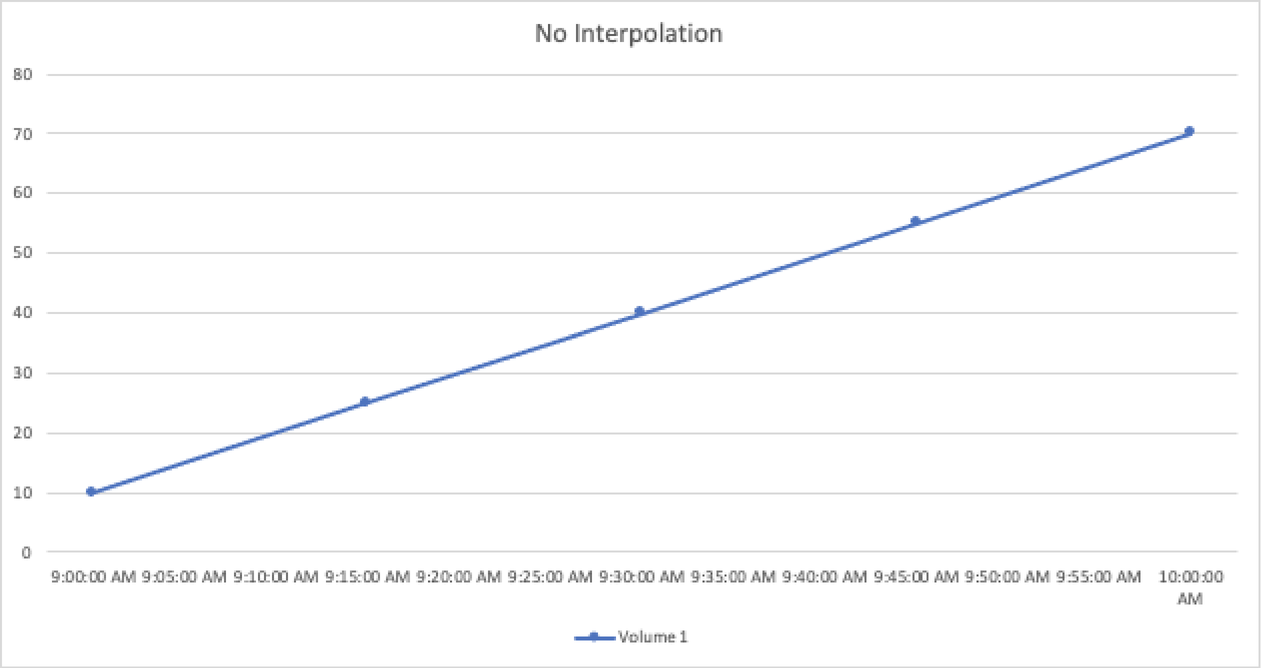
To alleviate this, Cloud Insights interpolates data when aggregating, using the surrounding data points to take a "best guess" at data until data collectors poll again. You can always view each data collector's object data individually by adjusting the widget's grouping.

Interpolation Methods

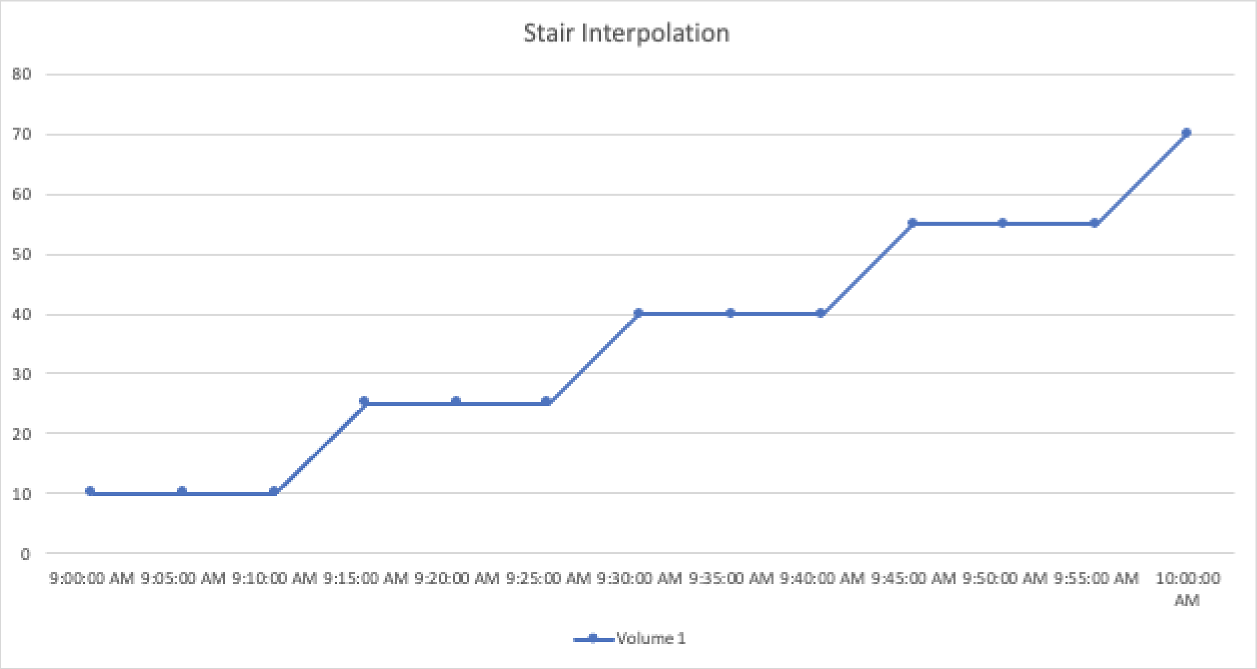
When creating or modifying a line chart (or spline, area, or stacked area chart), you can set the interpolation method to one of three types. In the "Group by" section, choose the desired Interpolation.



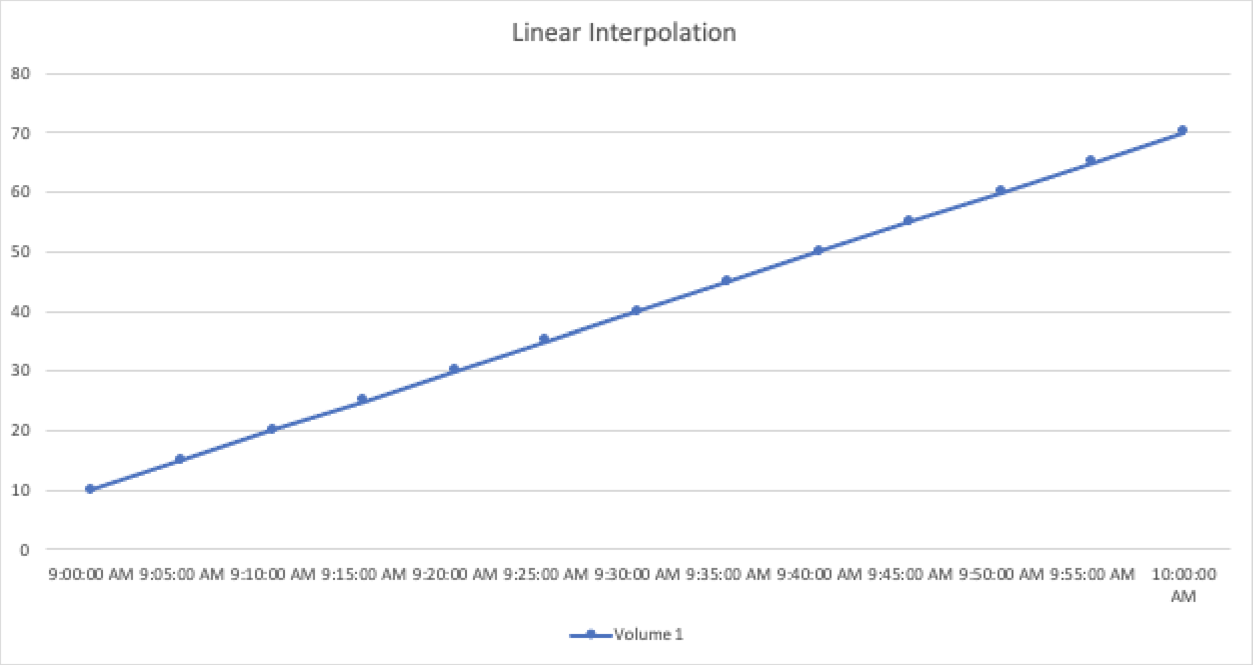
- **None**: Do nothing, i.e. do not generate points in between.



- **Stair**: A point is generated from the value of previous point. In a straight line, this would display as a typical "stair" layout.



- **Linear**: a point is generated as the value in between connecting the two points. Generates a line that looks like the line connecting the two points, but with additional (interpolated) data points.



Sample Dashboards

Dashboard Example: Virtual Machine Performance

There are many challenges facing IT operations today. Administrators are being asked to do more with less, and having full visibility into your dynamic data centers is a must. In this example, we will show you how to create a dashboard with widgets that give you operational insights into the virtual machine (VM) performance in your environment. By following this example, and creating widgets to target your own specific needs, you can do things like visualizing backend storage performance compared to frontend virtual machine performance, or viewing VM latency versus I/O demand.

About this task

Here we will create a Virtual Machine Performance dashboard containing the following:

- a table listing VM names and performance data
- a chart comparing VM Latency to Storage Latency
- a chart showing Read, Write and Total IOPS for VMs
- a chart showing Max Throughput for your VMs

This is just a basic example. You can customize your dashboard to highlight and compare any performance data you choose, in order to target for your own operational best practices.

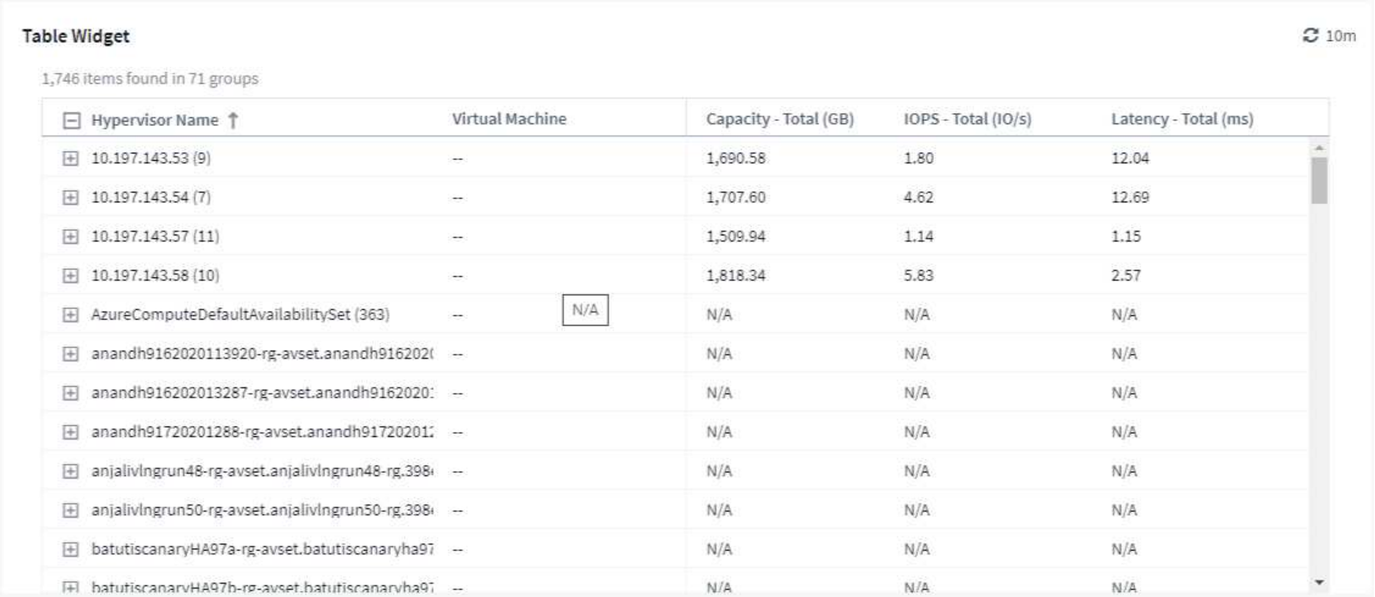
Steps

1. Log in to Insight as a user with administrative permissions.
2. From the **Dashboards** menu, select **[+New dashboard]**.

   The **New dashboard** page opens.

3. At the top of the page, enter a unique name for the dashboard, for example "VM Performance by Application".
4. Click **Save** to save the dashboard with the new name.
5. Let’s start adding our widgets. If necessary, click the **Edit** icon to enable Edit mode.
6. Click the **Add Widget** icon and select **Table** to add a new table widget to the dashboard.

   The Edit Widget dialog opens. The default data displayed is for all storages in your environment.



1,746 items found in 71 groups

Hypervisor Name	Virtual Machine	Capacity - Total (GB)	IOPS - Total (IO/s)	Latency - Total (ms)
10.197.143.53 (9)	--	1,690.58	1.80	12.04
10.197.143.54 (7)	--	1,707.60	4.62	12.69
10.197.143.57 (11)	--	1,509.94	1.14	1.15
10.197.143.58 (10)	--	1,818.34	5.83	2.57
AzureComputeDefaultAvailabilitySet (363)	-- N/A	N/A	N/A	N/A
anandh9162020113920-rg-avset.anandh916202(	--	N/A	N/A	N/A
anandh916202013287-rg-avset.anandh9162020:	--	N/A	N/A	N/A
anandh91720201288-rg-avset.anandh91720201:	--	N/A	N/A	N/A
anjalivlngrun48-rg-avset.anjalivlngrun48-rg.398	--	N/A	N/A	N/A
anjalivlngrun50-rg-avset.anjalivlngrun50-rg.398	--	N/A	N/A	N/A
batutiscanaryHA97a-rg-avset.batutiscanaryha97	--	N/A	N/A	N/A
batutiscanaryHA97b-rg-avset.batutiscanaryha97	--	N/A	N/A	N/A

1. We can customize this widget. In the Name field at the top, delete "Widget 1" and enter "Virtual Machine Performance table".

2. Click the asset type drop-down and change *Storage* to *Virtual Machine*.

   The table data changes to show all virtual machines in your environment.

3. Let’s add a few columns to the table. Click the Gear icon on the right and select *Hypervisor name*, *IOPS - Total*, and *Latency - Total*. You can also try typing the name into the search to quickly display the desired field.

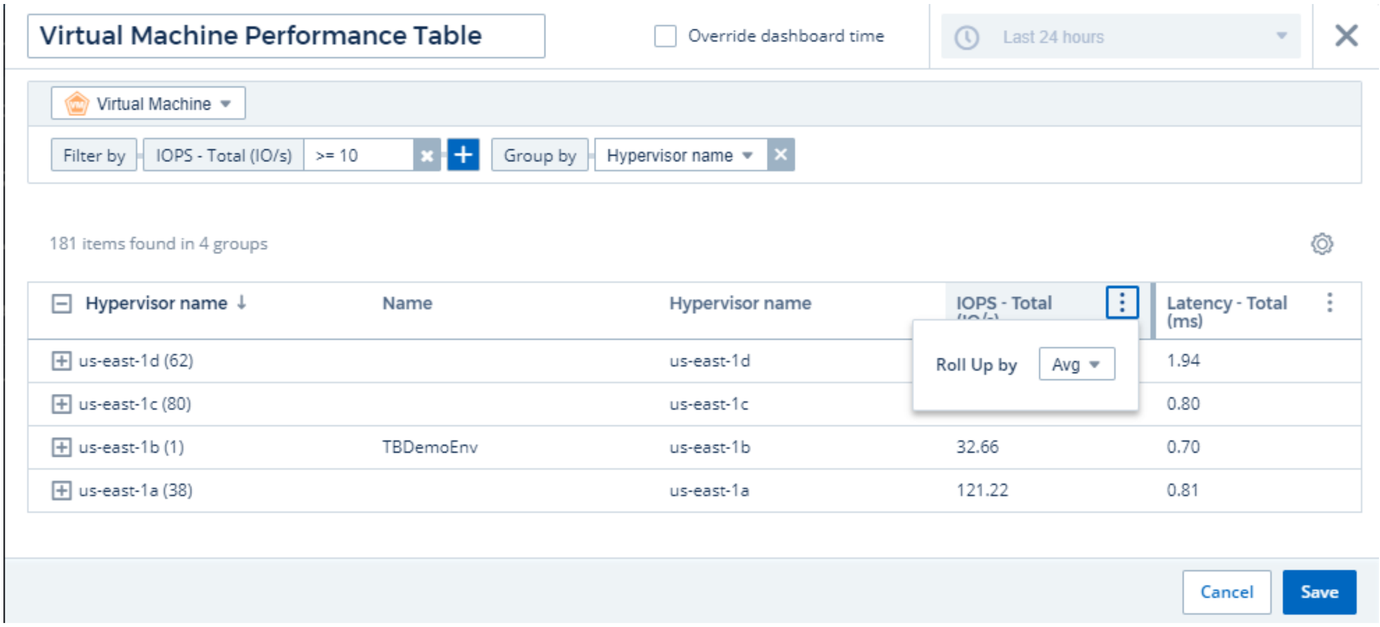
   These columns are now displayed in the table. You can sort the table by any of these columns. Note that the columns are displayed in the order in which they were added to the widget.

4. For this exercise we will exclude VMs that are not actively in use, so let’s filter out anything with less than 10 total IOPS. Click the **[+]** button next to **Filter by** and select *IOPS - Total*. Click on **Any** and enter "10" in the **from** field. Leave the **to** field empty. Click outsude the filter field or press Enter to set the filter.

   The table now shows only VMs with 10 or more total IOPS.

5. We can further collapse the table by grouping results. Click the **[+]** button next to **Group by** and select a field to group by, such as *Application* or *Hypervisor name*. Grouping is automatically applied.

   The table rows are now grouped according to your setting. You can expand and collapse the groups as needed. Grouped rows show rolled up data for each of the columns. Some columns allow you to choose the roll up method for that column.



Virtual Machine Performance Table

□ Override dashboard time

Last 24 hours

Virtual Machine

Filter by IOPS - Total (IO/s) >= 10

Group by Hypervisor name

181 items found in 4 groups

Hypervisor name ↓	Name	Hypervisor name	IOPS - Total (IO/s)	Latency - Total (ms)
us-east-1d (62)		us-east-1d		1.94
us-east-1c (80)		us-east-1c		0.80
us-east-1b (1)	TBDemoEnv	us-east-1b	32.66	0.70
us-east-1a (38)		us-east-1a	121.22	0.81

Roll Up by: Avg

1. When you have customized the table widget to your satisfaction, click the **[Save]** button.

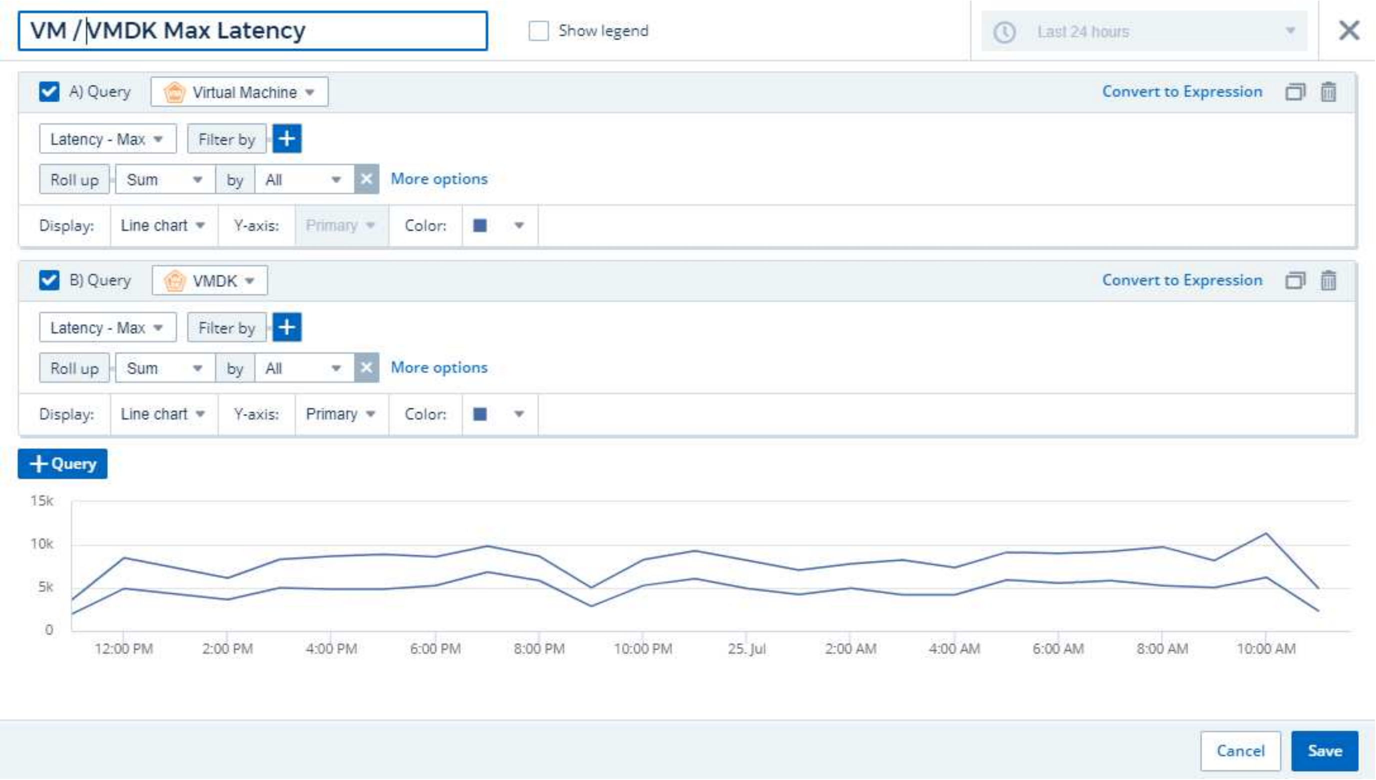
   The table widget is saved to the dashboard.

You can resize the widget on the dashboard by dragging the lower-right corner. Make the widget wider to show all the columns clearly. Click **Save** to save the current dashboard.

Next we will add some charts to show our VM Performance. Let’s create a line chart comparing VM latency with VMDK latency.

1. If necessary, click the **Edit** icon on the dashboard to enable Edit mode.

2. Click the **[Add widget]** icon and select *Line Chart* to add a new line chart widget to the dashboard.
3. The **Edit Widget** dialog opens. Name this widget "VM / VMDK Max Latency"
4. Select **Virtual Machine** and choose *Latency - Max*. Set any filters you wish, or leave **Filter by** empty. For **Roll up**, choose *Sum* by *All*. Display this data as a *Line Chart*, and leave *Y-Axis* as *Primary*.
5. Click the **[+Query]** button to add a second data line. For this line, select *VMDK* and *Latency - Max*. Set any filters you wish, or leave **Filter by** empty. For **Roll up**, choose *Sum* by *All*. Display this data as a *Line Chart*, and leave *Y-Axis* as *Primary*.
6. Click **[Save]** to add this widget to the dashboard.



VM / VMDK Max Latency

☐ Show legend

☑ A) Query Virtual Machine

Latency - Max Filter by

Roll up Sum by All

Display: Line chart Y-axis: Primary

☑ B) Query VMDK

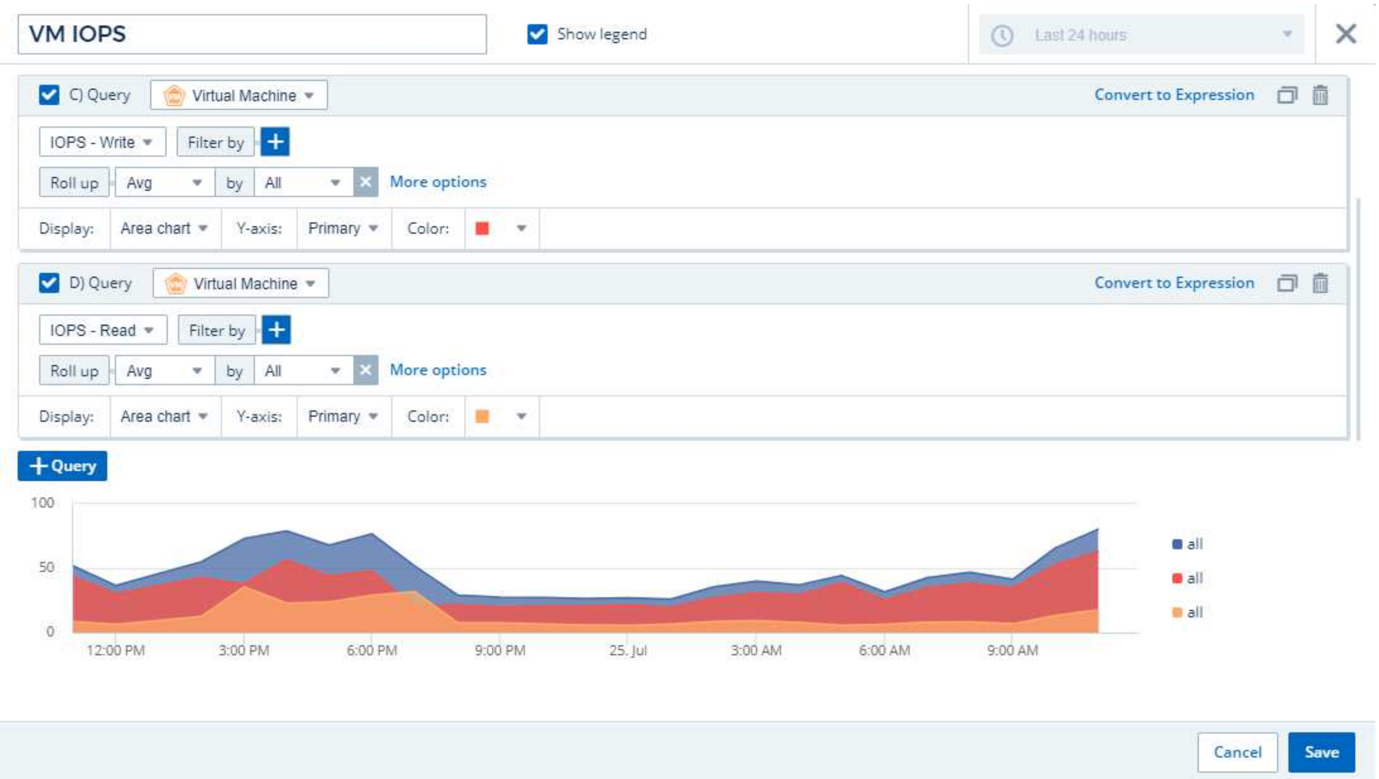
Latency - Max Filter by

Roll up Sum by All

Display: Line chart Y-axis: Primary

Next we will add a chart showing VM Read, Write and Total IOPS in a single chart.

1. Click the **[Add widget]** icon and select *Area Chart* to add a new area chart widget to the dashboard.
2. The Edit Widget dialog opens. Name this widget "VM IOPS"
3. Select **Virtual Machine** and choose *IOPS - Total*. Set any filters you wish, or leave **Filter by** empty. for **Roll up**, choose *Sum* by *All*. Display this data as an *Area Chart*, and leave *Y-Axis* as *Primary*.
4. Click the **[+Query]** button to add a second data line. For this line, select **Virtual Machine** and choose *IOPS - Read*.
5. Click the **[+Query]** button to add a third data line. For this line, select **Virtual Machine** and choose *IOPS - Write*.
6. Click **Show legend** to display a legend for this widget on the dashboard.



VM IOPS

☑ Show legend

Last 24 hours

☑ C) Query Virtual Machine

IOPS - Write Filter by

Roll up Avg by All

Display: Area chart Y-axis: Primary Color: 🟥

☑ D) Query Virtual Machine

IOPS - Read Filter by

Roll up Avg by All

Display: Area chart Y-axis: Primary Color: 🟧

1. Click **[Save]** to add this widget to the dashboard.

Next we will add a chart showing VM Throughput for each Application associated with the VM. We will use the Roll Up feature for this.

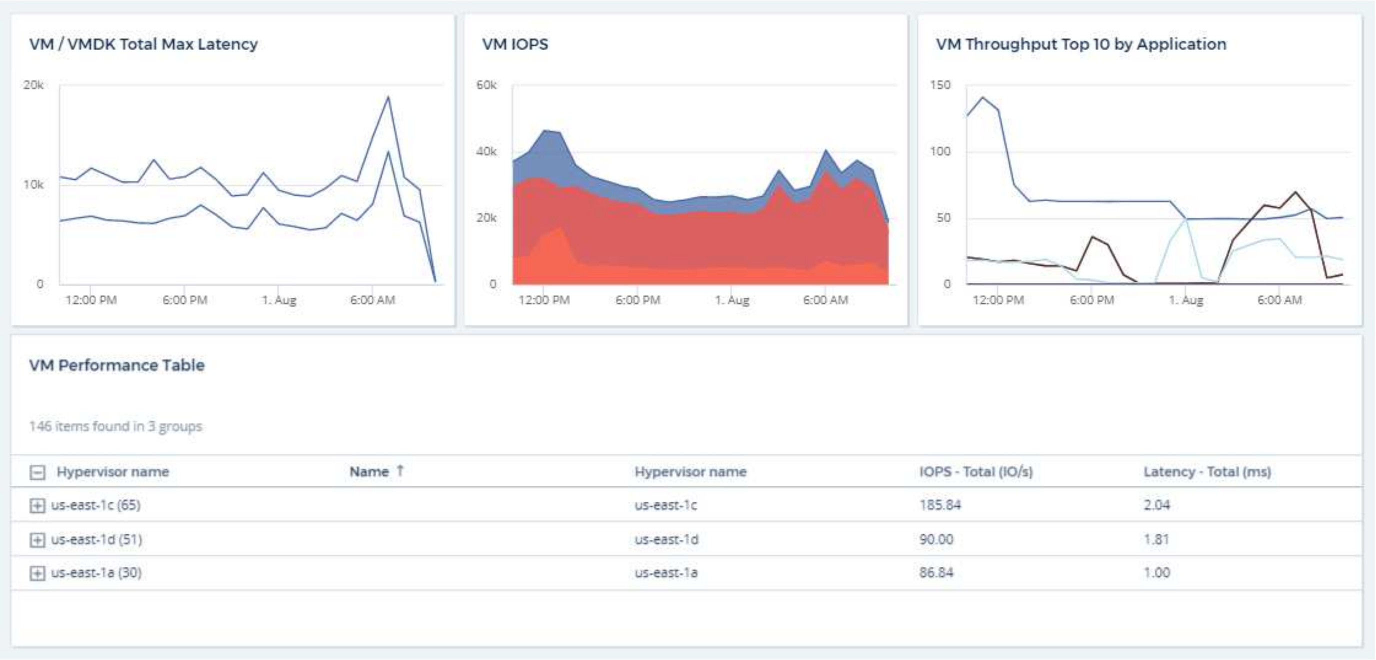
1. Click the **[Add widget]** icon and select *Line Chart* to add a new line chart widget to the dashboard.
2. The Edit Widget dialog opens. Name this widget "VM Throughput by Application"
3. Select Virtual Machine and choose Throughput - Total. Set any filters you wish, or leave Filter by empty. For Roll up, choose "Max" and select by "Application" or "Name". Show the Top 10 applications. Display this data as a Line Chart, and leave Y-Axis as Primary.
4. Click **[Save]** to add this widget to the dashboard.

You can move widgets on the dashboard by holding down the mouse button anywhere in the top of the widget and dragging it to a new location.

You can resize widgets by dragging the lower-right corner.

Be sure to **[Save]** the dashboard after you make your changes.

Your final VM Performance Dashboard will look something like this:



VM Performance Table

146 items found in 3 groups

⊟ Hypervisor name	Name ↑	Hypervisor name	IOPS - Total (IO/s)	Latency - Total (ms)
⊞ us-east-1c (65)		us-east-1c	185.84	2.04
⊞ us-east-1d (51)		us-east-1d	90.00	1.81
⊞ us-east-1a (30)		us-east-1a	86.84	1.00

Best Practices for Dashboards and Widgets

Tips and tricks to help you get the most out of the powerful features of dashboards and widgets.

Finding the Right Metric

Cloud Insights acquires counters and metrics using names that sometimes differ from data collector to data collector.

When searching for the right metric or counter for your dashboard widget, keep in mind that the metric you want could be under a different name from the one you are thinking of. While drop-down lists in Cloud Insights are usually alphabetical, sometimes a term may not show up in the list where you think it should. For example, terms like "raw capacity" and "used capacity" do not appear together in most lists.

Best practice: Use the search feature in fields such as Filter by or places like the column selector to find what you are looking for. For example, searching for "cap" will show all metrics with "capacity" in their names, no matter where they occur in the list. You can then easily select the metrics you want from that shorter list.

Here are a few alternative phrases you can try when searching for metrics:

When you want to find:	Try also searching for:
CPU	Processor
Capacity	Used capacity Raw capacity Provisioned capacity Storage pools capacity <other asset type> capacity Written capacity

Disk Speed	Lowest disk speed Least performing disk type
Host	Hypervisor Hosts
Hypervisor	Host Is hypervisor
Microcode	Firmware
Name	Alias Hypervisor name Storage name <other asset type> name Simple name Resource name Fabric Alias
Read / Write	Partial R/W Pending writes IOPS - Write Written capacity Latency - Read Cache utilization - read
Virtual Machine	VM Is virtual

This is not a comprehensive list. These are examples of possible search terms only.

Finding the Right Assets

The assets you can reference in widget filters and searches vary from asset type to asset type.

In dashboards and asset pages, the asset type around which you are building your widget determines the other asset type counters for which you can filter or add a column. Keep the following in mind when building your widget:

This asset type / counter:	Can be filtered for under these assets:
Virtual Machine	VMDK
Datastore(s)	Internal Volume VMDK Virtual Machine Volume
Hypervisor	Virtual Machine Is hypervisor Host
Host(s)	Internal Volume Volume Cluster Host Virtual Machine

Fabric	Port

This is not a comprehensive list.

Best practice: If you are filtering for a particular asset type that does not appear in the list, try building your query around an alternate asset type.

Scatter Plot Example: Knowing your Axis

Changing the order of counters in a scatter plot widget changes the axes on which the data is displayed.

About this task

This example will create a scatter plot that will allow you to see under-performing VMs that have high latency compared to low IOPS.

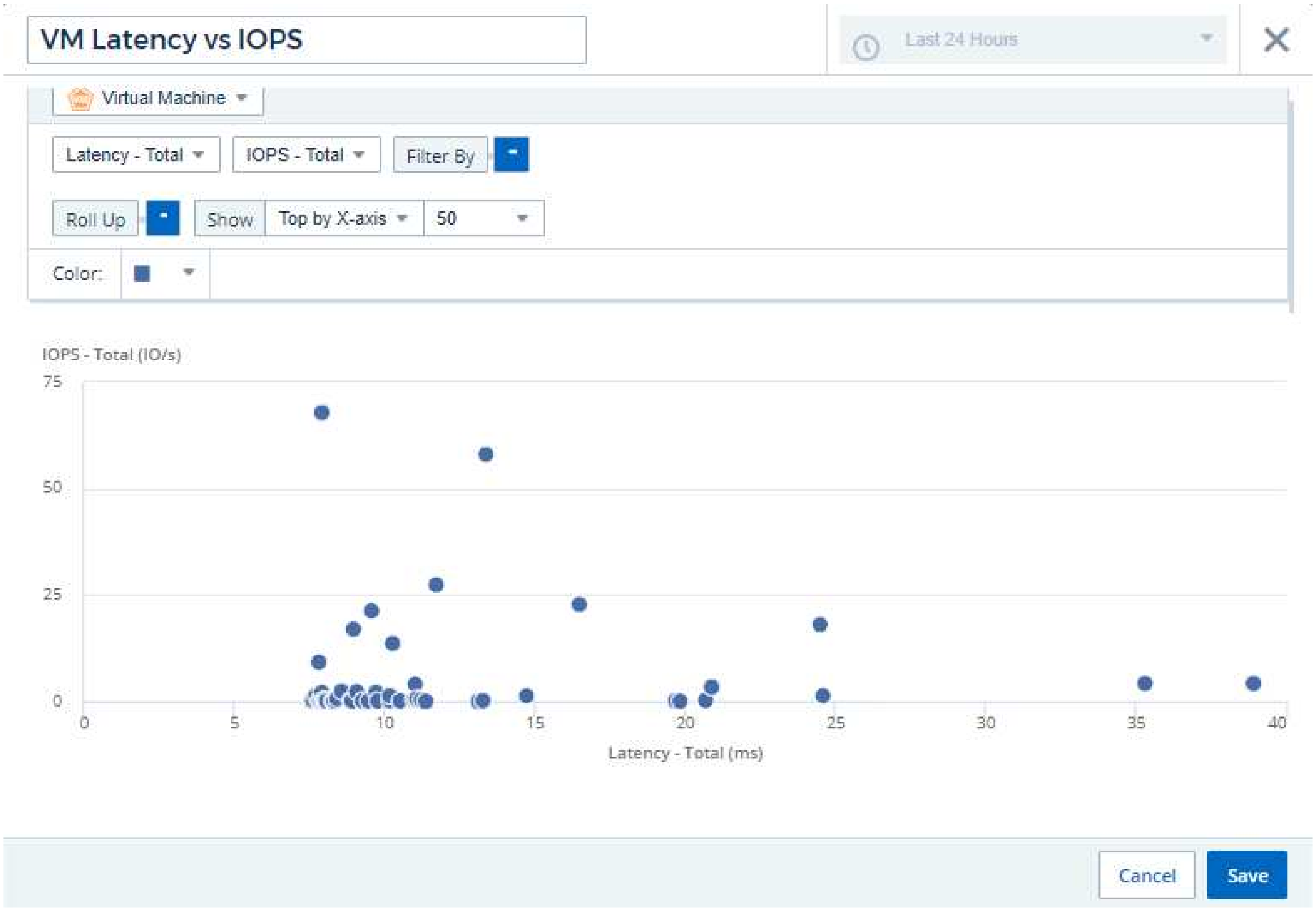
Steps

1. Create or open a dashboard in edit mode and add a **Scatter Plot Chart** widget.
2. Select an asset type, for example, *Virtual Machine*.
3. Select the first counter you wish to plot. For this example, select *Latency - Total*.

   Latency - Total is charted along the X-axis of the chart.

4. Select the second counter you wish to plot. For this example, select *IOPS - Total*.

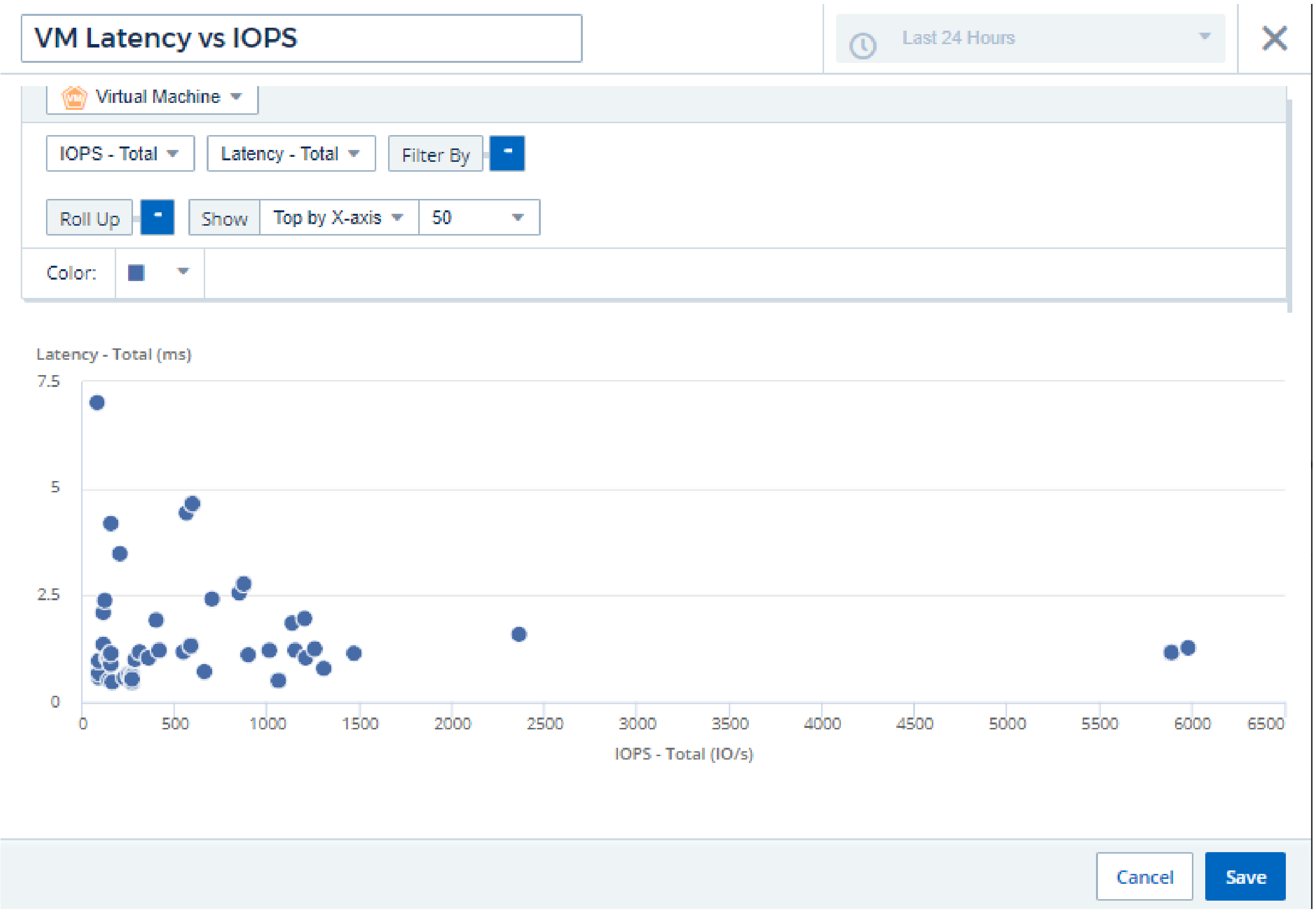
   IOPS - Total is charted along the Y-axis in the chart. VMs with higher latency display on the right side of the chart. Only the top 100 highest-latency VMs are displayed, because the **Top by X-axis** setting is current.



5. Now reverse the order of the counters by setting the first counter to *IOPS - Total* and the second to *Latency - Total*.

   Latency- Total is now charted along the Y-axis in the chart, and *IOPS - Total* along the X-axis. VMs with higher IOPS now display on the right side of the chart.

   Note that because we haven’t changed the **Top by X-Axis** setting, the widget now displays the top 100 highest-IOPS VMs, since this is what is currently plotted along the X-axis.



VM Latency vs IOPS

Last 24 Hours

Virtual Machine

IOPS - Total

Latency - Total

Filter By

Roll Up

Show: Top by X-axis, 50

Color: ■

You can choose for the chart to display the Top N by X-axis, Top N by Y-axis, Bottom N by X-axis, or Bottom N by Y-axis. In our final example, the chart is displaying the Top 100 VMs that have the highest total IOPS. If we change it to **Top by Y-axis**, the chart will once again display the top 100 VMs that have the highest total latency.

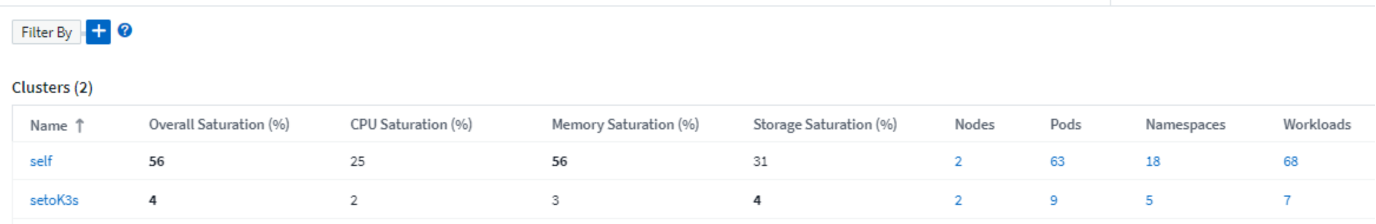
Note that in a scatter plot chart, you can click on a point to drill down to the asset page for that resource.

Kubernetes

Kubernetes Cluster Overview

The Cloud Insights Kubernetes Explorer is a powerful tool for displaying the overall health and usage of your Kubernetes clusters and allows you to easily drill down into areas of investigation.

Clicking on **Dashboards > Kubernetes Explorer** opens the Kubernetes Cluster list page. This overview page contains table of the Kubernetes clusters in your environment.



Clusters (2)

Name ↑	Overall Saturation (%)	CPU Saturation (%)	Memory Saturation (%)	Storage Saturation (%)	Nodes	Pods	Namespaces	Workloads
self	56	25	56	31	2	63	18	68
setoK3s	4	2	3	4	2	9	5	7

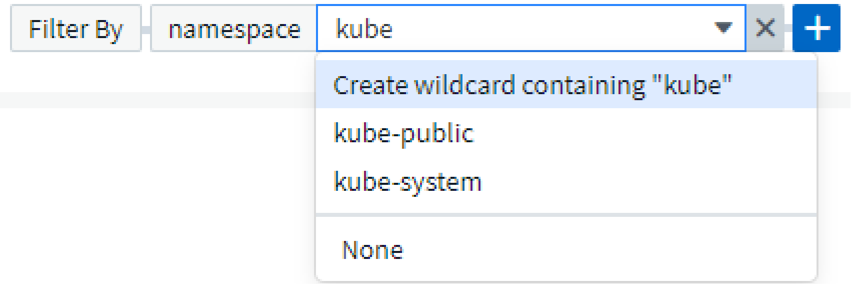
Cluster list

The cluster list displays the following information for each cluster in your environment:

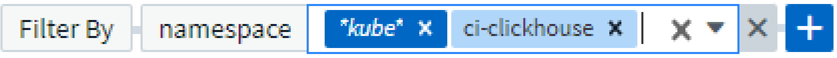
- Cluster **Name**. Clicking on a cluster name will open the detail page for that cluster.
- **Saturation** percentages. Overall Saturation is the highest of CPU, Memory, or Storage Saturation.
- Number of **Nodes** in the cluster. Clicking this number will open the Node list page.
- Number of **Pods** in the cluster. Clicking this number will open the Pod list page.
- Number of **Namespaces** in the cluster. Clicking this number will open the Namespace list page.
- Number of **Workloads** in the cluster. Clicking this number will open the Workload list page.

Refining the Filter

When you are filtering, as you begin typing you are presented with the option to create a **wildcard filter** based on the current text. Selecting this option will return all results that match the wildcard expression. You can also create **expressions** using NOT or AND, or you can select the "None" option to filter for null values in the field.



Filters based on wildcards or expressions (e.g. NOT, AND, "None", etc.) display in dark blue in the filter field. Items that you select directly from the list are displayed in light blue.



Kubernetes filters are contextual, meaning for example that if you are on a specific node page, the pod_name filter only lists pods related to that node. Moreover, if you apply a filter for a specific namespace, then the pod_name filter will list only pods on that node *and* in that namespace.

Note that Wildcard and Expression filtering works with text or lists but not with numerics, dates or booleans.

Before Installing or Upgrading the NetApp Kubernetes Monitoring Operator

Read this information before installing ot upgrading your NetApp Kubernetes Monitoring Operator

Pre-requisites:

- If you are using a custom or private docker repository, follow the instructions in the Using a custom or private docker repository section
- NetApp Kubernetes Monitoring Operator installation is supported with Kubernetes version 1.20 or greater.
- When Cloud Insights is monitoring the backend storage and Kubernetes is used with the Docker container runtime, Cloud Insights can display pod-to-PV-to-storage mappings and metrics for NFS and iSCSI; other runtimes only show NFS.
- Beginning August 2022, the NetApp Kubernetes Monitoring Operator includes support for Pod Security Policy (PSP). You must upgrade to the latest NetApp Kubernetes Monitoring Operator if your environment uses PSP.
- If you are running on OpenShift 4.6 or higher, you must follow the OpenShift Instructions below in addition to ensuring these pre-requisites are met.
- Monitoring is only installed on Linux nodes
  Cloud Insights supports monitoring of Kubernetes nodes that are running Linux, by specifying a Kubernetes node selector that looks for the following Kubernetes labels on these platforms:

Platform	Label
Kubernetes v1.20 and above	Kubernetes.io/os = linux
Rancher + cattle.io as orchestration/Kubernetes platform	cattle.io/os = linux

- The NetApp Kubernetes Monitoring Operator and its dependencies (telegraf, kube-state-metrics, fluentbit, etc.) are not supported on nodes that are running with Arm64 architecture.
- The following commands must be available: curl, kubectl. The docker command is required for an optional installation step. For best results, add these commands to the PATH. Note that kubectl needs to be configured with access to the following kubernetes objects at a minimum: agents, clusterroles, clusterrolebindings, customresourcedefinitions, deployments, namespaces, roles, rolebindings, secrets, serviceaccounts, and services. See here for an example .yaml file with these minimum clusterrole privileges.
- The host you will use for the NetApp Kubernetes Monitoring Operator installation must have kubectl configured to communicate with the target K8s cluster, and have Internet connectivity to your Cloud Insights environment.

- If you are behind a proxy during installation, or when operating the K8s cluster to be monitored, follow the instructions in the Configuring Proxy Support section.
- The NetApp Kubernetes Monitoring Operator installs its own kube-state-metrics to avoid conflict with any other instances.
  For accurate audit and data reporting, it is strongly recommended to synchronize the time on the Agent machine using Network Time Protocol (NTP) or Simple Network Time Protocol (SNTP).
- If you are re-deploying the Operator (i.e. you are updating or replacing it), there is no need to create a *new* API token; you can re-use the previous token.
- Also note that if you have a recent NetApp Kubernetes Monitoring Operator installed and are using an API access token that is renewable, expiring tokens will automatically be replaced by new/refreshed API access tokens.
- Network monitoring:
  - Requires Linux kernel version 4.18.0 and above
  - Photon OS is not supported.

Configuring the Operator

In newer versions of the operator, most commonly modified settings can be configured in the *AgentConfiguration* custom resource. You can edit this resource before deploying the operator by editing the *operator-config.yaml* file. This file includes commented out examples of some settings. See the list of available settings for the most recent version of the operator.

You can also edit this resource after the operator has been deployed using the following command:

```
kubectl -n netapp-monitoring edit AgentConfiguration
```

To determine if your deployed version of the operator supports AgentConfiguration, run the following command:

```
kubectl get crd agentconfigurations.monitoring.netapp.com
```

If you see an “Error from server (NotFound)” message, your operator must be upgraded before you can use the AgentConfiguration.

Important Things to Note Before You Start

If you are running with a proxy, have a custom repository, or are using OpenShift, read the following sections carefully.

Also read about Permissions.

If you are upgrading from a previous installation, read the Upgrading information.

Configuring Proxy Support

There are two places where you may use a proxy in your environment in order to install the NetApp Kubernetes Monitoring Operator. These may be the same or separate proxy systems:

- Proxy needed during execution of the installation code snippet (using "curl") to connect the system where the snippet is executed to your Cloud Insights environment
- Proxy needed by the target Kubernetes cluster to communicate with your Cloud Insights environment

If you use a proxy for either or both of these, to install the NetApp Kubernetes Operating Monitor you must first ensure that your proxy is configured to allow good communication to your Cloud Insights environment. For example, from the servers/VMs from which you wish to install the Operator, you need to be able to access Cloud Insights and be able to download binaries from Cloud Insights.

For the proxy used to install the NetApp Kubernetes Operating Monitor, before installing the Operator, set the *http_proxy/https_proxy* environment variables. For some proxy environments, you may also need to set the *no_proxy environment* variable.

To set the variable(s), perform the following steps on your system **before** installing the NetApp Kubernetes Monitoring Operator:

1. Set the *https_proxy* and/or *http_proxy* environment variable(s) for the current user:
   a. If the proxy being setup does not have Authentication (username/password), run the following command:

      ```
      export https_proxy=<proxy_server>:<proxy_port>
      ```

   b. If the proxy being setup does have Authentication (username/password), run this command:

      ```
      export
      http_proxy=<proxy_username>:<proxy_password>@<proxy_server>:<proxy_po
      rt>
      ```

For the proxy used for your Kubernetes cluster to communicate with your Cloud Insights environment, install the NetApp Kubernetes Monitoring Operator after reading all of these instructions.

Configure the proxy section of AgentConfiguration in operator-config.yaml before deploying the NetApp Kubernetes Monitoring Operator.

```
agent:
  ...
  proxy:
    server: <server for proxy>
    port: <port for proxy>
    username: <username for proxy>
    password: <password for proxy>

    # In the noproxy section, enter a comma-separated list of
    # IP addresses and/or resolvable hostnames that should bypass
    # the proxy
    noproxy: <comma separated list>

    isTelegrafProxyEnabled: true
    isFluentbitProxyEnabled: <true or false> # true if Events Log enabled
    isCollectorsProxyEnabled: <true or false> # true if Network
Performance and Map enabled
    isAuProxyEnabled: <true or false> # true if AU enabled
  ...
...
```

Using a custom or private docker repository

By default, the NetApp Kubernetes Monitoring Operator will pull container images from the Cloud Insights repository. If you have a Kubernetes cluster used as the target for monitoring, and that cluster is configured to only pull container images from a custom or private Docker repository or container registry, you must configure access to the containers needed by the NetApp Kubernetes Monitoring Operator.

Run the “Image Pull Snippet” from the NetApp Monitoring Operator install tile. This command will log into the Cloud Insights repository, pull all image dependencies for the operator, and log out of the Cloud Insights repository. When prompted, enter the provided repository temporary password. This command downloads all images used by the operator, including for optional features. See below for which features these images are used for.

Core Operator Functionality and Kubernetes Monitoring

- netapp-monitoring
- kube-rbac-proxy
- kube-state-metrics
- telegraf
- distroless-root-user

Events Log

- fluent-bit
- kubernetes-event-exporter

Network Performance and Map

- ci-net-observer

Push the operator docker image to your private/local/enterprise docker repository according to your corporate policies. Ensure that the image tags and directory paths to these images in your repository are consistent with those in the Cloud Insights repository.

Edit the monitoring-operator deployment in operator-deployment.yaml, and modify all image references to use your private Docker repository.

```
image: <docker repo of the enterprise/corp docker repo>/kube-rbac-
proxy:<kube-rbac-proxy version>
image: <docker repo of the enterprise/corp docker repo>/netapp-
monitoring:<version>
```

Edit the AgentConfiguration in operator-config.yaml to reflect the new docker repo location. Create a new imagePullSecret for your private repository, for more details see *https://kubernetes.io/docs/tasks/configure-pod-container/pull-image-private-registry/*

```
agent:
  ...
  # An optional docker registry where you want docker images to be pulled
from as compared to CI's docker registry
  # Please see documentation link here: https://docs.netapp.com/us-
en/cloudinsights/task_config_telegraf_agent_k8s.html#using-a-custom-or-
private-docker-repository
  dockerRepo: your.docker.repo/long/path/to/test
  # Optional: A docker image pull secret that maybe needed for your
private docker registry
  dockerImagePullSecret: docker-secret-name
```

OpenShift Instructions

If you are running on OpenShift 4.6 or higher, you must edit the AgentConfiguration in *operator-config.yaml* to enable the *runPrivileged* setting:

```
# Set runPrivileged to true SELinux is enabled on your kubernetes nodes
runPrivileged: true
```

Openshift may implement an added level of security that may block access to some Kubernetes components.

Permissions

If the cluster you are monitoring contains Custom Resources which do not have a ClusterRole which aggregates to view, you will need to manually grant the operator access to these resources to monitor them with Event Logs.

1. Edit *operator-additional-permissions.yaml* before installing, or after installing edit the resource *ClusterRole/<namespace>-additional-permissions*
2. Create a new rule for the desired apiGroups and resources with the verbs ["get", "watch", "list"]. See https://kubernetes.io/docs/reference/access-authn-authz/rbac/
3. Apply your changes to the cluster

Tolerations and Taints

The *netapp-ci-telegraf-ds*, *netapp-ci-fluent-bit-ds*, and *netapp-ci-net-observer-l4-ds* DaemonSets must schedule a pod on every node in your cluster in order to correctly collect data on all nodes. The operator has been configured to tolerate some well known **taints**. If you have configured any custom taints on your nodes, thus preventing pods from running on every node, you can create a **toleration** for those taints in the *AgentConfiguration*. If you have applied custom taints to all nodes in your cluster, you must also add the necessary tolerations to the operator deployment to allow the operator pod to be scheduled and executed.

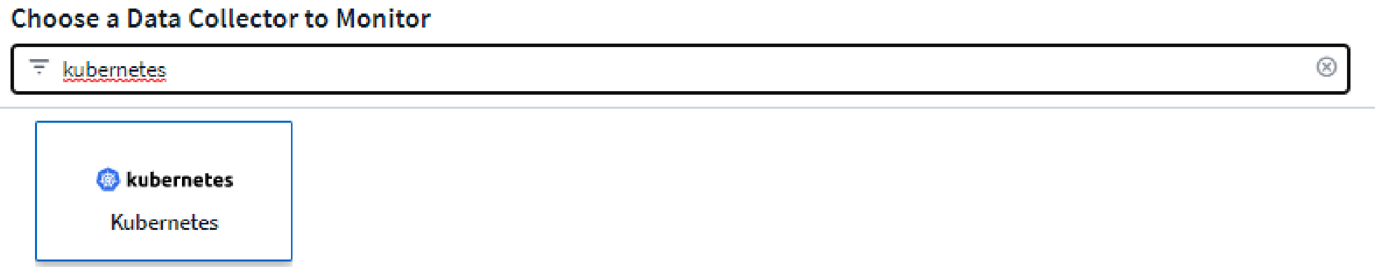
Learn More about Kubernetes Taints and Tolerations.

Return to the **NetApp Kubernetes Monitoring Operator Installation** page

Kubernetes Monitoring Operator Installation and Configuration

Cloud Insights offers the **NetApp Kubernetes Monitoring Operator** (NKMO) for Kubernetes collection. When adding a data collector, simply choose the "Kubernetes" tile.

If you have Cloud Insights Federal Edition, your installation and configuration instructions may be different than the instructions on this page. Follow the instructions in Cloud Insights to install the NetApp Kubernetes Monitoring Operator.



Choose a Data Collector to Monitor

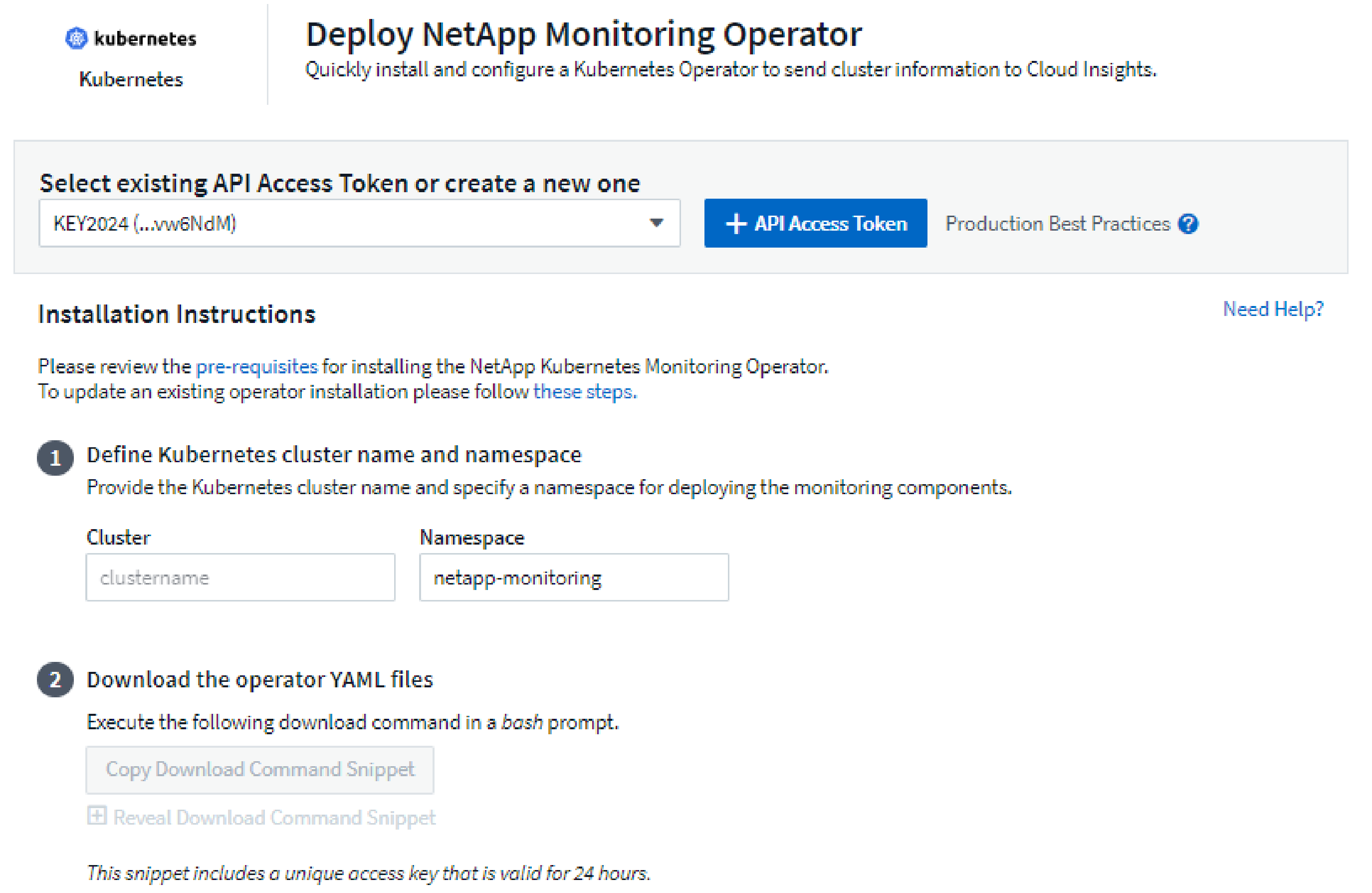
kubernetes

The Kubernetes Operator and the data collectors are downloaded from the Cloud Insights Docker Registry. Once installed, the Operator then manages any Operator-compatible collectors deployed in the Kubernetes cluster nodes to acquire data, including managing the life cycle of those collectors. Following this chain, data is acquired from the collectors and sent through to Cloud Insights.

Before installing the NetApp Kubernetes Monitoring Operator

Read the **Before Installing or Upgrading** pre-requisites documentation before installing or upgrading the NetApp Kubernetes Monitoring Operator.

Installing the NetApp Kubernetes Monitoring Operator



Deploy NetApp Monitoring Operator

Quickly install and configure a Kubernetes Operator to send cluster information to Cloud Insights.

Select existing API Access Token or create a new one

KEY2024 (...vw6NdM)

Installation Instructions

Please review the pre-requisites for installing the NetApp Kubernetes Monitoring Operator.
To update an existing operator installation please follow these steps.

1 Define Kubernetes cluster name and namespace

Provide the Kubernetes cluster name and specify a namespace for deploying the monitoring components.

Cluster: clustername

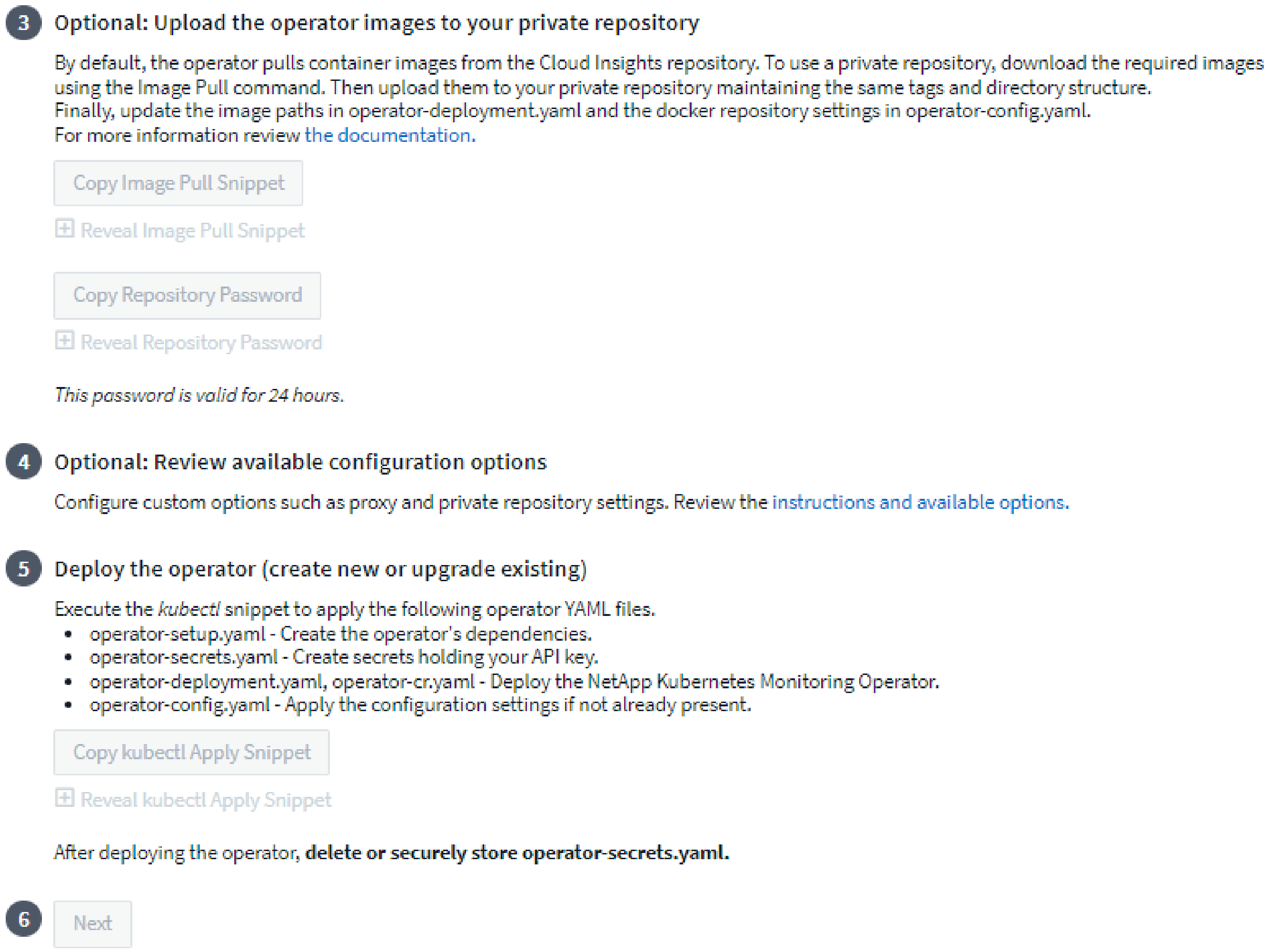
Namespace: netapp-monitoring

2 Download the operator YAML files

Execute the following download command in a *bash* prompt.

Copy Download Command Snippet
⊞ Reveal Download Command Snippet

This snippet includes a unique access key that is valid for 24 hours.



3 Optional: Upload the operator images to your private repository

By default, the operator pulls container images from the Cloud Insights repository. To use a private repository, download the required images using the Image Pull command. Then upload them to your private repository maintaining the same tags and directory structure.
Finally, update the image paths in operator-deployment.yaml and the docker repository settings in operator-config.yaml.
For more information review the documentation.

This password is valid for 24 hours.

4 Optional: Review available configuration options

Configure custom options such as proxy and private repository settings. Review the instructions and available options.

5 Deploy the operator (create new or upgrade existing)

Execute the *kubectl* snippet to apply the following operator YAML files.

- operator-setup.yaml - Create the operator's dependencies.
- operator-secrets.yaml - Create secrets holding your API key.
- operator-deployment.yaml, operator-cr.yaml - Deploy the NetApp Kubernetes Monitoring Operator.
- operator-config.yaml - Apply the configuration settings if not already present.

After deploying the operator, **delete or securely store operator-secrets.yaml.**

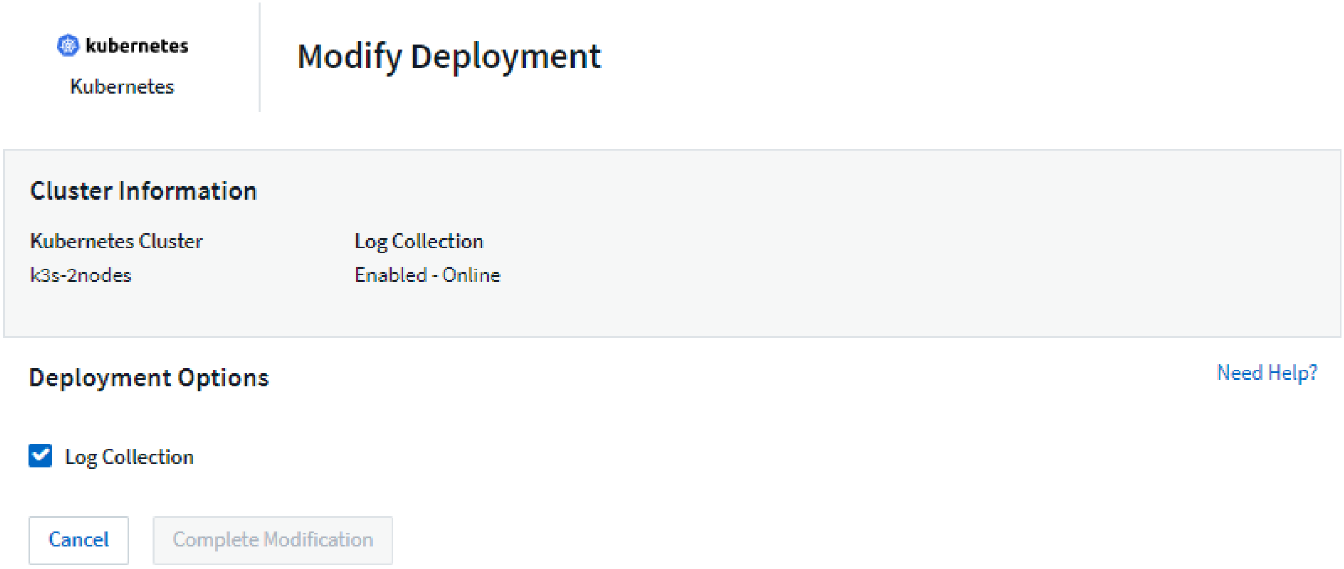
Steps to install NetApp Kubernetes Monitoring Operator agent on Kubernetes:

1. Enter a unique cluster name and namespace. If you are upgrading from a previous Kubernetes Operator, use the same cluster name and namespace.
2. Once these are entered, you can copy the Download Command snippet to the clipboard.
3. Paste the snippet into a *bash* window and execute it. The Operator installation files will be downloaded. Note that the snippet has a unique key and is valid for 24 hours.
4. If you have a custom or private repository, copy the optional Image Pull snippet, paste it into a *bash* shell and execute it. Once the images have been pulled, copy them to your private repository. Be sure to maintain the same tags and folder structure. Update the paths in *operator-deployment.yaml* as well as the docker repository settings in *operator-config.yaml*.
5. If desired, review available configuration options such as proxy or private repository settings. You can read more about configuration options.
6. When you are ready, deploy the Operator by copying the kubectl Apply snippet, downloading it, and executing it.
7. The installation proceeds automatically. When it is complete, click the *Next* button.
8. When installation is complete, click the *Next* button. Be sure to also delete or securely store the *operator-secrets.yaml* file.

Read more about configuring proxy.

Read more about using a custom/private docker repository.

Kubernetes EMS log collection is enabled by default when installing the NetApp Kubernetes Monitoring Operator. To disable this collection following installation, click the **Modify Deployment** button at the top of the Kubernetes cluster detail page, and un-select "Log collection".



kubernetes
Kubernetes

Modify Deployment

Cluster Information

Kubernetes Cluster
k3s-2nodes

Log Collection
Enabled - Online

Deployment Options

☑ Log Collection

This screen also shows current Log Collection status. Below are the possible states:

- Disabled
- Enabled
- Enabled - Installation in progress
- Enabled - Offline
- Enabled - Online
- Error - API Key has insufficient permissions

Upgrading

Upgrading to the latest NetApp Kubernetes Monitoring Operator

Determine whether an AgentConfiguration exists with the existing Operator (if your namespace is not the default *netapp-monitoring*, substitute the appropriate namespace):

```
kubectl -n netapp-monitoring get agentconfiguration netapp-monitoring-
configuration
```

If an AgentConfiguration exists:

- Install the latest Operator over the existing Operator.
  - Ensure you are pulling the latest container images if you are using a custom repository.

If the AgentConfiguration does not exist:

- Make note of your cluster name as recognized by Cloud Insights (if your namespace is not the default netapp-monitoring, substitute the appropriate namespace):

  ```
  kubectl -n netapp-monitoring get agent -o
  jsonpath='{.items[0].spec.cluster-name}'
  ```

- Create a backup of the existing Operator (if your namespace is not the default netapp-monitoring, substitute the appropriate namespace):

  ```
  kubectl -n netapp-monitoring get agent -o yaml > agent_backup.yaml
  ```

- Uninstall the existing Operator.
- Install the latest Operator.
  - Use the same cluster name.
  - After downloading the latest Operator YAML files, port any customizations found in agent_backup.yaml to the downloaded operator-config.yaml before deploying.
  - Ensure you are pulling the latest container images if you are using a custom repository.

Stopping and Starting the Netapp Kubernetes Monitoring Operator

To stop the Netapp Kubernetes Monitoring Operator:

```
kubectl -n netapp-monitoring scale deploy monitoring-operator --replicas=0
```

To start the Netapp Kubernetes Monitoring Operator:

```
kubectl -n netapp-monitoring scale deploy monitoring-operator --replicas=1
```

Uninstalling

To remove the NetApp Kubernetes Monitoring Operator

Note that the default namespace for the NetApp Kubernetes Monitoring Operator is "netapp-monitoring". If you have set your own namespace, substitute that namespace in these and all subsequent commands and files.

Newer versions of the monitoring operator can be uninstalled with the following commands:

```
kubectl -n <NAMESPACE> delete agent -l installed-by=nkmo-<NAMESPACE>
kubectl -n <NAMESPACE> delete
clusterrole,clusterrolebinding,crd,svc,deploy,role,rolebinding,secret,sa
-l installed-by=nkmo-<NAMESPACE>
```

If the monitoring operator was deployed in its own dedicated namespace, delete the namespace:

```
kubectl delete ns <NAMESPACE>
```

If the first command returns “No resources found”, use the following instructions to uninstall older versions of the monitoring operator.

Execute each of the following commands in order. Depending on your current installation, some of these commands may return ‘object not found’ messages. These messages may be safely ignored.

```
kubectl -n <NAMESPACE> delete agent agent-monitoring-netapp
kubectl delete crd agents.monitoring.netapp.com
kubectl -n <NAMESPACE> delete role agent-leader-election-role
kubectl delete clusterrole agent-manager-role agent-proxy-role agent-
metrics-reader <NAMESPACE>-agent-manager-role <NAMESPACE>-agent-proxy-role
<NAMESPACE>-cluster-role-privileged
kubectl delete clusterrolebinding agent-manager-rolebinding agent-proxy-
rolebinding agent-cluster-admin-rolebinding <NAMESPACE>-agent-manager-
rolebinding <NAMESPACE>-agent-proxy-rolebinding <NAMESPACE>-cluster-role-
binding-privileged
kubectl delete <NAMESPACE>-psp-nkmo
kubectl delete ns <NAMESPACE>
```

If a Security Context Constraint was previously-created:

```
kubectl delete scc telegraf-hostaccess
```

About Kube-state-metrics

The NetApp Kubernetes Monitoring Operator installs kube-state-metrics automatically; no user interaction is needed.

kube-state-metrics Counters

Use the following links to access information for these kube state metrics counters:

1. ConfigMap Metrics
2. DaemonSet Metrics
3. Deployment Metrics
4. Ingress Metrics
5. Namespace Metrics
6. Node Metrics
7. Persistent Volume Metrics
8. Persistant Volume Claim Metrics
9. Pod Metrics

10. ReplicaSet metrics
11. Secret metrics
12. Service metrics
13. StatefulSet metrics

```
== Configuring the Operator
```

In newer versions of the operator, most commonly modified settings can be configured in the *AgentConfiguration* custom resource. You can edit this resource before deploying the operator by editing the *operator-config.yaml* file. This file includes commented out examples of some settings. See the list of available settings for the most recent version of the operator.

You can also edit this resource after the operator has been deployed using the following command:

```
kubectl -n netapp-monitoring edit AgentConfiguration
```

To determine if your deployed version of the operator supports AgentConfiguration, run the following command:

```
kubectl get crd agentconfigurations.monitoring.netapp.com
```

If you see an “Error from server (NotFound)” message, your operator must be upgraded before you can use the AgentConfiguration.

Configuring Proxy Support

There are two places where you may use a proxy in your environment in order to install the NetApp Kubernetes Monitoring Operator. These may be the same or separate proxy systems:

- Proxy needed during execution of the installation code snippet (using "curl") to connect the system where the snippet is executed to your Cloud Insights environment
- Proxy needed by the target Kubernetes cluster to communicate with your Cloud Insights environment

If you use a proxy for either or both of these, in order to install the NetApp Kubernetes Operating Monitor you must first ensure that your proxy is configured to allow good communication to your Cloud Insights environment. If you have a proxy and can access Cloud Insights from the server/VM from which you wish to install the Operator, then your proxy is likely configured properly.

For the proxy used to install the NetApp Kubernetes Operating Monitor, before installing the Operator, set the *http_proxy/https_proxy* environment variables. For some proxy environments, you may also need to set the *no_proxy environment* variable.

To set the variable(s), perform the following steps on your system **before** installing the NetApp Kubernetes Monitoring Operator:

1. Set the *https_proxy* and/or *http_proxy* environment variable(s) for the current user:

a. If the proxy being setup does not have Authentication (username/password), run the following command:

```
export https_proxy=<proxy_server>:<proxy_port>
```

b. If the proxy being setup does have Authentication (username/password), run this command:

```
export
http_proxy=<proxy_username>:<proxy_password>@<proxy_server>:<proxy_po
rt>
```

For the proxy used for your Kubernetes cluster to communicate with your Cloud Insights environment, install the NetApp Kubernetes Monitoring Operator after reading all of these instructions.

Configure the proxy section of AgentConfiguration in operator-config.yaml before deploying the NetApp Kubernetes Monitoring Operator.

```
agent:
  ...
  proxy:
    server: <server for proxy>
    port: <port for proxy>
    username: <username for proxy>
    password: <password for proxy>

    # In the noproxy section, enter a comma-separated list of
    # IP addresses and/or resolvable hostnames that should bypass
    # the proxy
    noproxy: <comma separated list>

    isTelegrafProxyEnabled: true
    isFluentbitProxyEnabled: <true or false> # true if Events Log enabled
    isCollectorsProxyEnabled: <true or false> # true if Network
Performance and Map enabled
    isAuProxyEnabled: <true or false> # true if AU enabled
  ...
...
```

Using a custom or private docker repository

By default, the NetApp Kubernetes Monitoring Operator will pull container images from the Cloud Insights repository. If you have a Kubernetes cluster used as the target for monitoring, and that cluster is configured to only pull container images from a custom or private Docker repository or container registry, you must configure access to the containers needed by the NetApp Kubernetes Monitoring Operator.

Run the “Image Pull Snippet” from the NetApp Monitoring Operator install tile. This command will log into the Cloud Insights repository, pull all image dependencies for the operator, and log out of the Cloud Insights repository. When prompted, enter the provided repository temporary password. This command downloads all images used by the operator, including for optional features. See below for which features these images are used for.

Core Operator Functionality and Kubernetes Monitoring

- netapp-monitoring
- ci-kube-rbac-proxy
- ci-ksm
- ci-telegraf
- distroless-root-user

Events Log

- ci-fluent-bit
- ci-kubernetes-event-exporter

Network Performance and Map

- ci-net-observer

Push the operator docker image to your private/local/enterprise docker repository according to your corporate policies. Ensure that the image tags and directory paths to these images in your repository are consistent with those in the Cloud Insights repository.

Edit the monitoring-operator deployment in operator-deployment.yaml, and modify all image references to use your private Docker repository.

```
image: <docker repo of the enterprise/corp docker repo>/kube-rbac-
proxy:<ci-kube-rbac-proxy version>
image: <docker repo of the enterprise/corp docker repo>/netapp-
monitoring:<version>
```

Edit the AgentConfiguration in operator-config.yaml to reflect the new docker repo location. Create a new imagePullSecret for your private repository, for more details see *https://kubernetes.io/docs/tasks/configure-pod-container/pull-image-private-registry/*

```
agent:
  ...
  # An optional docker registry where you want docker images to be pulled
from as compared to CI's docker registry
  # Please see documentation link here: https://docs.netapp.com/us-
en/cloudinsights/task_config_telegraf_agent_k8s.html#using-a-custom-or-
private-docker-repository
  dockerRepo: your.docker.repo/long/path/to/test
  # Optional: A docker image pull secret that maybe needed for your
private docker registry
  dockerImagePullSecret: docker-secret-name
```

OpenShift Instructions

If you are running on OpenShift 4.6 or higher, you must edit the AgentConfiguration in *operator-config.yaml* to enable the *runPrivileged* setting:

```
# Set runPrivileged to true SELinux is enabled on your kubernetes nodes
runPrivileged: true
```

Openshift may implement an added level of security that may block access to some Kubernetes components.

A Note About Secrets

To remove permission for the NetApp Kubernetes Monitoring Operator to view secrets cluster-wide, delete the following resources from the *operator-setup.yaml* file before installing:

```
 ClusterRole/netapp-ci-<namespace>-agent-secret-clusterrole
 ClusterRoleBinding/netapp-ci-<namespace>-agent-secret-clusterrolebinding
```

If this is an upgrade, also delete the resources from your cluster:

```
 kubectl delete ClusterRole/netapp-ci-<namespace>-agent-secret-clusterrole
 kubectl delete ClusterRoleBinding/netapp-ci-<namespace>-agent-secret-
clusterrolebinding
```

If Change Analysis is enabled, modify the *AgentConfiguration* or *operator-config.yaml* to uncomment the change-management section and include *kindsToIgnoreFromWatch: '"secrets"'* under the change-management section. Note the presence and position of single and double quotes in this line.

```
# change-management:
  ...
  # # A comma separated list of kinds to ignore from watching from the
default set of kinds watched by the collector
  # # Each kind will have to be prefixed by its apigroup
  # # Example: '"networking.k8s.io.networkpolicies,batch.jobs",
"authorization.k8s.io.subjectaccessreviews"'
  kindsToIgnoreFromWatch: '"secrets"'
  ...
```

Verifying Kubernetes Checksums

The Cloud Insights agent installer performs integrity checks, but some users may want to perform their own verifications before installing or applying downloaded artifacts. To perform a download-only operation (as opposed to the default download-and-install), these users can edit the agent installation command obtained from the UI and remove the trailing “install” option.

Follow these steps:

1. Copy the Agent Installer snippet as directed.
2. Instead of pasting the snippet into a command window, paste it into a text editor.
3. Remove the trailing “--install” from the command.
4. Copy the entire command from the text editor.
5. Now paste it into your command window (in a working directory) and run it.
   - Download and install (default):

     ```
     installerName=cloudinsights-rhel_centos.sh … && sudo -E -H
     ./$installerName --download –install
     ```

   - Download-only:

     ```
     installerName=cloudinsights-rhel_centos.sh … && sudo -E -H
     ./$installerName --download
     ```

The download-only command will download all required artifacts from Cloud Insights to the working directory. The artifacts include, but may not be limited to:

- an installation script
- an environment file
- YAML files
- a signed checksum file (sha256.signed)
- a PEM file (netapp_cert.pem) for signature verification

The installation script, environment file, and YAML files can be verified using visual inspection.

The PEM file can be verified by confirming its fingerprint to be the following:

```
1A918038E8E127BB5C87A202DF173B97A05B4996
```

More specifically,

```
openssl x509 -fingerprint -sha1 -noout -inform pem -in netapp_cert.pem
```

The signed checksum file can be verified using the PEM file:

```
openssl smime -verify -in sha256.signed -CAfile netapp_cert.pem -purpose
any
```

Once all of the artifacts have been satisfactorily verified, the agent installation can be initiated by running:

```
sudo -E -H ./<installation_script_name> --install
```

Troubleshooting

Some things to try if you encounter problems setting up the NetApp Kubernetes Monitoring Operator:

Problem:	**Try this:**
I do not see a hyperlink/connection between my Kubernetes Persistent Volume and the corresponding back-end storage device. My Kubernetes Persistent Volume is configured using the hostname of the storage server.	Follow the steps to uninstall the existing Telegraf agent, then re-install the latest Telegraf agent. You must be using Telegraf version 2.0 or later, and your Kubernetes cluster storage must be actively monitored by Cloud Insights.

Problem:	Try this:
I’m seeing messages in the logs resembling the following: E0901 15:21:39.962145 1 reflector.go:178] k8s.io/kube-state-metrics/internal/store/builder.go:352: Failed to list *v1.MutatingWebhookConfiguration: the server could not find the requested resource E0901 15:21:43.168161 1 reflector.go:178] k8s.io/kube-state-metrics/internal/store/builder.go:352: Failed to list *v1.Lease: the server could not find the requested resource (get leases.coordination.k8s.io) etc.	These messages may occur if you are running kube-state-metrics version 2.0.0 or above with Kubernetes versions below 1.20. To get the Kubernetes version: *kubectl version* To get the kube-state-metrics version: *kubectl get deploy/kube-state-metrics -o jsonpath='{..image}'* To prevent these messages from happening, users can modify their kube-state-metrics deployment to disable the following Leases: *mutatingwebhookconfigurations* *validatingwebhookconfigurations* *volumeattachments resources* More specifically, they can use the following CLI argument: resources=certificatesigningrequests,configmaps,cronjobs,daemonsets, deployments,endpoints,horizontalpodautoscalers,ingresses,jobs,limitranges, namespaces,networkpolicies,nodes,persistentvolumeclaims,persistentvolumes, poddisruptionbudgets,pods,replicasets,replicationcontrollers,resourcequotas, secrets,services,statefulsets,storageclasses The default resource list is: "certificatesigningrequests,configmaps,cronjobs,daemonsets,deployments, endpoints,horizontalpodautoscalers,ingresses,jobs,leases,limitranges, mutatingwebhookconfigurations,namespaces,networkpolicies,nodes, persistentvolumeclaims,persistentvolumes,poddisruptionbudgets,pods,replicasets, replicationcontrollers,resourcequotas,secrets,services,statefulsets,storageclasses, validatingwebhookconfigurations,volumeattachments"

Problem:	Try this:
I see error messages from Telegraf resembling the following, but Telegraf does start up and run: Oct 11 14:23:41 ip-172-31-39-47 systemd[1]: Started The plugin-driven server agent for reporting metrics into InfluxDB. Oct 11 14:23:41 ip-172-31-39-47 telegraf[1827]: time="2021-10-11T14:23:41Z" level=error msg="failed to create cache directory. /etc/telegraf/.cache/snowflake, err: mkdir /etc/telegraf/.ca che: permission denied. ignored\n" func="gosnowflake.(*defaultLogger).Errorf" file="log.go:120" Oct 11 14:23:41 ip-172-31-39-47 telegraf[1827]: time="2021-10-11T14:23:41Z" level=error msg="failed to open. Ignored. open /etc/telegraf/.cache/snowflake/ocsp_response_cache.json: no such file or directory\n" func="gosnowflake.(*defaultLogger).Errorf" file="log.go:120" Oct 11 14:23:41 ip-172-31-39-47 telegraf[1827]: 2021-10-11T14:23:41Z I! Starting Telegraf 1.19.3	This is a known issue. Refer to This GitHub article for more details. As long as Telegraf is up and running, users can ignore these error messages.
On Kubernetes, my Telegraf pod(s) are reporting the following error: "Error in processing mountstats info: failed to open mountstats file: /hostfs/proc/1/mountstats, error: open /hostfs/proc/1/mountstats: permission denied"	If SELinux is enabled and enforcing, it is likely preventing the Telegraf pod(s) from accessing the /proc/1/mountstats file on the Kubernetes node. To overcome this restriction, edit the agentconfiguration, and enable the runPrivileged setting. For more details, refer to: https://docs.netapp.com/us-en/cloudinsights/task_config_telegraf_agent_k8s.html#openshift-instructions.
On Kubernetes, my Telegraf ReplicaSet pod is reporting the following error: [inputs.prometheus] Error in plugin: could not load keypair /etc/kubernetes/pki/etcd/server.crt:/etc/kubernetes/pki/etcd/server.key: open /etc/kubernetes/pki/etcd/server.crt: no such file or directory	The Telegraf ReplicaSet pod is intended to run on a node designated as a master or for etcd. If the ReplicaSet pod is not running on one of these nodes, you will get these errors. Check to see if your master/etcd nodes have taints on them. If they do, add the necessary tolerations to the Telegraf ReplicaSet, telegraf-rs. For example, edit the ReplicaSet… kubectl edit rs telegraf-rs …and add the appropriate tolerations to the spec. Then, restart the ReplicaSet pod.

Problem:	Try this:
I have a PSP/PSA environment. Does this affect my monitoring operator?	If your Kubernetes cluster is running with Pod Security Policy (PSP) or Pod Security Admission (PSA) in place, you must upgrade to the latest NetApp Kubernetes Monitoring Operator. Follow these steps to upgrade to the current NKMO with support for PSP/PSA: 1. Uninstall the previous monitoring operator: kubectl delete agent agent-monitoring-netapp -n netapp-monitoring kubectl delete ns netapp-monitoring kubectl delete crd agents.monitoring.netapp.com kubectl delete clusterrole agent-manager-role agent-proxy-role agent-metrics-reader kubectl delete clusterrolebinding agent-manager-rolebinding agent-proxy-rolebinding agent-cluster-admin-rolebinding 2. Install the latest version of the monitoring operator.
I ran into issues trying to deploy the NKMO, and I have PSP/PSA in use.	1. Edit the agent using the following command: kubectl -n <name-space> edit agent 2. Mark 'security-policy-enabled' as 'false'. This will disable Pod Security Policies and Pod Security Admission and allow the NKMO to deploy. Confirm by using the following commands: kubectl get psp (should show Pod Security Policy removed) kubectl get all -n <namespace> | grep -i psp (should show that nothing is found)
"ImagePullBackoff" errors seen	These errors may be seen if you have a custom or private docker repository and have not yet configured the NetApp Kubernetes Monitoring Operator to properly recognize it. Read more about configuring for custom/private repo.

Problem:	Try this:

I am having an issue with my monitoring-operator deployment, and the current documentation does not help me resolve it.	Capture or otherwise note the output from the following commands, and contact the Technical Support team.
	`kubectl -n netapp-monitoring get all`
	`kubectl -n netapp-monitoring describe all`
	`kubectl -n netapp-monitoring logs <monitoring-operator-pod> --all-containers=true`
	`kubectl -n netapp-monitoring logs <telegraf-pod> --all-containers=true`

net-observer (Workload Map) pods in NKMO namespace are in CrashLoopBackOff	These pods correspond to Workload Map data collector for Network Observability. Try these: • Check the logs of one of the pods to confirm minimum kernel version. For example: ---- {"ci-tenant-id":"your-tenant-id","collector-cluster":"your-k8s-cluster-name","environment":"prod","level":"error","msg":"failed in validation. Reason: kernel version 3.10.0 is less than minimum kernel version of 4.18.0","time":"2022-11-09T08:23:08Z"} ---- • Net-observer pods requires the Linux kernel version to be at least 4.18.0. Check the kernel version using the command “uname -r” and ensure they are >= 4.18.0
Pods are running in NKMO namespace (default: netapp-monitoring), but no data is shown in UI for workload map or Kubernetes metrics in Queries	Check the time setting on the nodes of the K8S cluster. For accurate audit and data reporting, it is strongly recommended to synchronize the time on the Agent machine using Network Time Protocol (NTP) or Simple Network Time Protocol (SNTP).
Some of the net-observer pods in NKMO namespace are in Pending state	Net-observer is a DaemonSet and runs a pod in each Node of the k8s cluster. • Note the pod which is in Pending state, and check if it is experiencing a resource issue for CPU or memory. Ensure the required memory and CPU is available in the node.

Problem:	**Try this:**
I'm seeing the following in my logs immediately after installing the NetApp Kubernetes Monitoring Operator: [inputs.prometheus] Error in plugin: error making HTTP request to http://kube-state-metrics.<namespace>.svc.cluster.local:8080/metrics: Get http://kube-state-metrics.<namespace>.svc.cluster.local:8080/metrics: dial tcp: lookup kube-state-metrics.<namespace>.svc.cluster.local: no such host	This message is typically only seen when a new operator is installed and the *telegraf-rs* pod is up before the *ksm* pod is up. These messages should stop once all pods are running.
I do see not any metrics being collected for the Kubernetes CronJobs that exist in my cluster.	Verify your Kubernetes version (i.e. `kubectl version`). If it is v1.20.x or below, this is an expected limitation. The kube-state-metrics release deployed with the Netapp Kubernetes Monitoring Operator only supports v1.CronJob. With Kubernetes 1.20.x and below, the CronJob resource is at v1beta.CronJob. As a result, kube-state-metrics cannot find the CronJob resource.
After installing the operator, the telegraf-ds pods enter CrashLoopBackOff and the pod logs indicate "su: Authentication failure".	Edit the telegraf section in *AgentConfiguration*, and set *dockerMetricCollectionEnabled* to false. For more details, refer to the operator's configuration options. NOTE: If you are using Cloud Insights Federal Edition, users with restrictions on the use of *su* will not be able to collect docker metrics because access to the docker socket requires either running the telegraf container as root or using *su* to add the telegraf user to the docker group. Docker metric collection and the use of *su* is enabled by default; to disable both, remove the *telegraf.docker* entry in the *AgentConfiguration* file: … spec: … telegraf: … - name: docker run-mode: - DaemonSet substitutions: - key: DOCKER_UNIX_SOCK_PLACEHOLDER value: unix:///run/docker.sock … …

<table>
<tr><th>Problem:</th><th>Try this:</th></tr>
<tr><td>I see repeating error messages resembling the following in my Telegraf logs:

E! [agent] Error writing to outputs.http: Post "https://<tenant_url>/rest/v1/lake/ingest/influxdb": context deadline exceeded (Client.Timeout exceeded while awaiting headers)</td><td>Edit the telegraf section in <em>AgentConfiguration</em>, and set <em>dockerMetricCollectionEnabled</em> to false. For more details, refer to the operator’s configuration options.</td></tr>
<tr><td>I’m missing <em>involvedobject</em> data for some Event Logs.</td><td>Be sure you have followed the steps in the Permissions section above.</td></tr>
<tr><td>Why am I seeing two monitoring operator pods running, one named netapp-ci-monitoring-operator-<pod> and the other named monitoring-operator-<pod>?</td><td>As of October 12, 2023, Cloud Insights has refactored the operator to better serve our users; for those changes to be fully adopted, you must remove the old operator and install the new one.</td></tr>
<tr><td>My kubernetes events unexpectedly stopped reporting to Cloud Insights.</td><td>

Retrieve the name of the event-exporter pod:

```
`kubectl -n netapp-monitoring get pods |grep event-exporter |awk '{print $1}' |sed 's/event-exporter./event-exporter/'`
```

It should be either "netapp-ci-event-exporter" or "event-exporter". Next, edit the monitoring agent `kubectl -n netapp-monitoring edit agent`, and set the value for LOG_FILE to reflect the appropriate event-exporter pod name found in the previous step. More specifically, LOG_FILE should be set to either "/var/log/containers/netapp-ci-event-exporter.log" or "/var/log/containers/event-exporter*.log"

```
fluent-bit:
...
- name: event-exporter-ci
  substitutions:
  - key: LOG_FILE
    values:
    - /var/log/containers/netapp-ci-event-exporter*.log
...
```

Alternatively, one can also uninstall and reinstall the agent.

</td></tr>
</table>

Problem:	Try this:
I’m seeing pod(s) deployed by the Netapp Kubernetes Monitoring Operator crash because of insufficient resources.	Refer to the Netapp Kubernetes Monitoring Operator configuration options to increase the CPU and/or memory limits as needed.

Additional information may be found from the Support page or in the Data Collector Support Matrix.

NetApp Kubernetes Monitoring Operator Configuration Options

The NetApp Kubernetes Monitoring Operator installation and configuration can be customized.

The table below lists the possible options for the AgentConfiguration file:

Component	Option	Description
agent		Configuration options that are common to all components that the operator can install. These can be considered as "global" options.
	dockerRepo	A dockerRepo override to pull images from customers private docker repos as compared to Cloud Insights docker repo. Default is cloud insights docker repo
	dockerImagePullSecret	Optional: A secret for the customers private repo
	clusterName	Free text field that uniquely identifies a cluster across all customers clusters. This should be unique across a cloud insights tenant. Default is what the customer enters in the UI for the "Cluster Name" field
	proxy Format: proxy: server: port: username: password: noProxy: isTelegrafProxyEnabled: isAuProxyEnabled: isFluentbitProxyEnabled: isCollectorProxyEnabled:	Optional to set proxy. This is usually the customer’s corporate proxy.
telegraf		Configuration options that can customize the telegraf installation of the Operator
	collectionInterval	Metrics collection interval, in seconds (Max=60s)
	dsCpuLimit	CPU Limit for telegraf ds

Component	Option	Description
	dsMemLimit	Memory limit for telegraf ds
	dsCpuRequest	CPU request for telegraf ds
	dsMemRequest	Memory request for telegraf ds
	rsCpuLimit	CPU Limit for telegraf rs
	rsMemLimit	Memory limit for telegraf rs
	rsCpuRequest	CPU request for telegraf rs
	rsMemRequest	Memory request for telegraf rs
	dockerMountPoint	an override for dockerMountPoint path. This is for non standard docker installations on k8s platforms like cloud foundry
	dockerUnixSocket	an override for dockerUnixSocket path. This is for non standard docker installations on k8s platforms like cloud foundry.
	crioSockPath	an override for crioSockPath path. This is for non standard docker installations on k8s platforms like cloud foundry.
	runPrivileged	Run the telegraf container in privileged mode. Set this to true if SELinux is enabled on your k8s nodes
	batchSize	See Telegraf configuration documentation
	bufferLimit	See Telegraf configuration documentation
	roundInterval	See Telegraf configuration documentation
	collectionJitter	See Telegraf configuration documentation
	precision	See Telegraf configuration documentation
	flushInterval	See Telegraf configuration documentation
	flushJitter	See Telegraf configuration documentation
	outputTimeout	See Telegraf configuration documentation
	dockerMetricCollectionEnabled	Collect Docker metrics. By default, this is set to true and docker metrics will be collected for on-premise, docker-based k8s deployments. To disable docker metric collection, set this to false.
	dsTolerations	telegraf-ds additional tolerations.
	rsTolerations	telegraf-rs additional tolerations.
kube-state-metrics		Configuration options that can customize the kube state metrics installation of the Operator
	cpuLimit	CPU limit for kube-state-metrics deployment
	memLimit	Mem limit for kube-state-metrics deployment
	cpuRequest	CPU request for kube state metrics deployment

Component	Option	Description
	memRequest	Mem request for kube state metrics deployment
	resources	a comma separated list of resources to capture. example: cronjobs,daemonsets,deployments,ingresses,jobs,namespaces,nodes,persistentvolumeclaims, persistentvolumes,pods,replicasets,resourcequotas,services,statefulsets
	tolerations	kube-state-metrics additional tolerations.
	labels	a comma separated list of resources that kube-state-metrics should capture example: cronjobs=[*],daemonsets=[*],deployments=[*],ingresses=[*],jobs=[*],namespaces=[*],nodes=[*], persistentvolumeclaims=[*],persistentvolumes=[*],pods=[*],replicasets=[*],resourcequotas=[*],services=[*],statefulsets=[*]
logs		Configuration options that can customize logs collection and installation of the Operator
	readFromHead	true/false, should fluent bit read the log from head
	timeout	timeout, in secs
	dnsMode	TCP/UDP, mode for DNS
	fluent-bit-tolerations	fluent-bit-ds additional tolerations.
	event-exporter-tolerations	event-exporter additional tolerations.
workload-map		Configuration options that can customize the workload map collection and installation of the Operator
	cpuLimit	CPU limit for net observer ds
	memLimit	mem limit for net observer ds
	cpuRequest	CPU request for net observer ds
	memRequest	mem request for net observer ds
	metricAggregationInterval	metric aggregation interval, in seconds
	bpfPollInterval	BPF poll interval, in seconds
	enableDNSLookup	true/false, enable DNS lookup
	l4-tolerations	net-observer-l4-ds additional tolerations.
	runPrivileged	true/false - Set runPrivileged to true if SELinux is enabled on your Kubernetes nodes.
change-management		Configuration options for Kubernetes Change Management and Analysis

Component	Option	Description
	cpuLimit	CPU limit for change-observer-watch-rs
	memLimit	Mem limit for change-observer-watch-rs
	cpuRequest	CPU request for change-observer-watch-rs
	memRequest	mem request for change-observer-watch-rs
	failureDeclarationIntervalMins	Interval in minutes after which a non-successful deployment of a workload will be marked as failed
	deployAggrIntervalSeconds	Frequency at which workload deployment in-progress events are sent
	nonWorkloadAggrIntervalSeconds	Frequency at which non-workload deployments are combined and sent
	termsToRedact	A set of regular expressions used in env names and data maps whose value will be redacted Example terms:"pwd", "password", "token", "apikey", "api-key", "jwt"
	additionalKindsToWatch	A comma separated list of additional kinds to watch from the default set of kinds watched by the collector
	kindsToIgnoreFromWatch	A comma separated list of kinds to ignore from watching from the default set of kinds watched by the collector
	logRecordAggrIntervalSeconds	Frequency with which log records are sent to CI from the collector
	watch-tolerations	change-observer-watch-ds additional tolerations. Abbreviated single line format only. Example: '{key: taint1, operator: Exists, effect: NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'

Sample AgentConfiguration file

Below is a sample AgentConfiguration file.

```
apiVersion: monitoring.netapp.com/v1alpha1
kind: AgentConfiguration
metadata:
  name: netapp-monitoring-configuration
  namespace: "NAMESPACE_PLACEHOLDER"
  labels:
    installed-by: nkmo-NAMESPACE_PLACEHOLDER

spec:
  # # You can modify the following fields to configure the operator.
  # # Optional settings are commented out and include default values for
reference
```

```
  # #   To update them, uncomment the line, change the value, and apply
the updated AgentConfiguration.
  agent:
    # # [Required Field] A uniquely identifiable user-friendly
clustername.
    # # clusterName must be unique across all clusters in your Cloud
Insights environment.
    clusterName: "CLUSTERNAME_PLACEHOLDER"

    # # Proxy settings. The proxy that the operator should use to send
metrics to Cloud Insights.
    # # Please see documentation here: https://docs.netapp.com/us-
en/cloudinsights/task_config_telegraf_agent_k8s.html#configuring-proxy-
support
    # proxy:
    #   server:
    #   port:
    #   noproxy:
    #   username:
    #   password:
    #   isTelegrafProxyEnabled:
    #   isFluentbitProxyEnabled:
    #   isCollectorsProxyEnabled:

    # # [Required Field] By default, the operator uses the CI repository.
    # # To use a private repository, change this field to your repository
name.
    # # Please see documentation here: https://docs.netapp.com/us-
en/cloudinsights/task_config_telegraf_agent_k8s.html#using-a-custom-or-
private-docker-repository
    dockerRepo: 'DOCKER_REPO_PLACEHOLDER'
    # # [Required Field] The name of the imagePullSecret for dockerRepo.
    # # If you are using a private repository, change this field from
'docker' to the name of your secret.
    {{ if not (contains .Values.config.cloudType "aws") }}# {{ end -}}
    dockerImagePullSecret: 'docker'

    # # Allow the operator to automatically rotate its ApiKey before
expiration.
    # tokenRotationEnabled: '{{
.Values.telegraf_installer.kubernetes.rs.shim_token_rotation  }}'
    # # Number of days before expiration that the ApiKey should be
rotated. This must be less than the total ApiKey duration.
    # tokenRotationThresholdDays: '{{
.Values.telegraf_installer.kubernetes.rs.shim_token_rotation_threshold_day
s  }}'
```

```
  telegraf:
    # # Settings to fine-tune metrics data collection. Telegraf config
names are included in parenthesis.
    # # See
https://github.com/influxdata/telegraf/blob/master/docs/CONFIGURATION.md#a
gent

    # # The default time telegraf will wait between inputs for all plugins
(interval). Max=60
    # collectionInterval: '{{
.Values.telegraf_installer.agent_resources.collection_interval }}'
    # # Maximum number of records per output that telegraf will write in
one batch (metric_batch_size).
    # batchSize: '{{
.Values.telegraf_installer.agent_resources.metric_batch_size }}'
    # # Maximum number of records per output that telegraf will cache
pending a successful write (metric_buffer_limit).
    # bufferLimit: '{{
.Values.telegraf_installer.agent_resources.metric_buffer_limit }}'
    # # Collect metrics on multiples of interval (round_interval).
    # roundInterval: '{{
.Values.telegraf_installer.agent_resources.round_interval }}'
    # # Each plugin waits a random amount of time between the scheduled
collection time and that time + collection_jitter before collecting inputs
(collection_jitter).
    # collectionJitter: '{{
.Values.telegraf_installer.agent_resources.collection_jitter }}'
    # # Collected metrics are rounded to the precision specified. When set
to "0s" precision will be set by the units specified by interval
(precision).
    # precision: '{{ .Values.telegraf_installer.agent_resources.precision
}}'
    # # Time telegraf will wait between writing outputs (flush_interval).
Max=collectionInterval
    # flushInterval: '{{
.Values.telegraf_installer.agent_resources.flush_interval }}'
    # # Each output waits a random amount of time between the scheduled
write time and that time + flush_jitter before writing outputs
(flush_jitter).
    # flushJitter: '{{
.Values.telegraf_installer.agent_resources.flush_jitter }}'
    # # Timeout for writing to outputs (timeout).
    # outputTimeout: '{{
.Values.telegraf_installer.http_output_plugin.timeout }}'
```

```
    # # telegraf-ds CPU/Mem limits and requests.
    # # See https://kubernetes.io/docs/concepts/configuration/manage-
resources-containers/
    dsCpuLimit: '{{
.Values.telegraf_installer.telegraf_resources.ds_cpu_limits  }}'
    dsMemLimit: '{{
.Values.telegraf_installer.telegraf_resources.ds_mem_limits  }}'
    dsCpuRequest: '{{
.Values.telegraf_installer.telegraf_resources.ds_cpu_request  }}'
    dsMemRequest: '{{
.Values.telegraf_installer.telegraf_resources.ds_mem_request  }}'

    # # telegraf-rs CPU/Mem limits and requests.
    rsCpuLimit: '{{
.Values.telegraf_installer.telegraf_resources.rs_cpu_limits  }}'
    rsMemLimit: '{{
.Values.telegraf_installer.telegraf_resources.rs_mem_limits  }}'
    rsCpuRequest: '{{
.Values.telegraf_installer.telegraf_resources.rs_cpu_request  }}'
    rsMemRequest: '{{
.Values.telegraf_installer.telegraf_resources.rs_mem_request  }}'

    # # telegraf additional tolerations. Use the following abbreviated
single line format only.
    # # Inspect telegraf-rs/-ds to view tolerations which are always
present.
    # # Example: '{key: taint1, operator: Exists, effect:
NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'
    # dsTolerations: ''
    # rsTolerations: ''

    # # Set runPrivileged to true if SELinux is enabled on your Kubernetes
nodes.
    # runPrivileged: 'false'

    # # Collect NFS IO metrics.
    # dsNfsIOEnabled: '{{
.Values.telegraf_installer.kubernetes.ds.shim_nfs_io_processing }}'

    # # Collect kubernetes.system_container metrics and objects in the
kube-system|cattle-system namespaces for managed kubernetes clusters (EKS,
AKS, GKE, managed Rancher).  Set this to true if you want collect these
metrics.
    # managedK8sSystemMetricCollectionEnabled: '{{
.Values.telegraf_installer.kubernetes.shim_managed_k8s_system_metric_colle
ction }}'
```

```
    # # Collect kubernetes.pod_volume (pod ephemeral storage) metrics.
Set this to true if you want to collect these metrics.
    # podVolumeMetricCollectionEnabled: '{{
.Values.telegraf_installer.kubernetes.shim_pod_volume_metric_collection
}}'

    # # Declare Rancher cluster as managed.  Set this to true if your
Rancher cluster is managed as opposed to on-premise.
    # isManagedRancher: '{{
.Values.telegraf_installer.kubernetes.is_managed_rancher }}'

  # kube-state-metrics:
    # # kube-state-metrics CPU/Mem limits and requests. By default, when
unset, kube-state-metrics has no CPU/Mem limits nor request.
    # cpuLimit:
    # memLimit:
    # cpuRequest:
    # memRequest:

    # # Comma-separated list of metrics to enable.
    # # See metric-allowlist in https://github.com/kubernetes/kube-state-
metrics/blob/main/docs/cli-arguments.md
    # resources:
'cronjobs,daemonsets,deployments,ingresses,jobs,namespaces,nodes,persisten
tvolumeclaims,persistentvolumes,pods,replicasets,resourcequotas,services,s
tatefulsets'

    # # Comma-separated list of Kubernetes label keys that will be used in
the resources' labels metric.
    # # See metric-labels-allowlist in https://github.com/kubernetes/kube-
state-metrics/blob/main/docs/cli-arguments.md
    # labels:
'cronjobs=[*],daemonsets=[*],deployments=[*],ingresses=[*],jobs=[*],namesp
aces=[*],nodes=[*],persistentvolumeclaims=[*],persistentvolumes=[*],pods=[
*],replicasets=[*],resourcequotas=[*],services=[*],statefulsets=[*]'

    # # kube-state-metrics additional tolerations. Use the following
abbreviated single line format only.
    # # No tolerations are applied by default
    # # Example: '{key: taint1, operator: Exists, effect:
NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'
    # tolerations: ''

  # # Settings for the Events Log feature.
  # logs:
    # # If Fluent Bit should read new files from the head, not tail.
    # # See Read_from_Head in
https://docs.fluentbit.io/manual/pipeline/inputs/tail
    # readFromHead: "true"

    # # Network protocol that Fluent Bit should use for DNS: "UDP" or
"TCP".
    # dnsMode: "UDP"

    # # Logs additional tolerations. Use the following abbreviated single
line format only.
    # # Inspect fluent-bit-ds to view tolerations which are always
present. No tolerations are applied by default for event-exporter.
    # # Example: '{key: taint1, operator: Exists, effect:
NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'
    # fluent-bit-tolerations: ''
    # event-exporter-tolerations: ''

  # # Settings for the Network Performance and Map feature.
  # workload-map:
    # # net-observer-l4-ds CPU/Mem limits and requests.
    # # See https://kubernetes.io/docs/concepts/configuration/manage-
resources-containers/
    # cpuLimit: '500m'
    # memLimit: '500Mi'
    # cpuRequest: '100m'
    # memRequest: '500Mi'

    # # Metric aggregation interval in seconds. Min=30, Max=120
    # metricAggregationInterval: '60'

    # # Interval for bpf polling. Min=3, Max=15
    # bpfPollInterval: '8'

    # # Enable performing reverse DNS lookups on observed IPs.
    # enableDNSLookup: 'true'

    # # net-observer-l4-ds additional tolerations. Use the following
abbreviated single line format only.
    # # Inspect net-observer-l4-ds to view tolerations which are always
present.
    # # Example: '{key: taint1, operator: Exists, effect:
NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'
    # l4-tolerations: ''

    # # Set runPrivileged to true if SELinux is enabled on your Kubernetes
nodes.
```

```
    # # Note: In OpenShift environments, this is set to true
automatically.
    # runPrivileged: 'false'

  # change-management:
    # # change-observer-watch-rs CPU/Mem limits and requests.
    # # See https://kubernetes.io/docs/concepts/configuration/manage-
resources-containers/
    # cpuLimit: '500m'
    # memLimit: '500Mi'
    # cpuRequest: '100m'
    # memRequest: '500Mi'

    # # Interval in minutes after which a non-successful deployment of a
workload will be marked as failed
    # failureDeclarationIntervalMins: '30'

    # # Frequency at which workload deployment in-progress events are sent
    # deployAggrIntervalSeconds: '300'

    # # Frequency at which non-workload deployments are combined and sent
    # nonWorkloadAggrIntervalSeconds: '15'

    # # A set of regular expressions used in env names and data maps whose
value will be redacted
    # termsToRedact: '"pwd", "password", "token", "apikey", "api-key",
"jwt"'

    # # A comma separated list of additional kinds to watch from the
default set of kinds watched by the collector
    # # Each kind will have to be prefixed by its apigroup
    # # Example: 'authorization.k8s.io.subjectaccessreviews'
    # additionalKindsToWatch: ''

    # # A comma separated list of kinds to ignore from watching from the
default set of kinds watched by the collector
    # # Each kind will have to be prefixed by its apigroup
    # # Example: 'networking.k8s.io.networkpolicies,batch.jobs'
    # kindsToIgnoreFromWatch: ''

    # # Frequency with which log records are sent to CI from the collector
    # logRecordAggrIntervalSeconds: '20'

    # # change-observer-watch-ds additional tolerations. Use the following
abbreviated single line format only.
    # # Inspect change-observer-watch-ds to view tolerations which are
always present.
```

```
    # # Example: '{key: taint1, operator: Exists, effect:
NoSchedule},{key: taint2, operator: Exists, effect: NoExecute}'
    # watch-tolerations: ''----




[[ID75e726adea6e42936168224f4e5d2b10]]
= Kubernetes Cluster Detail Page
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Kubernetes cluster detail page displays a detailed overview of your
Kubernetes cluster.

//The detail page is comprised of three distinct but linked landing pages
showing cluster, node, and pod information. The "Resource Usage" section
changes to show the details of the selected item (cluster, node, or pod).
You can see the current page type and name at the top of the screen. The
current page is shown in the following heirarchy: _Site Name / Kubernetes
/ Cluster / Node / Pod_.  You can click any part of this "breadcrumb"
trail to go directly to that specific page.

//image:Kubernetes_Breadcrumb.png[Page Breadcrumb]


//== Cluster Overview

//The cluster overview page provides useful information at a glance:

image:Kubernetes_Detail_Page_new.png[Cluster detail page]




== Namespace, Node, and Pod Counts

The counts at the top of the page show you the total number of namespaces,
nodes, and pods in the cluster, as well as the number of popds that are
currently alerting and pending.

//NOTE:  It is possible that the three pod sub-counts (healthy, alerting,
pending) can add up to more than the displayed total number of pods. This
can happen because the _pending_ count includes _all_ pending pods, both
unscheduled and scheduled (in other words, unattached and attached to
nodes).


== Shared Resources and Saturation

On the top right of the detail page is your cluster saturation as a
current percentage as well as a graph showing the recent trend over time.
Cluster saturation is the highest of CPU, memory, or storage saturation at
each point in time.

Below that, the page shows by default *Shared Resources* usage, with tabs
for CPU, Memory, and Storage. Each tab shows the saturation percentage and
trend over time, with additional usage details. For storage, the value
shown is the greater of backend and filesystem saturation, which are
calculated independently.

The devices with the highest usage are shown in a table at the bottom.
Click any link to explore these devices.


== Namespaces

The Namespaces tab displays a list of all the namespaces in your
Kubernetes environment, showing CPU and Memory usage as well as a count of
workloads in each namespace. Click the Name links to explore each
namespace.

image:Kubernetes_Namespace_tab_new.png[list of current namespaces in your
K8s environment]


== Workloads

Similarly, the Workloads tab displays a list of the workloads in each
namespace, again showing CPU and Memory usage. Clicking the Namespace
links drills into each.

image:Kubernetes_Workloads_tab_new.png[list of current namespaces in your
K8s environment]




== The Cluster "Wheel"
```

```
image:Kubernetes_Wheel_Section.png[Cluster Wheel]

The Cluster "Wheel" section provides node and pod health at a glance,
which you can drill into for more information. If your cluster contains
more nodes than can be displayed in this area of the page, you will be
able to turn the wheel using the buttons available.

Alerting pods or nodes are displayed in red. "Warning" areas are displayed
in orange. Pods that are unscheduled (that is, unattached) will display in
the lower corner of the Cluster "Wheel".

Hovering over a pod (circle) or Node (bar) will extend the view of the
node.

image:Kubernetes_Node_Expand.png[Expanded Node]

Clicking on the pod or node in that view will zoom in to the expanded Node
view.

image:Kubernetes_Critical_Pod_Zoom.png[Expanded Node View]

From here, you can hover over an element to display details about that
element. For example, hovering over the critical pod in this example
displays details about that pod.

image:Kubernetes_Pod_Red.png[Critical Pod Information]

You can view Filesystem, Memory, and CPU information by hovering over the
Node elements.

image:Kubernetes_Capacity_Info.png[Node Capacity and Allocation]



////
== Detail Section

Each page of the Kubernetes Explorer displays a set of usage graphs that
may include CPU, Memory, and Storage. Below these graphs are summaries and
lists of the top objects in each category, with links to underlying
details. For example, _Node_ shows pods and containers, _Pod_ shows PVCs
and related objects and containers, etc.  The following illustration shows
an example of the detailed information on a _Node_ page:

image:Kubernetes_Node_Resource_Usage.png[Resource Usage Example]
```

```
Resources experiencing alerts will show at the top of the lists. Click on
the affected resource to drill into it for more detail.
////




== A note about the gauges

The Memory and CPU gauges show three colors, since they show _used_ in
relation to both _allocatable capacity_ and _total capacity_.



////
Keep the following in mind when reading the gauges.

The dark blue band shows the amount used.

* When viewed against the _light blue band_, the dark blue shows used as
the % of allocatable amount. This matches the "% of allocatable" value
shown (81 in the example below).
* When viewed against the _white background_, the dark blue shows used as
the % of total capacity. This matches the "% of capacity" value shown (63
in this example).

image:Kubernetes_Gauge_Explained.png[Gauge Numbers Explained]

//The length of the light blue band against the white background shows the
total allocatable amount vs the total capacity; that figure itself is not
shown, but it's derived using the formula shown in the red text:(capacity
/ allocatable) * 100.

//Much of the time, our own environments show the same number for the 2
percent values in the gauge, and so you don't often see the white band
because the light blue covers it completely (meaning 100% of the total
capacity is allocatable).
////









[[ID3e544f26d29e5f01ad54475e63205d82]]
= Kubernetes Network Performance Monitoring and Map
```

```
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Kubernetes Network Performance Monitoring and Map feature simplifies
troubleshooting by mapping dependencies between services (also called
workloads), and provides real-time visibility into network performance
latencies and anomalies to identify performance issues before they affect
users.
This capability helps organizations reduce overall costs by analyzing and
auditing Kubernetes traffic flows.

Key Features:
• The Workload Map presents Kubernetes workload dependencies and flows and
highlights network and performance issues.
• Monitor network traffic between Kubernetes pods, workloads, and nodes;
identifies the source of traffic and latency problems.
• Reduce overall costs by analyzing ingress, egress, cross-region, and
cross-zone network traffic.

//image:Workload Map Example_withSlideout.png[Workload Map example showing
"Slideout" panel with details]

image:workload-map-animated.gif[Workload Map Example]



== Pre-Requisites

Before you can use the Kubernetes Network Performance Monitoring and Map,
you must have configured the
xref:{relative_path}task_config_telegraf_agent_k8s.html[NetApp Kubernetes
Monitoring Operator] to enable this option. During deployment of the
Operator, select the "Network Performance and Map" checkbox to enable. You
can also enable this option by navigating to a Kubernetes landing page and
selecting "Modify Deployment".

image:ServiceMap_NKMO_Deployment_Options.png[selecting the Map option
during NKMO stup]

== Monitors

The Workload Map uses
```

```
xref:{relative_path}task_create_monitor.html[monitors] to derive
information. Cloud Insights provides a number of default Kubernetes
Monitors (note that these may be _Paused_ by default. You can _Resume_
(i.e. enable) the monitors you want), or you can create custom monitors
for kubernetes objects, which the Workload Map will also use.

You can create Cloud insights metric alerts on any of the object types
below. Make sure the data is grouped by the default object type.

* kubernetes.workload
* kubernetes.daemonset
* kubernetes.deployment
* kubernetes.cronjob
* kubernetes.job
* kubernetes.replicaset
* kubernetes.statefulset
* kubernetes.pod
* kubernetes.network_traffic_l4


== The Map

The Map shows services/workloads and their relationships to each other.
Arrows show directions of traffic. Hovering over a workload displays
summary information for that workload, as you can see in this example:

image:ServiceMap_Simple_Example.png[Example of a Workload Map workload]

Icons within the circles represent different service types. Note that
icons are only visible if the underlying objects have <<workload-labels,
labels>>.

image:ServiceMap_Icons.png[Service Icons Explained]

The size of each circle indicates node size. Note that these sizes are
relative, your browser zoom level or screen size may affect actual circle
sizes.  In the same way, the traffic line style gives you an at-a-glance
view of the connection size; bold solid lines are high traffic, while
light dotted lines are lower traffic.

Numbers inside the circles are the number of external connections
currently being processed by the service.

image:ServiceMap_Node_and_Connection_Legend.png[legend showing relative
circle (node) and connection sizes]
```

```
////
== Details

Hovering over a circle displays a summary of information for that service.

image:Workload_Map_Summary.png[Workload Hover Summary]
////


== Workload Details and Alerts

Circles displayed in color indicate a warning- or critical-level alert for
the workload.  Hover over the circle for a summary of the issue, or click
on the circle to open a slideout panel with more detail.

image:Workload_Map_Slideout_with_Alert.png[Workload Slideout Details With
Alerts]


== Finding and Filtering

As with other Cloud Insights features, you can easily set filters to focus
on the specific objects or workload attributes you want.

image:Workload_Map_Filtering.png[Workload Map filtering]

Likewise, typing a string in the _Find_ field will highlight matching
workloads.

image:Workload_Map_Find_Highlighting.png[typing in find box highlights
workloads]



== Workload Labels

Workload labels are necessary if you want the Map to identify the types of
workloads displayed (i.e. the circle icons).  Labels are derived as
follows:

* Name of the service/application running in generic terms

* If the source is a pod:
** Label is derived from the workload label of the pod
** Expected label on the workload: app.kubernetes.io/component
** Label name reference:
https://kubernetes.io/docs/concepts/overview/working-with-objects/common-
```

```
labels/
** Recommended labels:
*** frontend
*** backend
*** database
*** cache
*** queue
*** kafka

* If the source is external to the kubernetes cluster:
** Cloud Insights will attempt to parse the DNS resolved name to extract
the service type.
+
For example, with a DNS resolved name of _s3.eu-north-1.amazonaws.com_,
the resolved name is parsed to get _s3_ as the service type.



== Dive Deep

Right-clicking on a workload presents you with additional options to
explore further. For example, from here you can zoom in to view the
connections for that workload.

image:Workload_Map_Zoom_Into_Connections.png[Workload Map Right-Click Zoom
to show the workload's connections]

Or you can open the detail slideout panel to directly view the _Summary_,
_Network_, or _Pod & Storage_ tab.

image:Workload_Map_Detail_Network_Slideout.png[Detail Slideout Network Tab
Example]

Finally, selecting _Go to Asset Page_ will open the detailed asset landing
page for the workload.

image:Workload_Map_Asset_Page.png[Workload Asset Page]
```

```
[[IDf6a45412d8c403ca6ce47ee2a1e88b2e]]
= Kubernetes Change Analytics
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Kubernetes Change Analytics provide you with an all-in-one view of recent
changes to your K8s environment. Alerts and deployment status are at your
fingertips. With Change Analytics, you can track every deployment and
configuration change, and correlate it with the health and performance of
K8s services, infrastructure, and clusters.

Keep the following in mind:

* In multi-tenant environments, outages may happen because of mis-
configured changes. In very dynamic environments, Cloud Insights Change
Analytics may not be able to properly track all changes.
* Change Analytics provides a single pane to view and correlate the health
of workloads and configuration changes. This may help in troubleshooting
dynamic environments.


To view Kubernetes Change Analytics, navigate to *Kubernetes > Change
Analysis*.

image:ChangeAnalytitcs_Main_Screen.png[Kubernetes Change Analytics main
screen, showing warning and critical alerts, successful and failed
deployments, and the top 3 workloads triggering alerts].

The page automatically refreshes based on the currently-selected Cloud
Insights time range.  Smaller time ranges mean more frequent screen
refreshing.

== Filtering

As with all features of Cloud Insights, filtering the change list is
intuitive: at the top of the page, enter or select values for your
```

```
Kubernetes Cluster, Namespace, or Workload, or add your own filters by
selecting the {+] button.

When you filter down to a specific Cluster, Namespace, and Workload (along
with any other filters you set), you are shown a timeline of deployments
and alerts for that workload in that namespace on that cluster. Zoom in
further by clicking and dragging in the graph to focus on a more specific
time range.

image:ChangeAnalytitcs_Filtered_Timeline.png[Workload Timeline example]

== Quick Status

Below the filtering area are a number of high-level indicators. On the
left is the number of alerts (Warning and Critical). This number includes
_Active_ as well as _Resolved_ alerts. To see only _Active_ alerts, set a
filter for "Status" and choose "Active".

image:ChangeAnalytitcs_Alerts.png[Change Analytics Alerts]

Deployment status is also shown here. Again, the default is to show the
count of _Started_, _Complete_, and _Failed_ deployments. To see only
_Failed_ deployments, set a filter for "Status" and select "Failed".

image:ChangeAnalytitcs_Deploys.png[Change Analytics DSeploys]

The top 3 workloads with the most alerts are next. The number in red next
to each workload indicates the number of alerts related to that workload.
Click the workload link to explore through your Infrastructure (Kubernetes
Explorer), Dependencies (Workload Map), or Log Analysis (Event Logs).

image:ChangeAnalytitcs_ExploreWorkloadAlerts.png[Change Analytics Workload
Exploration Options]

== Detail Panel

Selecting a change in the list opens a panel describing the change in more
detail. For example, selecting a failed Deploy shows a summary of the
Deploy, with start and end times, duration, and where the deploy was
triggered, with links to explore those resources. It also displays the
reason for the failure, any related changes, and any associated events.

image:ChangeAnalytitcs_DeployDetailPanel.png[Deploy Failure Detail Panel]

Selecting an Alert similarly provides details about the alert, including
the monitor that triggered the alert as well as a chart showing a visual
timeline for the alert.
```

```
:leveloffset: -1


= Insights

:leveloffset: +1


[[ID332fdfcd2c88695bed2cdeb02c5b3edd]]
= Insights
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Insights allow you to look into things like resource usage and how it
affects other resources, or time-to-full analyses.

A number of Insights are available. Navigate to *Dashboards > Insights* to
start diving in.  You can view active Insights (Insights that are
currently occurring) on the main tab, or inactive Insights on the
_Inactive Insights_ tab. Inactive Insights are those that were previously
active but are no longer occurring.

== Insight Types

=== Shared Resources Under Stress

High-impact workloads can reduce the performance of other workloads in a
shared resource. This puts the shared resource under stress. Cloud
Insights provides tools to help you investigate resource saturation and
impact in your environment.
xref:{relative_path}insights_shared_resources_under_stress.html[Learn
More]

//NOTE: This is a _Preview_ feature and may change over time as
improvements are made.
xref:{relative_path}/concept_preview_features.html[Learn more] about Cloud
Insights Preview features.
```

```
=== Kubernetes Namespaces Running Out of Space

The Kubernetes Namespaces Running Out of Space Insight gives you a view
into workloads on your Kubernetes namespaces that are at risk of running
out of space, with an estimate for the number of days remaining before
each space becomes full.
xref:{relative_path}insights_k8s_namespaces_running_out_of_space.html[Lear
n More]

//NOTE: This is a _Preview_ feature and may change over time as
improvements are made.
xref:{relative_path}/concept_preview_features.html[Learn more] about Cloud
Insights Preview features.

=== Reclaim ONTAP Cold Storage

The _Reclaim ONTAP Cold Storage_ Insight provides data about cold
capacity, potential cost/power savings and recommended action items for
volumes on ONTAP systems.
xref:{relative_path}insights_reclaim_ontap_cold_storage.html[Learn More]

NOTE: This is a _Preview_ feature and may change over time as improvements
are made. xref:{relative_path}/concept_preview_features.html[Learn more]
about Cloud Insights Preview features.




[[ID1fa1e3a0a4bd412ee2c99aeeb95ba1f8]]
= Insights: Shared Resources Under Stress
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
High-impact workloads can reduce the performance of other workloads in a
shared resource. This puts the shared resource under stress. Cloud
Insights provides tools to help you investigate resource saturation and
impact in your environment.

////
NOTE: The _Shared Resources Under Stress_ Insight is considered a
```

```
_Preview_ feature and is therefore subject to change.
////

== Terminology

When talking about workload or resource impact, the following definitions
are useful.

//A *Demanding* or *Impactful* resource is one that causes a negative
impact on another resource. For example, a volume experiencing very high
IOPS may cause increased latency in other volumes (i.e. _Impacted_ or
_Degraded_ resources). Demanding and Impacted resources are “peers” that
utilize the same shared resource, for example, a storage pool or Volume.
Demanding resources are sometimes called _greedy_ resources.

A *Demanding Workload* is a workload that is currently identified as
impacting other resources in the shared storage pool. These workloads
drive higher IOPS (for example), reducing IOPS in the Impacted Workloads.
Demanding workloads are sometimes called _high-consuming workloads_.

An *Impacted Workload* is a workload that is affected by a high-consuming
workload in the shared Storage Pool. These workloads are experiencing
reduced IOPS and/or higher latency, caused by the Demanding Workloads.

Note that if Cloud Insights has not discovered the leading compute
workload, the volume or internal volume itself will be recognized as the
workload. This applies to both demanding and impacted workloads.

*Shared Resource Saturation* is the ratio of impacting IOPS to _baseline_.

*Baseline* is defined as the maximum reported data point for each workload
in the hour immediately preceding the detected saturation.

A *Contention* or *Saturation* occurs when IOPS are determined to be
affecting other resources or workloads in the shared storage pool.


== Demanding Workloads

To start looking into Demanding and impacted workloads in your shared
resources, click on *Dashboards > Insights* and select the *Shared
Resources Under Stress* Insight.

//image:Shared_resources_Under_Stress_menu.png[Workloads List]
image:InsightsMenu.png[Insights Menu]

Cloud Insights displays a list of any workloads where a saturation has
```

```
been detected. Note that Cloud Insights will show workloads where at least
one _demanding resource_ *or* _impacted resource_ has been detected.

Click on a workload to view the details page for it. The top chart shows
the activity on the shared resource (for example, a storage pool) on which
the contention/saturation is occurring.

//image:Shared_resources_Under_Stress_SharedResource.png[Shared resource
showing contention]
image:ResourceInsightShared.png[Shared resource showing contention]

//image:Insights_Shared_Resource_Contention_Chart.png[Chart showing
activity on the shared resource]

Below that are two charts showing the _demanding_ workloads and the
workloads that are _impacted_ by those demanding workloads.

//image:Insights_Demanding_Workload_Chart.png[Demanding workload chart]
//image:Insights_Impacted_Workload_Chart.png[Impacted workload chart]
image:ResourceInsightDemanding.png[Demanding workload chart]
image:ResourceInsightImpacted-a.png[Impacted workload chart]

Below each table is a list of workloads and/or resources affecting or
affected by the contention.  Clicking on a resource (for example, a VM)
opens a detail page for that resource. Clicking on a workload opens a
query page showing the pods involved. Note that if the link opens an empty
query, it may be because the affected pod is no longer part of the active
contention. You can modify the query's time range to view the pod list in
greater or more focused time range.


== What do I do to resolve saturation?

There are a number of steps you can take to reduce or eliminate the chance
of saturation in your environment. These are shown by expanding the *+Show
Recommendations* link on the page.  Here are a few things you can try.

* Move high-IOPS consumers
+
Move the "greedy" workloads to less-saturated Storage Pools. It is
recommended to assess the tier and capacity of these pools before moving
the workloads, to avoid unnecessary costs or additional contentions.

* Implement a quality of service (QoS) policy
+
Implementing a QoS policy per workload to ensure enough free resources
available will alleviate saturation on the Storage Pool. This is a long-
```

```
term solution.

* Add additional resources
+
If the shared resource (for example, Storage Pool) has reached the IOPS
saturation point, adding more or faster disks to the pool will ensure
enough free resources available to alleviate saturation.

Finally, you can click the *Copy Insight Link* to copy the page url to the
clipboard, to more easily share with colleagues.





[[ID87eb09797f799b1d82d7901d8e469fbb]]
= Insights: Kubernetes Namespaces Running out of Space
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Running out of space in your environment is never a good situation. Cloud
Insights helps you predict the time you have before Kubernetes persistent
volumes become full.

//NOTE: This is a _Preview_ feature and may change over time as
improvements are made.
xref:{relative_path}/concept_preview_features.html[Learn more] about Cloud
Insights Preview features.

The _Kubernetes Namespaces Running Out of Space_ Insight gives you a view
into workloads on your Kubernetes namespaces that are at risk of running
out of space, with an estimate for the number of days remaining before
each persistent volume becomes full.

You can view this Insight by navigating to *Dashboards > Insights*.

image:K8sRunningOutOfSpaceWorkloadList.png[List of workloads in K8s
namespaces that are at risk of running out of space]

Click on a workload to open a detail page for the Insight.  On this page
you will see a graph showing the workload capacity trends as well as a
```

```
table showing the following:

* Workload Name
* Persistent Volume affected
* Predicted Time-to-Full in days
* Persistent Volume capacity
* Backend Storage Resource affected, with current capacity used out of
total capacity. Clicking this link will opoen the detailed landing page
for the backend volume.

image:K8sRunningOutOfSpaceWorkloadTable.png[Workload table showing
details]

=== What can I do if I'm running out of space?

On the Insight page, click the *+Show Recommendations* to view possible
solutions. The easiest option when running out of space is always to add
more capacity, and Cloud Insights shows you the optimal capacity to add to
increase time-to-full to a target 60-day prediction. Other recommendations
are also shown.

image:K8sRunningOutOfSpaceRecommendations.png[Capacity to add to return to
60-day TTF]

It is here also that you can copy a convenient link to this Insight, to
bookmark the page or to easily share with your team.








[[ID4b1b00862510e153bdb91c4c56bbad22]]
= Insights: Reclaim ONTAP Cold Storage
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The _Reclaim ONTAP Cold Storage_ Insight provides data about cold
capacity, potential cost/power savings and recommended action items for
volumes on ONTAP systems.
```

```
To view these Insights, navigate to *Dashboards > Insights* and take a
look at the _Reclaim ONTAP Cold Storage_ Insight. Note that this Insight
will only list affected storages if Cloud Insights has detected cold
storage, otherwise you will see an "all clear" message.

Keep in mind that cold data less than 30 days old is not shown.

image:Cold_Data_Insight_List.png[Insight list showing 3 storages with cold
data]

The Insight description gives a quick indication of the amount of data
detected as "cold" and which storage that data resides on. The table also
provides a count of workloads with cold data.

Selecting an Insight from the list opens a page showing more details,
including recommendations to move data to the Cloud or cycle down unised
disks, as well as estimated cost and power savings you could potentially
realize from implementing those recommendations. The page even provides a
handy link to link:https://bluexp.netapp.com/cloud-tiering-service-
tco[NetApp's TCO Calculator] so you can experiment with the numbers.

image:Cold_Data_Power_Info.png[Cold Data Power Info]

=== Recommendations

On the Insight page, expand the *Recommendations* to explore the following
options:

* Move unused workloads (zombies) to a lower cost storage tier (HDD)
+
Utilizing the zombie flag, cold storage and number of days, find the
coldest and largest amount of data and move the workload to a lower cost
storage tier (such as a storage pool using hard disk storage). A workload
is considered a "zombie" when is has not received any significant IO
requests for 30 days or more.

* Delete unused workloads
+
Verify which workloads are not in use and consider archiving them or
remove them from the storage system.

* Consider NetApp's Fabric Pool Solution
+
NetApp's link:https://docs.netapp.com/us-en/cloud-manager-tiering/concept-
cloud-tiering.html#features[Fabric Pool Solution] automatically tiers cold
data to low cost cloud storage, thus increasing the effiecency of your
```

```
performance tier as well as providing remote data protection.


=== Visualize and Explore

The graphs and table provide additional trending information as well as
allow you to drill into the individual workloads.

//image:Cold_Data_Workload_Graph_and_Table.png[Cold_Data_Workload_Graph_an
d_Table]
image:Cold_Data_Storage_Trend.png[Cold Data Summary Graphs]
image:Cold_Data_Workload_Table.png[Cold Data Workload Table]







:leveloffset: -1


[[ID0b84cb710989b4c928a01d0cbe64fe1a]]
= ONTAP Essentials
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
ONTAP Essentials is a set of dashboards and workflows that provide
detailed overviews of your ONTAP inventories and workloads. You may see
the following terms used when working in ONTAP Essentials:

* Infrastructure/Inventory: Objects that provide storage/networking
services to user data
* Workloads: Objects that provide interface to users to read/write data.
* Data Protection: Objects that can be protected using NetApp data
protection technologies

For additional terms and definitions related to ONTAP, see the
xref:{relative_path}task_dc_na_cdot.html[ONTAP Data Collector]
documentation.

ONTAP Essentials requires at least one working ONTAP data collector with
```

```
data collected within the last seven days.


== Overview

To begin exploring, select *ONTAP Essentials* from the main Cloud Insights
menu.

//image:ONTAP_Essentials_Overview_Sept.png[Overview dashboard for ONTAP
Essentials]
image:OE_Overview.png[Overview dashboard for ONTAP Essentials]

The *Overview* dashboard displays useful information like the number of
clusters in your environment with their overall capacity and performance
percentages. You will also see predictive data regarding the number of
expected days until storage capacity or performance capacity runs out of
space. Additionally, if any controllers in your infrastructure are running
with their CPU at more than 65%--potentially putting your cluster at risk
in case of failover--ONTAP Essentials shows those as "Hot" controllers.

Informative graphs give you a look into performance over time as well as
breakdowns of capacity usage. Each of these graphs or data points can be
used as a starting point for exploration or investigation.

Note: A "days to full" number of "0" (zero) indicates that days to full is
estimated at greater than 90 days. In other words, your systems aren't in
danger of running out of space any time soon.


== Data Protection

//Select the *Data Protection* page to view SnapMirror relationships.
Click through to source or destination volume information, or click the
gear icon to add columns for the data you wish to view.

The *Data Protection* page shows the status of volumes protected by
*Snapshot copies* or *SnapMirror policies*.

In the _Local Protection Overview_ section, the charts provide the
following information for volumes protected by Snapshot copies:

* The number of volumes protected by Snapshot copies, as well as those not
protected.
* The number of volumes that are using or exceeding the reserve space for
the Snapshot copies.
* The number of volumes in specific ranges of Snapshot copy count (i.e.
less than 10 copies, 10 to 200, etc.).
```

```
In the _Remote Protection Overview_ section, the charts provide
information related to volumes protected by SnapMirror policies:

* The number of healthy and unhealthy SnapMirror relationships.
* The number of SnapMirror relationships experiencing recovery point
objective (RPO) lag based on the lag status.
* The number of relationships protected by SnapMirror volume protection
types such as Volume SnapMirror, SVMDR relationships, FlexGroup SnapMirror
relationships, SnapMirror Business Continuity (SMBC) consistency Group
relationships, as well as unprotected volumes.
* The number of relationships protected by the SnapMirror relationship
types such as Asynchronous Mirror, Asynchronous Vault, Asynchronous
MirrorVault, StrictSync, and Sync.

image:DataProtectionDashboard_OverviewWidgets_.png[Data Protection
Dashboard widgets showing Local and Remote overviews]

The _Clusters_ grid at the bottom of the page provides details related to
the following:

* Volumes not protected by Snapshots.
* Volumes breaching snapshot reserve space.
* Volumes not protected by snapmirror policies and snapmirror
relationships experiencing lag.
* Unhealthy SnapMirror relationships.

//image:ONTAP_Essentials_data_protection.png[SnapMirror Relationships list
page]
//image:OE_DataProtection.png[SnapMirror Relationships list page]

image:DataProtectionDashboard_ClusterList.png[Data Protection Cluster
List]


== Security

The Security Dashboard gives you an instant view of your current security
situation, showing charts for hardware and software volume encryption,
anti-ransomware status, and cluster authentication methods. Security
criteria is evaluated based on recommendations defined in the
link:https://www.netapp.com/pdf.html?item=/media/10674-tr4569.pdf[*NetApp
Security Hardening Guide for ONTAP 9*].

Select any of the encryption or anti-ransomware counts to dive into your
environment.
```

```
image:OE_SecurityDashboard.png[ONTAP Essentials Security Dashboard]


The ONTAP Essentials Security dashboard monitors your environment to
determine cluster compliance status. Refer to the
link:https://docs.netapp.com/us-en/active-iq-unified-manager/health-
checker/reference_cluster_compliance_categories.html[Cluster Compliance
Categories] to learn more. ONTAP Essentials uses the following monitors to
determine compliance:

|===
|Monitor Name   |Attribute Name (Displayed in Cluster Details)  |Attribute
Compliant Value

|FIPS Mode Disabled |FIPS mode  |Enabled
|Cluster Insecure ciphers for SSH   |Secure SSH Settings    |Yes
|Telnet Protocol Enabled    |Telnet |Disabled
|Remote Shell Enabled   |Remote Shell   |Disabled
|Default Local Admin User Enabled|Default Admin User    |Disabled
|MD5 Hashed password    |MD5 in use |No
|Cluster Peer Communication Not Encrypted   |Cluster Peering
|Encrypted/ No Peer
|AutoSupport HTTPS Transport Disabled   |AutoSupport using HTTPS    |Yes
|No NTP Servers are Configured  |Network Time Protocol  |Configured
|NTP Server Count is Low    |Network Time Protocol  |Configured
|Cluster Login Banner Disabled  |Login Banner   |Enabled
|Log Forwarding Not Encrypted   |Log Forwarding Encrypted   |Yes
|===


Note that if a monitor above is disabled, the cluster details will show
the value as ‘Not checked’ for the corresponding security compliance
attribute.

image:OE_Cluster_Compliance_Example.png[Cluster Compliance Status]

For SVMs, the Security dashboard looks at the following monitors:

|===
|Monitor Name   |Attribute Name (Displayed in Storage VM Settings)
|Attribute Compliant Value

|Storage VM Insecure ciphers for SSH    |Secure SSH Settings    |Yes
|Storage VM Login banner disabled   |Login Banner   |Enabled
|Storage VM Audit Log Disabled  |Audit Log  |Enabled
|===
//The following link:https://docs.netapp.com/us-en/active-iq-unified-
manager/health-
checker/reference_svm_compliance_categories.html[parameters] also factor
in determining SVM security status:

//image:OE_SVM_Parameters.png[SVM Parameters for compliance]



In the cluster list, select  _View Details_ for each cluster to open a
"slideout" panel showing you the current settings for _Cluster, Storage
VM,_ or _Anti-Ransomware_.

Cluster details include connection status, certificate information, and
more:
image:OE_Cluster_Slideout.png[Cluster Detail Slideout Panel]

Storage VM details show audit and SSH information:
image:OE_Storage_Slideout.png[Storage tab]

Anti-Ransomware details show whether a storage VM is protected by ONTAP's
Anti-Ransomware Protection or Cloud Insights Workload Security. Note that
the ONTAP ARP column displays the current status of ONTAP's on-board Anti-
Ransomware Protection, which is configured on the ONTAP system. Cloud
Insights Workload Security can be enabled by selecting "Protect" in that
column.
image:OE_Anti-Ransomware_Slideout.png[Anti-Ransomware tab]





== Alerts

Here you can view the Active alerts in your environment and quickly drill
down into potential problems. Select the _Resolved_ tab to view alerts
that have been resolved.

//image:ONTAP_Essentials_Alerts_Menu.png[ONTAP Alerts Menu]
//image:ONTAP_Essentials_Alerts_Page.png[ONTAP Alerts page example showing
active alerts]
image:OE_Alerts.png[ONTAP Essentials Alerts List]


== Infrastructure

The ONTAP Essentials *Infrastructure* page gives you a view of cluster
```

```
health and performance, using pre-built (yet further customizable) queries
on all the basic ONTAP objects. Select the object type you wish to explore
(cluster, storage pool, etc.) and choose whether to view health or
performance information. Set filters to dive deeper into individual
systems.

image:ONTAP_Essentials_Health_Performance.png[Infrastructure selections
for storage pools]

Infrastructure page showing cluster health:
image:ONTAP_Essentials_Infrastructure_A.png[Infrastructure objects to
explore]

== Networking

ONTAP Essentials Networking gives you views into your FC, NVME FC,
Ethernet, and iSCSI infrastructure. On these pages you can explore things
like ports in your clusters and their nodes.

image:ONTAP_Essentials_Alerts_Menu.png[ONTAP Essentials Networking Menu]
image:ONTAP_Essentials_Alerts_Page.png[ONTAP Essentials Networking FC page
showing ports into cluster nodes]


== Workloads

View and explore workloads on LUNs/Volumes, NFS or SMB Shares, or Qtrees
in your environment.

image:ONTAP_Essentials_Workloads_Menu.png[Workloads Menu]

image:ONTAP_Essentials_Workloads_Page.png[Workloads list page]




= Working with Queries

:leveloffset: +1


[[ID0c53f1ced857101edad3a284f43eda6d]]
= Assets used in queries
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Queries enable you to monitor and troubleshoot your network by searching
the assets and metrics in your environment at a granular level based on
user-selected criteria (for example, annotations).

Note that annotation rules, which automatically assign annotations to
assets, _require_ a query.

You can query the physical or virtual inventory assets (and their
associated metrics) in your environment, or the metrics provided with
integration such as Kubernetes or ONTAP Advanced Data.

== Inventory Assets

The following asset types can be used in queries, dashboard widgets, and
custom asset landing pages. The fields and counters available for filters,
expressions, and display will vary among asset types. Not all assets can
be used in all widget types.

* Application
* Datastore
* Disk
* Fabric
* Generic Device
* Host
* Internal Volume
* iSCSI Session
* iSCSI Network Portal
* Path
* Port
* Qtree
* Quota
* Share
* Storage
* Storage Node
* Storage Pool
* Storage Virtual Machine (SVM)
* Switch
* Tape
* VMDK
* Virtual Machine
* Volume
* Zone
* Zone Member

== Integration Metrics

In addition to querying for inventory assets and their associated
performance metrics, you can query for *integration data* metrics as well,
such as those generated by Kubernetes or Docker, or provided with ONTAP
Advanced Metrics.

image:QueryPageFilter.png[Integration Query Filter Example]



[[IDfea8d8052c340d37b5a245397923881b]]
= Creating Queries
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Queries enable you to search the assets in your environment at a granular
level, allowing to filter for the data you want and sort the results to
your liking.

For example, you can create a query for _volumes_, add a filter to find
particular _storages_ associated with the selected volumes, add another
filter to find a particular _annotation_ such as "Tier 1" on the selected
storages, and finally add another filter to find all storages with _IOPS -
Read (IO/s)_ greater than 25. When the results are displayed, you can then
sort the columns of information associated with the query in ascending or
descending order.

Note: When a new data collector is added which acquires assets, or any
annotation or application assignments are made, you can query for those
new assets, annotations, or applications only after the queries are
indexed. Indexing occurs at a regularly scheduled interval or during
certain events such as running annotation rules.

.Creating a Query is very simple:

. Navigate to *Queries > *+New Query*.
. From the 'Select...' list, select the object type you want to query for.
You can scroll through the list or you can start typing to more quickly
find what you're searching for.

.Scroll list:
image:QueryDrop-DownList.png[Query Drop-Down]

.Type-to-Search:
image:QueryPageFilter.png[Typing to find]

You can add filters to further narrow down your query by clicking the *+*
button in the *Filter By* field.
Group rows by object or attribute. When working with integration data
(Kubernetes, ONTAP Advanced Metrics, etc.), you can group by multiple
attributes, if desired.

image:QueryFilterExample.png[Query Filtering and Grouping]

The query results list shows a number of default columns, depending on the
object type searched for. To add, remove, or change the columns, click the
gear icon on the right of the table. The available columns variy based on
the asset/metric type.

image:QuerySelectColumns.png[Select Columns]


== Choosing Aggregation, Units, Conditional Formatting

=== Aggregation and Units

For "value" columns, you can further refine your query results by choosing
how the displayed values are aggregated as well as selecting the units in
which those values are displayed. These options are found by selecting the
"three dots" menu at the top corner of a column.

image:Query_Page_Aggregation_etc.png[Query Page results showing
Aggregation, Conditional Formatting, Unit Display, and Column Renaming]

==== Units

You can select the units in which to display the values. For example, if
the selected column shows raw capacity and the values are shown in GiB,
but you prefer to display them as TiB,  simply select TiB from the Unit
Display drop-down.

==== Aggregation
```

```
By the same token, if the values shown are aggregated from the underlying
data as "Average", but you prefer to show the sum of all values, select
"Sum" from either the _Group by_ drop-down (if you want any grouped values
to show the sums) or from the _Time Aggregate By_ drop-down (if you want
the row values to show sums of underlying data).

You can choose to aggregate grouped data points by _Avg, Max, Min, or
Sum_.

You can aggregate individual row data by _Average, Last data point
acquired, Maximum, Minimum, or Sum_.

==== Conditional Formatting

Conditional Formatting allows you to highlight Warning-level and Critical-
level thresholds in the query results list, bringing instant visibility to
outliers and exceptional data points.

image:Query_Page_Conditional_Formatting.png[Conditional Formatting on
Query Page]

Conditional formatting is set separately for each column. For example, you
can choose one set of thresholds for a capacity column, and another set
for a throughput column.

==== Rename Column

Renaming a column changes the displayed name on the Query results list.
The new column name is also shown in the resulting file if you export the
query list to .CSV.

=== Save

After you have configured your query to show you the results you want, you
can click the *Save* button to save the query for future use. Give it a
meaningful and unique name.


== More on Filtering


=== Wildcards and Expressions

When you are filtering for text or list values in queries or dashboard
widgets, as you begin typing you are presented with the option to create a
*wildcard filter* based on the current text. Selecting this option will
return all results that match the wildcard expression. You can also create
```

```
*expressions* using NOT or OR, or you can select the "None" option to
filter for null values in the field.

image:Type-Ahead-Example-ingest.png[Wildcard Filter]

Filters based on wildcards or expressions (e.g. NOT, OR, "None", etc.)
display in dark blue in the filter field. Items that you select directly
from the list are displayed in light blue.

image:Type-Ahead-Example-Wildcard-DirectSelect.png[Wildcard Filter
Results]

Note that Wildcard and Expression filtering works with text or lists but
not with numerics, dates or booleans.



=== Refining Filters

You can use the following to refine your filter:

|===
|Filter|What it does | Example | Result
| * (Asterisk) |enables you to search for everything | vol*rhel |returns
all resources that start with "vol" and end with "rhel"
| ? (question mark) |enables you to search for a specific number of
characters|  BOS-PRD??-S12 |returns BOS-PRD**__12__**-S12, BOS-
PRD**__23__**-S12, and so on
| OR |enables you to specify multiple entities | FAS2240 OR CX600 OR
FAS3270 |returns any of FAS2440, CX600, or FAS3270
| NOT |allows you to exclude text from the search results |  NOT EMC*
|returns everything that does not start with "EMC"
| _None_ |searches for NULL values in all fields | _None_ |returns results
where the target field is empty
| Not * |searches for NULL values in _text-only_ fields | Not * |returns
results where the target field is empty
|===

If you enclose a filter string in double quotes, Insight treats everything
between the first and last quote as an exact match. Any special characters
or operators inside the quotes will be treated as literals. For example,
filtering for "*" will return results that are a literal asterisk; the
asterisk will not be treated as a wildcard in this case. The operators OR
and NOT will also be treated as literal strings when enclosed in double
quotes.

//The operator AND is always trated as a literal string.
```

```
== What do I do now that I have query results?

Querying provides a simple place to add annotations or assign applications
to assets. Note that you can only assign applications or annotations to
your inventory assets (Disk, Storage, etc.). Integration metrics cannot
take on annotation or application assignments.

To assign an annotation or application to the assets resulting from your
query, sinply select the asset(s) using the check box column on the left
of the results table, then click the *Bulk Actions* button on the right.
Choose the desired action to apply to the selected assets.

image:QueryVolumeBulkActions.png[Query Bulk Actions Example]

== Annotation Rules require query

If you are configuring
xref:{relative_path}task_create_annotation_rules.html[Annotation Rules],
each rule must have an underlying query to work with. But as you've seen
above, queries can be made as broad or as narrow as you need.



[[IDe32272ad6699297a7f90f0ee04ac4892]]
= Viewing queries
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can view your queries to monitor your assets and change how your
queries display the data related to your assets.

.Steps
. Log in to your Cloud Insights tenant.
. Click *Queries* and select *Show all queries*.
You can change how queries display by doing any of the following:
. You can enter text in the filter box to search to display specific
queries.
. You can change the sort order of the columns in the table of queries to
either ascending (up arrow) or descending (down arrow) by clicking the
arrow in the column header.
```

```
. To resize a column, hover the mouse over the column header until a blue
bar appears. Place the mouse over the bar and drag it right or left.
. To move a column, click on the column header and drag it right or left.

When scrolling through the query results, be aware that the results may
change as Cloud Insights automatically polls your data collectors. This
may result in some items being missing, or some items appearing out of
order depending on how they are sorted.



[[ID21e78ac9b3d9e5e924e4d396f7c471d1]]
= Exporting query results to a .CSV file
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can export the results of any query to a .CSV file, which will allow
you to analyze the data or import it into another application.

.Steps
. Log in to Cloud Insights.
. Click *Queries* and select *Show all queries*.
+
The Queries page is displayed.
. Click a query.
. Click image:ExportButton.png[Export Button] to export the query results
to a .CSV file.

NOTE: Export to .CSV is also available in the "three dots" menu in
dashboard table widgets as well as most landing page tables.

////
. When prompted, do one of the following:

.. Click *Open with* and then *OK* to open the file with Microsoft Excel
and save the file to a specific location.
.. Click *Save file* and then *OK* to save the file to your Downloads
folder.
////

//All of the attributes for the objects in the columns currently selected
```

```
for display are exported to the file, regardless of whether those
attributes are being displayed.

The exported data will reflect the current filtering, columns, and column
names displayed.

Note: When a comma appears in an asset name, the export encloses the name
in quotes, preserving the asset name and the proper .csv format.

When opening an exported .CSV file with Excel, if you have an object name
or other field that is in the format NN:NN (two digits followed by a colon
followed by two more digits), Excel will sometimes interpret that name as
a Time format, instead of Text format. This can result in Excel displaying
incorrect values in those columns. For example, an object named "81:45"
would show in Excel as "81:45:00".

To work around this, import the .CSV into Excel using the following steps:

. Open a new sheet in Excel.
. On the "Data" tab, choose "From Text".
. Locate the desired .CSV file and click "Import".
. In the Import wizard, choose "Delimited" and click Next.
. Choose "Comma" for the delimiter and click Next.
. Select the desired columns and choose "Text" for the column data format.
. Click Finish.
+
Your objects should show in Excel in the proper format.



[[ID5e7b91b2ad4dd1782c9a4e7a2be0f69b]]
= Modifying or Deleting a Query
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can change the criteria that are associated with a query when you want
to change the search criteria for the assets that you are querying.

== Modifying a Query

.Steps
```

```
. Click *Queries* and select *Show all queries*.
+
The Queries page is displayed.
. Click the query name
. To add a criteria to the query, click image:GearIcon.png[Columns] and
select a criteria from the list.
. To remove a filter from the query, click the *X* next to the filter to
remove.

When you have made all necessary changes, do one of the following:

* Click the *Save* button to save the query with the name that was used
initially.
* Click the drop-down next to the *Save* button and select *Save As* to
save the query with another name. This does not overwrite the original
query.
* Click the drop-down next to the *Save* button and select *Rename* to
change the query name that you had used initially. This overwrites the
original query.
* Click the drop-down next to the *Save* button and select *Discard
Changes* to revert the query back to the last saved changes.

== Deleting a Query
To delete a query, click *Queries* and select *Show all queries*, and do
one of the following:

. Click on the "three dot" menu to the right of the query and click
*Delete*.
. Click on the query name and select *Delete* from the *Save* drop-down
menu.






[[IDbde2c2467525d4876b7fe6a434cede4c]]
= Assigning multiple applications to or removing multiple applications
from assets
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[.lead]
You can assign multiple
xref:{relative_path}task_create_application.html[applications] to or
remove multiple applications from assets by using a query instead of
having to manually assign or remove them.

NOTE: You can use these steps to add or remove
xref:{relative_path}task_defining_annotations.html[annotations] in the
same way.

.Before you begin

You must have already created a query that finds all the assets that you
to edit.

.Steps
. Click *Queries* and select *Show all queries*.
+
The Queries page displays.
. Click the name of the query that finds the assets.
+
The list of assets associated with the query displays.
. Select the desired assets in the list or click the top checkbox to
select All.
+
The image:BulkActions.png[Actions] button displays.
.  To add an application to the selected assets, click
image:BulkActions.png[Actions] and select *Add Application*.
. Select one or more applications.
+
You can select multiple applications for hosts, internal volumes, qtrees,
and virtual machines; however, you can select only one application for a
volume or a share.
. Click *Save*.

. To remove an application assigned to the assets, click
image:BulkActions.png[Actions] and select *Remove Application*.
. Select the application or applications you want to remove.
. Click *Delete*.

Any new applications you assign override any applications on the asset
that were derived from another asset. For example, volumes inherit
applications from hosts, and when new applications are assigned to a
volume, the new application takes precedence over the derived application.

After you click _Save_ on a bulk add or _Remove_ on a bulk delete action,
Cloud Insights informs you that the action will take some time. You can
dismiss this message; the action will continue in the background.

NOTE: For environments with large amounts of related assets, inheritance
of application assignments to those assets could take several minutes.
Please allow more time for inheritance to occur if you have many related
assets.







[[IDb0cb004c9043028f353db8247c833d88]]
= Copying table values
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can copy values in tables to the clipboard for use in search boxes or
other applications.

.About this task
There are two methods you can use to copy values from tables or query
results to the clipboard.

.Steps
. Method 1: Highlight the desired text with the mouse, copy it, and paste
it into search fields or other applications.
. Method 2: For single-value fields, hover over the field and click the
clipboard icon image:ClipboardIcon.png[Clipboard] that appears. The value
is copied to the clipboard for use in search fields or other applications.
+
Note that only values that are links to assets can be copied using this
method. Only fields that include single values (i.e. non-lists) have the
copy icon.




[[ID14ed8bbd70e441dd198bf3982b3dce5a]]
= Log Explorer
:toc: macro
```

```
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Cloud Insights Log Explorer is a powerful tool for querying system
logs. In addition to helping with investigations, you can also save a log
query in a Monitor to provide alerts when those particular log triggers
are activated.

To begin exploring logs, click *Log Queries > +New Log Query*.

//image:LogExplorerMenu.png[Log queries menu, 480]

Select an available log from the list.
//This list may vary based on your current Cloud Insights environment
configuration.

image:LogExplorer_2022.png[Choose your log]

NOTE: The types of logs available for querying may vary based on your
environment. Additional log types may be added over time.

You can set filters to further refine the results of the query. For
example, to find all log messages showing a failure, set a filter for
_Messages_ containing the word "failed".

TIP: You can begin typing the desired text in the filter field; Cloud
Insights will prompt you to create a wildcard search containing the string
as you type.

The results are displayed in a graph showing the number of log instances
in each time period shown. Below the graph are the log entries temselves.
The graph and the entries refresh automatically based on the selected time
range.

image:LogExplorer_QueryForFailed.png[Query example showing filter]


== Filtering

=== Include / Exclude
When filtering the logs, you can choose to *include* (i.e. "Filter to") or
*exclude* the strings you type. Excluded strings are displayed in the
```

```
completed filter as "NOT <string>".

image:Log_Advanced_Query_Filter_Exclude.png[Log Filter Showing Exclude
option]

Filters based on wildcards or expressions (e.g. NOT, OR, "None", etc.)
display in dark blue in the filter field. Items that you select directly
from the list are displayed in light blue.

NOTE: At any point, you can click on _Create a Log Monitor_ to create a
new Monitor based on the current filter.


=== Advanced Filtering

When you are filtering for text or list values in queries or dashboard
widgets, as you begin typing you are presented with the option to create a
*wildcard filter* based on the current text. Selecting this option will
return all results that match the wildcard expression. You can also create
expressions using NOT, AND, or OR, or you can select the "None" option to
filter for null values.

NOTE: Be sure to Save your query early and often as you build your
filtering. Advanced Querying is "free-form" string entry, and parsing
mistakes may occur as you build.

Take a look at this screen image showing filtered results for an advanced
query of the _logs.kubernetes.event_ log. There is a lot going on in this
page, which is explained below the image:

image:Log_Advanced_Query_ScreenExplained.png[The Advanced Query Screen
Explained]

1. This advanced query string filters for the following:
+
* Filter for log entries with a _reason_ that includes the word "failed",
but not anything with the specific reason of "FailedMount".
* Include any of those entries that also include a _metadata.namespace_
including the word "monitoring", but exclude the specific namespaces of
"cm-monitoring" or "eg-monitoring".
+
Note that in the case above, since both "cm-monitoring" and "eg-
monitoring" contain a dash ("-"), the strings must be included in double-
quotes or a parsing error will be displayed. Strings that do not include
dashes, spaces, etc. do not need to be enclosed in quotes. If in doubt,
try putting the string in quotes.
```

```
2. The results of the current filter, including any "Filter By" values AND
the Advanced Query filter, are displayed in the results list. The list can
be sorted by any displayed columns. To display additional columns, select
the "gear" icon.

3. The graph has been zoomed in to show only log results that occurred
within a specific time frame. The time range shown here reflects the
current zoom level. Select the _Reset Zoom_ button to set the zoom level
back to the current Cloud Insights time range.

4. The chart results have been Grouped By the _source_ field. The chart
shows results in each column grouped into colors. Hovering over a column
in the chart will display some details about the specific entries.
+
image:Log_Advanced_Query_Group_Detail.png[Grouped Hover Details]

==== Refining Filters

You can use the following to refine your filter:

|===
|Filter|What it does
| * (Asterisk) |enables you to search for everything
| ? (question mark) |enables you to search for a specific number of
characters
| OR |enables you to specify multiple entities
| NOT |allows you to exclude text from the search results
| _None_ |searches for NULL values in all fields
| Not * |searches for NULL values in _text-only_ fields
|===

If you enclose a filter string in double quotes, Insight treats everything
between the first and last quote as an exact match. Any special characters
or operators inside the quotes will be treated as literals. For example,
filtering for "*" will return results that are a literal asterisk; the
asterisk will not be treated as a wildcard in this case. The operators OR
and NOT will also be treated as literal strings when enclosed in double
quotes.

You can combine a simple filter with an advanced query filter; the
resulting filter is an "AND" of the two.

=== The Chart Legend

The _Legend_ below the chart has a few surprises as well. For each result
(based on the current filter) shown in the Legend, you have an option to
display only results for that line (Add Filter), or to display any results
```

```
NOT for that line (Add Exclude Filter). The chart and the Log Entries list
update to show results based on your selection.  To remove this filtering,
open the Legend again and select the [X] to clear the Legend-based filter.

image:Log_Advanced_Query_Legend.png[Advanced Query Legen showing "Add
Filter" for the first result]




////
== The Log Graph

The graph shows the number of log entries, grouped into _buckets_, which
are based on the selected dashboard time range. The buckets for each time
range are as follows:

|===
|Dashboard Time Range|Bucket size
|Last 15 Minutes|10 Seconds
|Last 30 Minutes|15 Seconds
|Last 60 Minutes|30 Seconds
|Last 2 Hours|1 Minute
|Last 3 Hours|5 Minutes
|Last 6 Hours|5 Minutes
|Last 12 Hours|10 Minutes
|Last 24 Hours|15 Minutes
|Last 2 Days|30 Minutes
|Last 3 Days|45 Minutes
|Last 7 Days|2 Hours
|Last 30 Days|1 Day
|===

//To zoom in the graph, simply drag the sliders from either side. To pan
the zoomed area, click and hold in the white area and move left or right.
Click _Reset Zoom_ to reset the zoom level.

//image:LogExplorer_Zoom.png[Zoom in by dragging in the sides of the
graph]
//image:LogExplorer_Zoom_2.png[Zoom in by dragging in the sides of the
graph]

Note that when zooming the graph or scrolling the table, dashboard auto-
refresh will pause and the time range will show the frozen time. To resume
refresh, click the _Resume_ button image:ResumeButton.png[]. This will
also reset the zoom level.
////
```

```
== Log Details

Clicking anywhere in a log entry in the list will open a detail pane for
that entry.  Here you can explore more information about the event.

Click on "Add Filter" to add the selected field to the current filter. The
log entry list will update based on the new filter.

image:LogExplorer_DetailPane.png[Log Entry Detail Pane]



== Troubleshooting

Here you will find suggestions for troubleshooting problems with Log
Queries.

|===
|*Problem:* | *Try this:*
|I don't see "debug" messages in my log query
|Debug log messaging is not collected. To capture messages you want,
change the relevant message severity to _informational, error, alert,
emergency,_ or _notice_ level.
|===






:leveloffset: -1



= Working with Annotations

:leveloffset: +1



[[IDbfbdf2696413e9f03c2c72188df922e9]]
= Defining annotations
:toc: macro
:hardbreaks:
:toclevels: 2
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
When customizing Cloud Insights to track data for your corporate
requirements, you can define specialized notes, called annotations, and
assign them to your assets.

You can assign annotations to assets with information such as asset end of
life, data center, building location, storage tier, or volume service
level.

Using annotations to help monitor your environment includes the following
high-level tasks:

* Creating or editing definitions for all annotation types.
* Displaying asset pages and associating each asset with one or more
annotations.
+
For example, if an asset is being leased and the lease expires within two
months, you might want to apply an end-of-life annotation to the asset.
This helps prevent others from using that asset for an extended time.

* Creating rules to automatically apply annotations to multiple assets of
the same type.
* Filter assets by their annotations.

== Default annotation types

Cloud Insights provides some default annotation types. These annotations
can be used to filter or group data.

You can associate assets with default annotation types such as the
following:

* Asset life cycle, such as birthday, sunset, or end of life
* Location information about a device, such as data center, building, or
floor
* Classification of assets, such as by quality (tiers), by connected
devices (switch level), or by service level
* Status, such as hot (high utilization)

The following table lists the Cloud Insights-provided annotation types.

[cols=3*, Optiosn="header",cols="30,53, 16"]
```

```
|===
|Annotation types
|Description
|Type
|Alias|User-friendly name for a resource|Text
//|Birthday|Date device was/will be brought online|Date
//|Building|Physical location of assets|List

//|City|Municipality location of assets|List
|Compute Resource Group|Group assignment used by the Host and VM
Filesystems data collector|List
//|Continent|Geographic location of assets|List
//|Country|National location of assets|List
|Data Center|Physical location|List
//|Direct Attached|Indicates (Yes or No) if a storage resource is
connected directly to hosts|Boolean
//|End of Life |Date when a device will be taken offline|Date
//|Fabric Alias|User-friendly name for a fabric|Text
//|Floor|Location of a device on a floor of a building (hosts, storage
arrays, switches, and tapes)|List
|Hot|Devices under heavy use on a regular basis or at the threshold of
capacity|Boolean
|Note|Comments associated with a resource|Test
//|Rack|Rack in which the resource resides|List
//|SAN|Logical partition of the network for hosts, storage arrays, tapes,
switches, and applications.|List
|Service Level|A set of supported service levels that you can assign to
resources. Provides an ordered options list for internal volumes, qtree,
and volumes. Edit service levels to set performance policies for different
levels.|List
//|State/Province|State or province where the resource is located.|List
|Sunset|Threshold set after which no new allocations can be made to that
device. Useful for planned migrations and other pending network
changes.|Date
|Switch Level|Predefined options for setting up categories for switches.
Typically, these designations remain for the life of the device, although
you can edit them. Available only for switches.|List
|Tier|Can be used to define different levels of service within your
environment. Tiers can define the type of level, such as speed needed (for
example, gold or silver). This feature is available only on internal
volumes, qtrees, storage arrays, storage pools, and volumes.|List
|Violation Severity|Rank (for example, major) of a violation (for example,
missing host ports or missing redundancy), in a hierarchy of highest to
lowest importance.|List
|===
NOTE: Alias, Data Center, Hot, Service Level, Sunset, Switch Level,  Tier,
and Violation Severity are system-level annotations, which you cannot
delete or rename; you can change only their assigned values.

== Creating custom annotations

Using annotations, you can add custom business-specific data that matches
your business needs to assets. While Cloud Insights provides a set of
default annotations, you might find that you want to view data in other
ways. The data in custom annotations supplements device data already
collected, such as storage manufacturer, number volumes, and performance
statistics. The data you add using annotations is not discovered by Cloud
Insights.

.Steps

. In the Cloud Insights menu, click *Manage > Annotations*.
+
The Annotations page displays the list of annotations.
. Click *+Add*
. Enter a *Name* and *Description* of the annotation.
+
You can enter up to 255 characters in these fields.
. Click *Type* and then select one of the following options that
represents the type of data allowed in this annotation:

.Annotation types
Boolean:: Creates a drop-down list with the choices of yes and no. For
example, the "Direct Attached" annotation is Boolean.
Date:: This creates a field that holds a date. For example, if the
annotation will be a date, select this.
List:: Creates either of the following:
* A drop-down fixed list
+
When others are assigning this annotation type on a device, they cannot
add more values to the list.
* A drop-down flexible list
+
If you select the Add new values on the fly option when you create this
list, when others are assigning this annotation type on a device, they can
add more values to the list.

Number:: Creates a field where the user assigning the annotation can enter
a number. For example, if the annotation type is "Floor", the user could
select the Value Type of "number" and enter the floor number.

Text:: Creates a field that allows free-form text. For example, you might
```

```
enter "Language" as the annotation type, select "Text" as the value type,
and enter a language as a value.

NOTE: After you set the type and save your changes, you cannot change the
type of the annotation. If you need to change the type, you have to delete
the annotation and create a new one.

. If you select List as the annotation type, do the following:
.. Select *Add new values on the fly* if you want the ability to add more
values to the annotation when on an asset page, which creates a flexible
list.
+
For example, suppose you are on an asset page and the asset has the City
annotation with the values Detroit, Tampa, and Boston. If you selected the
*Add new values on the fly* option, you can add additional values to City
like San Francisco and Chicago directly on the asset page instead of
having to go to the Annotations page to add them. If you do not choose
this option, you cannot add new annotation values when applying the
annotation; this creates a fixed list.

.. Enter a value and description in *Value* and  *Description* fields.

.. Click *+Add+* to add additional values.

.. Click the Trash icon to delete a value.

. Click *Save*
+
Your annotations appear in the list on the Annotations page.

.After you finish
In the UI, the annotation is available immediately for use.




[[ID7dfa666d767426ba6c05aeb98f7d54a8]]
= Using annotations
:toc: macro
:hardbreaks: AA
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[.lead]
You create annotations and assign them to assets you monitor. Annotations
are notes that provide information about an asset, such as physical
location, end of life, storage tier, or volume service levels.

== Defining annotations

Using annotations, you can add custom business-specific data that matches
your business needs to assets. While Cloud Insights provides a set of
default annotations, such as asset life cycle (birthday or end of life),
building or data center location, and tier, you might find that you want
to view data in other ways.

The data in custom annotations supplements device data already collected,
such as switch manufacturer, number of ports, and performance statistics.
The data you add using annotations is not discovered by Cloud Insights.

.Before you begin

* List any industry terminology to which environment data must be
associated.
* List corporate terminology to which environment data must be associated.
* Identify any default annotation types that you might be able to use.
* Identify which custom annotations you need to create. You need to create
the annotation before it can be assigned to an asset.

Use the following steps to create an annotation.

.Steps

. In the Cloud Insights menu, click *Manage > Annotations*
. Click *+ Annotation* to create a new annotation.
. Enter a Name, Description, and type for the new annotation.
+
For example, enter the following to create a text annotation that defines
the physical location of an asset in Data Center 4:
+
* Enter a name for the annotation, such as "Location"
* Enter a description of what the annotation is describing, such as
"Physical location is Data Center 4"
* Enter the 'type' of annotation it is, such as "Text".

== Manually assigning annotations to assets

Assigning annotations to assets helps you sort, group, and report on
assets in ways that are relevant to your business. Although you can assign
```

```
annotations to assets of a particular type automatically using annotation
rules, you can assign annotations to an individual asset by using its
asset page.

.Before you begin

* You must have created the annotation you want to assign.

.Steps

. Log in to your Cloud Insights environment.
. Locate the asset to which you want to apply the annotation.
** You can locate assets by querying, choosing from a dashoard widget, or
search. When you have located the asset you want, click the link to open
the asset's landing page.
. On the asset page, in the User Data section, click *+ Annotation*.
. The Add Annotation dialog box displays.
. Select an annotation from the list.
. Click Value and do either of the following, depending on type of
annotation you selected:
** If the annotation type is list, date, or Boolean, select a value from
the list.
** If the annotation type is text, type a value.
. Click *Save*.

If you want to change the value of the annotation after you assign it,
click the annotation field and select a different value.
If the annotation is of list type for which the _Add new values on the
fly_ option is selected, you can type a new value in addition to selecting
an existing value.

== Assigning annotations using annotation rules

To automatically assign annotations to assets based on criteria that you
define, you configure annotation rules. Cloud Insights assigns the
annotations to assets based on these rules. Cloud Insights also provides
two default annotation rules, which you can modify to suit your needs or
remove if you do not want to use them.

////
=== Default storage annotation rules

To expedite the assignment of storage annotations to your resources, Cloud
Insights includes 21 default annotation rules, which associate a tier
level with a storage tier model. All of your storage resources are
automatically associated with a tier upon acquisition of the assets in
your environment.
```

```
The default annotation rules apply tier annotations in the following way:

Tier 1, storage quality tier::
The Tier 1 annotation is applied to the following vendors and their
specified families: EMC (Symmetrix), HDS (HDS9500V, HDS9900, HDS9900V,
R600, R700, USP r, USP V), IBM (DS8000), NetApp (FAS6000 or FAS6200), and
Violin (Memory).
Tier 2, storage quality tier::
The Tier 2 annotation is applied to the following vendors and their
specified families: HP (3PAR StoreServ or EVA), EMC (CLARiiON), HDS (AMS
or D800), IBM (XIV), and NetApp (FAS3000, FAS3100, and FAS3200).

You can edit the default settings of these rules to match your tier
requirements, or you can remove them if you do not need them.
////

=== Creating annotation rules

As an alternative to manually applying annotations to individual assets,
you can automatically apply annotations to multiple assets using
annotation rules. Annotations set manually on an individual asset pages
take precedence over rule-based annotations when Insight evaluates the
annotation rules.

.Before you begin

You must have created a query for the annotation rule.

.About this task
Although you can edit the annotation types while you are creating the
rules, you should have defined the types ahead of time.

.Steps

. Click *Manage > Annotation rules*
+
The Annotation Rules page displays the list of existing annotation rules.
. Click *+ Add*.
. Do the following:
.. In the *Name* box, enter a unique name that describes the rule.
+
This name will appear in the Annotation Rules page.
.. Click *Query* and select the query that is used to apply the annotation
to assets.
.. Click *Annotation* and select the annotation you want to apply.
.. Click *Value* and select a value for the annotation.
+
For example, if you choose Birthday as the annotation, you specify a date
for the value.
.. Click *Save*
.. Click *Run all rules* if you want to run all the rules immediately;
otherwise, the rules are run at a regularly scheduled interval.



[[IDe8a6ca007914e5f22b359eb147b2d278]]
= Creating annotation rules
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can use annotation rules to automatically apply annotations to
multiple assets based on criteria that you define. Cloud Insights assigns
the annotations to assets based on these rules. Annotations set manually
on an individual asset pages take precedence over rule-based annotations
when Cloud Insight evaluates the annotation rules.

.Before you begin
You must have created a query for the annotation rule.

.Steps

. In the Cloud Insights menu click *Manage > Annotation rules*.
. Click *+ Rule* to add a new annotation rule.
+
The Add Rule dialog is displayed.
. Do the following:
.. In the *Name* box, enter a unique name that describes the rule.
+
The name appears in the Annotation Rules page.
.. Click *Query* and select the query that Cloud Insights uses to identify
the assets the annotation applies to.
.. Click *Annotation* and select the annotation you want to apply.
.. Click *Value* and select a value for the annotation.
+
For example, if you choose Birthday as the annotation, you specify a date
```

```
for the value.
.. Click *Save*
.. Click *Run all rules* if you want to run all the rules immediately;
otherwise, the rules are run at a regularly scheduled interval.
+
NOTE: In a large Cloud Insights environment, you may notice that running
annotation rules seems to take a while to complete. This is because the
indexer runs first and must complete prior to running the rules. The
indexer is what gives Cloud Insights the ability to search or filter for
new or updated objects and counters in your data. The rules engine waits
until the indexer completes its update before applying the rules.

== Modifying annotation rules

You can modify an annotation rule to change the rule's name, its
annotation, the annotation's value, or the query associated with the rule.

.Steps
. In the Cloud Insights menu, Click *Manage > Annotation rules*.
+
The Annotation Rules page displays the list of existing annotation rules.
. Locate the Annotation Rule you want to modify.
+
You can filter the annotation rules by entering a value in the filter box
or click a page number to browse through the annotation rules by page.
. Click the menu icon for the rule that you want to modify.
. Click *Edit*
+
The Edit Rule dialog is displayed.
. Modify the annotation rule's name, annotation, value, or query.

== Changing the Order of Rules

Annotation rules are processed from the top of the rules list to the
bottom. To change the order in which a rule is processed, do the
following:

.Steps
. Click on the menu icon for the rule you want to move.
. Click *Move Up* or *Move Down* as needed until the rule appears in the
location you want.

Note that when running multiple rules that update the same annotation on
an asset, the first rule (as run from the top down) applies the annotation
and updates the asset, then the second rule applies but doesn’t change any
annotation that was already set by the previous rule.
```

```
== Deleting annotation rules

You might want to delete annotation rules that are no longer used.

.Steps
. In the Cloud Insights menu, Click *Manage > Annotation rules*.
+
The Annotation Rules page displays the list of existing annotation rules.
. Locate the Annotation Rule you want to delete.
+
You can filter the annotation rules by entering a value in the filter box
or click a page number to browse through the annotation rules by page.
. Click the menu icon for the rule that you want to delete.
. Click *Delete*
+
A confirmation message is displayed, prompting whether you want to delete
the rule.
. Click *OK*






[[IDe514772f06adbd0f4a0d253c559d5a99]]
= Importing Annotations
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights includes an API for importing annotations or applications
from a CSV file, and assigning them to objects you specify.

NOTE: The Cloud Insights API is available in *Cloud Insights Premium
Edition*.

//The export and import functions are supported only between servers that
are running the same version of OnCommand Insight.

== Importing

The *Admin > API Access* links contain
```

```
xref:{relative_path}API_Overview.html[documentation] for the
*Assets/Import* API. This documentation contains information on the .CSV
file format.

image:api_assets_import.png[Import API]

== .CSV File Format

The general format of the CSV file is as follows. The first line of the
file defines the import fields and specifies the order of the fields. This
is followed by separate lines for each annotation or application. You do
not need to define every field. However, the subsequent annotation lines
must follow the same order as the definition line.

 [Object Type] , [Object Name or ID] , Annotation Type [, Annotation
Type,  ...] [, Application] [, Tenant] [, Line_Of_Business] [,
Business_Unit] [, Project]

See the API Documentation for examples of .CSV files.

////
<Object Type Value 1>, <Object Name or Key 1>, <Annotation Value> [,
<Annotation Value> ...] [, <Application>] [, <Tenant>] [,
<Line_Of_Business>] [, <Business_Unit>] [, <Project>]

<Object Type Value 2>, <Object Name or Key 2>, <Annotation Value> [,
<Annotation Value> ...] [, <Application>] [, <Tenant>] [,
<Line_Of_Business>] [, <Business_Unit>] [, <Project>]

<Object Type Value 3>, <Object Name or Key 3>, <Annotation Value> [,
<Annotation Value> ...] [, <Application>] [, <Tenant>] [,
<Line_Of_Business>] [, <Business_Unit>] [, <Project>]

...

<Object Type Value N>, <Object Name or Key N>, <Annotation Value> [,
<Annotation Value> ...] [, <Application>] [, <Tenant>] [,
<Line_Of_Business>] [, <Business_Unit>] [, <Project>]
////

You can import and assign annotations from a .CSV file from within the API
swagger itself. Simply choose the file to use and click the _Execute_
button:

image:api_assets_import_assign.png[Import and Assign]

== Import Behavior
```

```
During the import operation, data is added, merged, or replaced, depending
on the objects and object types that are being imported. While importing,
keep in mind the following behaviors.

* Adds an annotation or application if none exists with the same name in
the target system.
* Merges an annotation if the annotation type is a list, and an annotation
with the same name exists in the target system.
* Replaces an annotation if the annotation type is anything other than a
list, and an annotation with the same name exists in the target system.
+
Note: If an annotation with the same name but with a different type exists
in the target system, the import fails. If objects depend on the failed
annotation, those objects may show incorrect or unwanted information. You
must check all annotation dependencies after the import operation is
complete.
* If an annotation value is empty then that annotation is removed from the
object. Inherited annotations are not affected.
* Date type annotation values must be passed in as unix time in
milliseconds.
* When annotating volumes or internal volumes, the object name is a
combination of storage name and volume name using the "\->" separator. For
example: _<Storage Name>\-><Volume Name>_
* If an object name contains a comma, the whole name must be in double
quotes. For example: _"NetApp1,NetApp2"\->023F_
* When attaching annotating to storages, switches, and ports, the
'Application' column will be ignored.
* Tenant, Line_Of_Business, Business_Unit, and/or Project makes a business
entity. As with all business entities, any of the values can be empty.

The following object types can be annotated.

|===
|OBJECT TYPE |NAME OR KEY
|Host|id\-><id> or <Name> or <IP>
|VM|id\-><id> or <Name>
|StoragePool|id\-><id> or <Storage Name>\-><Storage Pool Name>
|InternalVolume|id\-><id> or <Storage Name>\-><Internal Volume Name>
|Volume|id\-><id> or <Storage Name>\-><Volume Name>
|Storage|id\-><id> or <Name> or <IP>
|Switch|id\-><id> or <Name> or <IP>
|Port|id\-><id> or <WWN>
|Qtree|id\-><id> or <Storage Name>\-><Internal Volume Name>\-><Qtree Name>
|Share|id\-><id> or <Storage Name>\-><Internal Volume Name>\-><Share
Name>\-><Protocol>[\-><Qtree Name (optional in case of default Qtree)>]
```

```
|===


//• TBD: ONLY FOR OCI? The user can import a csv file and execute the API
for the annotation assignment -


////
* Annotation Rules
+
Adds an annotation rule if no annotation rule with the same name exists in
the target system.
Replaces an annotation rule if an annotation rule with the same name
exists in the target system.
Note: Annotation rules are dependent on both queries and annotations. You
must check all the annotation rules for accuracy after the import
operation is complete.
////

////
Policies
Adds a policy if no policy with the same name exists in the target system.
Replaces a policy if a policy with the same name exists in the target
system.
Note: Policies may be out of order after the import operation is complete.
You must check the policy order after the import.
Policies that are dependent on annotations may fail if the annotations are
incorrect. You must check all the annotation dependencies after the
import.

Queries
Adds a query if no query with the same name exists in the target system.
Replaces a query if a query with the same name exists in the target
system, even if the resource type of the query is different.
Note: If the resource type of a query is different, after the import, any
dashboard widgets that use that query may display unwanted or incorrect
results. You must check all query-based widgets for accuracy after the
import.
Queries that are dependent on annotations may fail if the annotations are
incorrect. You must check all the annotation dependencies after the
import.

Dashboards
Adds a dashboard if no dashboard with the same name exists in the target
system.
Replaces a dashboard if a dashboard with the same name exists in the
```

```
target system, even if the resource type of the query is different.
Note: You must check all query-based widgets in dashboards for accuracy
after the import.
If the source server has multiple dashboards with the same name, they are
all exported. However, only the first one will be imported to the target
server. To avoid errors during import, you should ensure that your
dashboards have unique names before exporting them.
////



:leveloffset: -1


= Working with Applications

:leveloffset: +1


[[IDaadceffc6e72831fcc38a065335771fa]]
= Tracking asset usage by application
[.lead]
Understanding the applications used in your company's environment helps
you to keep track of asset usage and cost.

Before you can track data associated with the applications running in your
environment, you must first define those applications and associate them
with the appropriate assets. You can associate applications with the
following assets: hosts, virtual machines, volumes, internal volumes,
qtrees, shares, and hypervisors.

This topic provides an example of tracking the usage of virtual machines
that the Marketing Team uses for its Exchange email.

You might want to create a table similar to the following to identify
applications used in your environment and note the group or business unit
using each applications.

[cols=5*,options="header]
|===
|Tenant|Line of Business|Business Unit|Project|Applications
|NetApp|Data Storage|Legal|Patents|Oracle Identity Manager, Oracle On
Demand, PatentWiz
|NetApp|Data Storage|Marketing|Sales Events|Exchange, Oracle Shared
DataBase, BlastOff Event Planner
|===
The table shows that that Marketing Team uses the Exchange application. We
want to track their virtual machine utilization for Exchange, so that we
can predict when we will need to add more storage.  We can associate the
Exchange application with all of Marketing's virtual machines:

. Create an application named _Exchange_
. Go to *Queries > +New Query* to create a new query for virtual machines
(or select an existing VM query, if applicable).
+
Assuming the Marketing team's VMs all have a name containing the string
“*mkt*”, create your query to filter VM name for “mkt”.
. Select the VMs.
. Associate the VMs with the _Exchange_ application using *Bulk Actions >
Add Applications*.
. Select the desired application and click *Save*.
. When finished, *Save* the query.





[[ID0c7d50d5843dcda73e3411ac7fc182e6]]
= Creating Applications
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
To track data associated with specific applications running in your
environment, you can define the applications in Cloud Insights.

.Before you begin

If you want to associate the application with a business entity, you must
create the business entity before you define the application.

.About this task

Cloud Insights allows you to track data from assets associated with
applications for things like usage or cost reporting.

.Steps
```

```
. In the Cloud Insights menu, click *Manage > Applications*.
+
The Add Application dialog box displays.

. Enter a unique name for the application.
. Select a priority for the application.
. Click *Save*.

After defining an application, it can be assigned to assets.

== Assigning applications to assets

This procedure assigns the application to a host as an example. You can
assign host, virtual machine, volume, or internal volumes to an
application.

.Steps

. Locate the asset to which you want to assign to the application:
. Click *Queries > +New Query* and search for Host.
. Click the check box on the left of the Host you want to associate with
the application.
. Click *Bulk Actions > Add Application*.
. Select the Application you are assigning the asset to.

Any new applications you assign override any applications on the asset
that were derived from another asset. For example, volumes inherit
applications from hosts, and when new applications are assigned to a
volume, the new application takes precedence over the derived application.

NOTE: For environments with large amounts of related assets, inheritance
of application assignments to those assets could take several minutes.
Please allow more time for inheritance to occur if you have many related
assets.

.After you finish

After assigning the host to the application you can assign the remaining
assets to the application. To access the landing page for the application,
click *Manage > Application* and select the application you created.




:leveloffset: -1
```

```
= Monitors and Alerts

:leveloffset: +1


[[ID0316d9dda54967bdc76c3867fce774f8]]
= Alerting with Monitors
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You create monitors to set thresholds that trigger alerts to notify you
about issues related to the resources in your network. For example, you
can create a monitor to alert for _node write latency_ for any of a
multitude of protocols.

TIP: Monitors and Alerting is available in all Cloud Insights Editions,
however, Basic Edition is subject to the following:
* You may only have up to five custom monitors active at a time. Any
monitors beyond five will be created in or moved to _Paused_ state.
* VMDK, Virtual Machine, Host, and DataStore metrics monitors are not
supported. If you have monitors created for these metrics, they will be
paused and cannot be resumed when downgrading to Basic Edition.

toc::[]

//When the monitored threshold and conditions are reached or exceeded,
Cloud Insights creates an alert. A Monitor can have a _Warning_ threshold,
a _Critical_ threshold, or both. Log Monitors can also have an
_Informational_ alert level.

Monitors allow you to set thresholds on metrics generated by
"infrastructure" objects such as storage, VM, EC2, and ports, as well as
for "integration" data such as those collected for Kubernetes, ONTAP
advanced metrics, and Telegraf plugins. These _metric_ monitors alert you
when warning-level or critical-level thresholds are crossed.

You can also create monitors to trigger warning-, critical-, or
informational-level alerts when specified _log events_ are detected.

Cloud Insights provides a number of
```

```
xref:{relative_path}task_system_monitors.html[System-Defined Monitors] as
well, based on your environment.

== Security Best Practice

Cloud Insights alerts are designed to highlight data points and trends in
your environment, and Cloud Insights allows you to enter any valid email
address as an alert recipient. If you are working in a secure environment,
be especially mindful of who is receiving the notification or otherwise
has access to the alert.

== Metric or Log Monitor?

. From the Cloud Insights menu, click *Alerts > Manage Monitors*
+
The Monitors list page is displayed, showing currently configured
monitors.

. To modify an existing monitor, click the monitor name in the list.

. To add a monitor, Click *+ Monitor*.
+
image:Monitor_log_or_metric.png[Choose system or log monitor]
+
When you add a new monitor, you are prompted to create a Metric Monitor or
a Log Monitor.

* _Metric_ monitors alert on infrastructure- or performance-related
triggers
* _Log_ monitors alert on log-related activity

+
After you choose your monitor type, the Monitor Configuration dialog is
displayed. Configuration varies depending on which type of monitor you are
creating.


=== Metric Monitor

. In the drop-down, search for and choose an object type and metric to
monitor.

You can set filters to narrow down which object attributes or metrics to
monitor.

//image:select_metric_to_monitor.png[Select Metric]
```

```
image:MonitorMetricFilter.png[Metrics Filtering]

//When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering works against the data samples themselves, not the
objects as with infrastructure data (storage, VMs, ports, etc.).

When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering removes the individual/unmatched data points from
the plotted data series, unlike infrastructure data (storage, VM, ports
etc.) where filters work on the aggregated value of the data series and
potentially remove the entire object from the chart.

//image:IntegrationMetricFilterExample.png[Integration Metric Filtering]

TIP: To create a multi-condition monitor (e.g., IOPS > X and latency > Y),
define the first condition as a threshold and the second condition as a
filter.


==== Define the Conditions of the Monitor.

. After choosing the object and metric to monitor, set the Warning-level
and/or Critical-level thresholds.
. For the _Warning_ level, enter 200 for our example. The dashed line
indicating this Warning level displays in the example graph.
. For the _Critical_ level, enter 400. The dashed line indicating this
Critical level displays in the example graph.
+
The graph displays historical data. The Warning and Critical level lines
on the graph are a visual representation of the Monitor, so you can easily
see when the Monitor might trigger an alert in each case.

. For the occurence interval, choose _Continuously_ for a period of _15
Minutes_.
+
You can choose to trigger an alert the moment a threshold is breached, or
wait until the threshold has been in continuous breach for a period of
time. In our example, we do not want to be alerted every time the Total
IOPS peaks above the Warning or Critical level, but only when a monitored
object continuously exceeds one of these levels for at least 15 minutes.
+
//image:define_monitor_conditions.png[Define Conditions]
image:Monitor_metric_conditions.png[Define the monitor's conditions]
```

```
=== Log Monitor

When creating a *Log monitor*, first choose which log to monitor from the
available log list. You can then filter based on the available attributes
as above. You can also choose one or more "Group By" attributes.

NOTE: The Log Monitor filter cannot be empty.

//image:Monitor_log_monitor_filter.png[choose which log to monitor, and
set a filter]
image:Monitor_Group_By_Example.png[Choose log to monitor, set a filter,
and select group by method, if desired]


////
 ////==== Define the alert behavior

Choose how you want to alert when a log alert is triggered. You can set
the monitor to alert with _Warning_, _Critical_, or _Informational_
severity, based on the filter conditions you set above.

image:Monitor_log_alert_behavior.png[define the log behavior to monitor]
////

==== Define the alert Behavior

You can create the monitor to alert with a severity level of _Critical_,
_Warning_, or _Informational_, when the conditions you defined above occur
once (i.e.  immediately), or wait to alert until the conditions occur 2
times or more.


==== Define the alert resolution behavior

You can choose how a log monitor alert is resolved. You are presented with
three choices:

* Resolve instantly
* Purge after the data retention period (please refer to the Editions Page
for details). Note that the Monitor has no resolution condition by
definition, so an Alert will stay _active_ and suppress all subsequent
alerts with matching _group_by_ generated by this monitor, until the data
retention period has passed.
* Resolve based on log entry: Resolve alert when the log line is
discovered as outlined in the following definition, or purge after the
```

```
data retention period.

image:LogMonitorAlertResolution.png[Alert Resolution Options]


////
* *Resolve instantly*: The alert is immediately resolved with no further
action needed
* *Resolve based on time*: The alert is resolved after the specified time
has passed
* *Resolve based on log entry*: The alert is resolved when a subsequent
log activity has occurred. For example, when an object is logged as
"available".

image:Monitor_log_monitor_resolution.png[Alert Resolution]
////


=== Select notification type and recipients

In the _Set up team notification(s)_ section, you can choose whether to
alert your team via email or Webhook.

image:Webhook_Choose_Monitor_Notification.png[Choose alerting method]

*Alerting via Email:*

Specify the email recipients for alert notifications. If desired, you can
choose different recipients for warning or critical alerts.

image:email_monitor_alerts.png[Email Alert Recipients]

*Alerting via Webhook:*

Specify the webhook(s) for alert notifications. If desired, you can choose
different webhooks for warning or critical alerts.

image:Webhook_Monitor_Notifications.png[Webhook Alerting]

NOTE: ONTAP Data Collector notifications take precedence over any specific
Monitor notifications that are relevant to the cluster/data collector. The
recipient list you set for the Data Collector itself will receive the data
collector alerts. If there are no active data collector alerts, then
monitor-generated alerts will be sent to specific monitor recipients.


=== Setting Corrective Actions or Additional Information
```

```
You can add an optional description as well as additional insights and/or
corrective actions by filling in the *Add an Alert Description* section.
The description can be up to 1024 characters and will be sent with the
alert. The insights/corrective action field can be up to 67,000 characters
and will be displayed in the summary section of the alert landing page.

In these fields you can provide notes, links, or steps to take to correct
or otherwise address the alert.

image:Monitors_Alert_Description.png[Alert Corrective Actions and
Description]


=== Save your Monitor

. If desired, you can add a description of the monitor.
+
. Give the Monitor a meaningful name and click *Save*.
+
Your new monitor is added to the list of active Monitors.



== Monitor List

The Monitor page lists the currently configured monitors, showing the
following:

* Monitor Name
* Status
* Object/metric being monitored
* Conditions of the Monitor

You can choose to temporarily pause monitoring of an object type by
clicking the menu to the right of the monitor and selecting *Pause*. When
you are ready to resume monitoring, click *Resume*.

You can copy a monitor by selecting *Duplicate* from the menu. You can
then modify the new monitor and change the object/metric, filter,
conditions, email recipients, etc.

If a monitor is no longer needed, you can delete it by selecting *Delete*
from the menu.


== Monitor Groups
```

```
Grouping allows you to view and manage related monitors. For example, you
can have a monitor group dedicated to the storage in your environment, or
monitors relevant to a certain recipient list.

image:Monitors_GroupList.png[Monitor Grouping]

The following monitor groups are shown. The number of monitors contained
in a group is shown next to the group name.

* *All Monitors* lists all monitors.
* *Custom Monitors* lists all user-created monitors.
* *Suspended Monitors* will list any system monitors that have been
suspended by Cloud Insights.
* Cloud Insights will also show a number of *System Monitor Groups*, which
will list one or more groups of
xref:{relative_path}task_system_monitors.html[system-defined monitors],
including ONTAP Infrastructure and Workload monitors.
//* *Data Collection* monitors will alert on Data Collector or Acquisition
Unit issues.

NOTE: Custom monitors can be paused, resumed, deleted, or moved to another
group. System-defined monitors can be paused and resumed but can not be
deleted or moved.

=== Suspended Monitors

This group will only be shown if Cloud Insights has suspended one or more
monitors. A monitor may be suspended if it is generating excessive or
continuous alerts. If the monitor is a custom monitor, modify the
conditions to prevent the continuous alerting, and then resume the
monitor. The monitor will be removed from the Suspended Monitors group
when the issue causing the suspension is resolved.


////
=== Data Collection Monitors

This group will show monitors
////


=== System-Defined Monitors

These groups will show monitors provided by Cloud Insights, as long as
your environment contains the devices and/or log availability required by
the monitors.
```

```
System-Defined monitors cannot be modified, moved to another group, or
deleted. However, you can duplicate a system monitor and modify or move
the duplicate.

System monitors may include monitors for ONTAP Infrastructure (storage,
volume, etc.) or Workloads (i.e. log monitors), or other groups. NetApp is
constantly evaluating customer need and product functionality, and will
update or add to system monitors and groups as needed.


=== Custom Monitor Groups

You can create your own groups to contain monitors based on your needs.
For example, you may want a group for all of your storage-related
monitors.

To create a new custom monitor group, click the *"+" Create New Monitor
Group* button. Enter a name for the group and click *Create Group*. An
empty group is created with that name.

To add monitors to the group, go to the _All Monitors_ group (recommended)
and do one of the following:

* To add a single monitor, click the menu to the right of the monitor and
select _Add to Group_. Choose the group to which to add the monitor.
* Click on the monitor name to open the monitor's edit view, and select a
group in the _Associate to a monitor group_ section.
+
image:Monitors_AssociateToGroup.png[Associate to group]

//* To add multiple monitors to a group, select them by clicking the
checkbox next to each monitor, then click the *Bulk Actions* button and
select _Move to Group_.

Remove monitors by clicking on a group and selecting _Remove from Group_
from the menu. You can not remove monitors from the _All Monitors_ or
_Custom Monitors_ group. To delete a monitor from these groups, you must
delete the monitor itself.

//To remove a monitor from a group while editing the monitor, in the
_Associate with a group_ section, click the *X* next to the group name.

NOTE: Removing a monitor from a group does not delete the monitor from
Cloud Insights. To completely remove a monitor, select the monitor and
click _Delete_. This also removes it from the group to which it belonged
and it is no longer available to any user.
```

```
You can also move a monitor to a different group in the same manner,
selecting _Move to Group_.

//NOTE: Each monitor can belong to only a single group at any given time
(in addition to belonging to "All Monitors" and "Custom Monitors").

To pause or resume all monitors in a group at once, select the menu for
the group and click _Pause_ or _Resume_.

Use the same menu to rename or delete a group. Deleting a group does not
delete the monitors from Cloud Insights; they are still available in _All
Monitors_.

image:Monitors_PauseGroup.png[Pause a group]




////
=== Creating a Monitor

In the example below, we will create a Monitor to give a Warning alert
when _Volume Node NFS Write Latency_ reaches or exceeds 200ms, and a
Critical alert when it reaches or exceeds 400ms. We only want to be
alerted when either threshold is exceeded for at least 15 continuous
minutes.

==== Requirements

* Cloud Insights must be configured to collect integration data, and that
data is being collected.
////
////
==== Create the Monitor

. From the Cloud Insights menu, click *Alerts > Manage Monitors*
+
The Monitors list page is displayed, showing currently configured
monitors.

. To add a monitor, Click *+ Monitor*. To modify an existing monitor,
click the monitor name in the list.
+
The Monitor Configuration dialog is displayed.
. In the drop-down, search for and choose an object type and metric to
monitor, for example _netapp_ontap_volume_node_nfs_write_latency_.
```

```
You can set filters to narrow down which object attributes or metrics to
monitor.

//image:select_metric_to_monitor.png[Select Metric]

image:MonitorMetricFilter.png[Metrics Filtering]

//When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering works against the data samples themselves, not the
objects as with infrastructure data (storage, VMs, ports, etc.).

When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering removes the individual/unmatched data points from
the plotted data series, unlike infrastructure data (storage, VM, ports
etc.) where filters work on the aggregated value of the data series and
potentially remove the entire object from the chart.

//image:IntegrationMetricFilterExample.png[Integration Metric Filtering]

TIP: To create a multi-condition monitor (e.g., IOPS > X and latency > Y),
define the first condition as a threshold and the second condition as a
filter.


==== Define the Conditions of the Monitor.

. After choosing the object and metric to monitor, set the Warning-level
and/or Critical-level thresholds.
. For the _Warning_ level, enter 200. The dashed line indicating this
Warning level displays in the example graph.
. For the _Critical_ level, enter 400. The dashed line indicating this
Critical level displays in the example graph.
+
The graph displays historical data. The Warning and Critical level lines
on the graph are a visual representation of the Monitor, so you can easily
see when the Monitor might trigger an alert in each case.

. For the occurence interval, choose _Continuously_ for a period of _15
Minutes_.
+
You can choose to trigger an alert the moment a threshold is breached, or
wait until the threshold has been in continuous breach for a period of
time. In our example, we do not want to be alerted every time the Total
IOPS peaks above the Warning or Critical level, but only when a monitored
object continuously exceeds one of these levels for at least 15 minutes.
+
image:define_monitor_conditions.png[Define Conditions]


==== Refining the Filter

When you are filtering, as you begin typing you are presented with the
option to create a *wildcard filter* based on the current text. Selecting
this option will return all results that match the wildcard expression.
You can also create *expressions* using NOT or OR, or you can select the
"None" option to filter for null values in the field.

image:Type-Ahead_Monitor_1.png[Wildcard Filter]

Filters based on wildcards or expressions (e.g. NOT, OR, "None", etc.)
display in dark blue in the filter field. Items that you select directly
from the list are displayed in light blue.

image:Type-Ahead-Example-Wildcard-DirectSelect.png[Wildcard Filter
Results]

Note that Wildcard and Expression filtering works with text or lists but
not with numerics, dates or booleans.



=== Setting Corrective Actions or Additional Information

You can add an optional description as well as additional insights and/or
corrective actions by filling in the *Add an Alert Description* section.
The description can be up to 1024 characters and will be sent with the
alert. The insights/corrective action field can be up to 67,000 characters
and will be displayed in the summary section of the alert landing page.

In these fields you can provide notes, links, or steps to take to correct
or otherwise address the alert.

image:Monitors_Alert_Description.png[Alert Corrective Actions and
Description]




=== Select notification type and recipients

In the _Set up team notification(s)_ section, you can choose whether to
alert your team via email or Webhook.
```

```
image:Webhook_Choose_Monitor_Notification.png[Choose alerting method]

*Alerting via Email:*

Specify the email recipients for alert notifications. If desired, you can
choose different recipients for warning or critical alerts.

image:email_monitor_alerts.png[Email Alert Recipients]

*Alerting via Webhook:*

Specify the webhook(s) for alert notifications. If desired, you can choose
different webhooks for warning or critical alerts.

image:Webhook_Monitor_Notifications.png[Webhook Alerting]

==== Warning vs. Critical vs. Resolved alerting

Whether a monitor sends a Warning, Critical, or Resolved alert
notification depends on which threshold is crossed:

* Crossing from non-triggered to WARNING - Send Warning Alert
* Crossing from non-triggered to CRITICAL - Send Critical Alert
* Crossing from WARNING to CRITICAL - Send Critical Alert
* Crossing from CRITICAL to WARNING - Send Warning Alert
* Crossing from WARNING to Non-Triggered - Send RESOLVED Alert
* Crossing from CRITICAL to Non-Triggered - Send RESOLVED Alert


=== Save your Monitor

. If desired, you can add a description of the monitor.
+
. Give the Monitor a meaningful name and click *Save*.
+
Your new monitor is added to the list of active Monitors.

=== Monitor List

The Monitor page lists the currently configured monitors, showing the
following:

* Monitor Name
* Status
* Object/metric being monitored
* Conditions of the Monitor
```

```
You can view any active alerts associated with a monitor by clicking rthe
"bell" icon next to the Monitor name.
image:ViewActiveAlerts.png[Icon showing active alerts for a monitor]

You can choose to temporarily suspend monitoring of an object type by
clicking the menu to the right of the monitor and selecting *Pause*. When
you are ready to resume monitoring, click *Resume*.

You can copy a monitor by selecting *Duplicate* from the menu. You can
then modify the new monitor and change the object/metric, filter,
conditions, email recipients, etc.

If a monitor is no longer needed, you can delete it by selecting *Delete*
from the menu.



== Monitor Groups

Grouping allows you to view and manage related monitors. For example, you
can have a monitor group dedicated to the storage in your environment, or
monitors relevant to a certain recipient list.

image:Monitors_GroupList.png[Monitor Grouping]

////
////
Two groups are shown by default:

* *All Monitors* lists all monitors.
* *Custom Monitors* lists only user-created monitors.
* *Suspended Monitors* will be shown only if a monitor has been suspended
by the system.
////

////

The number of monitors contained in a group is shown next to the group
name.

To create a new group, click the *"+" Create New Monitor Group* button.
Enter a name for the group and click *Create Group*. An empty group is
created with that name.

To add monitors to the group, go to the _All Monitors_ group (recommended)
and do one of the following:
```

```
* To add a single monitor, click the menu to the right of the monitor and
select _Add to Group_. Choose the group to which to add the monitor.
* Click on the monitor name to open the monitor's edit view, and select a
group in the _Associate to a monitor group_ section.
+
image:Monitors_AssociateToGroup.png[Associate to group]

//* To add multiple monitors to a group, select them by clicking the
checkbox next to each monitor, then click the *Bulk Actions* button and
select _Move to Group_.

Remove monitors by clicking on a group and selecting _Remove from Group_
from the menu. You can not remove monitors from the _All Monitors_ or
_Custom Monitors_ group. To delete a monitor from these groups, you must
delete the monitor itself.

NOTE: Removing a monitor from a group does not delete the monitor from
Cloud Insights. To completely remove a monitor, select the monitor and
click _Delete_. This also removes it from the group to which it belonged
and it is no longer available to any user.

You can also move a monitor to a different group in the same manner,
selecting _Move to Group_.

NOTE: Each monitor can belong to only a single group at any given time.

To pause or resume all monitors in a group at once, select the menu for
the group and click _Pause_ or _Resume_.

Use the same menu to rename or delete a group. Deleting a group does not
delete the monitors from Cloud Insights; they are still available in _All
Monitors_.

image:Monitors_PauseGroup.png[Pause a group]
////



== System-Defined Monitors

Cloud Insights includes a number of system-defined monitors for both
metrics and logs. The system monitors available are dependent on the data
collectors present in your environment. Because of that, the monitors
available in Cloud Insights may change as data collectors are added or
their configurations changed.

View the xref:{relative_path}task_system_monitors.html[System-Defined
Monitors] page for descriptions of monitors included with Cloud Insights.


=== More Information

* xref:{relative_path}task_view_and_manage_alerts.html[Viewing and
Dismissing Alerts]









[[ID745c0eb118e066ed3de06e47d2d49bfe]]
= Viewing and Managing Alerts from Monitors
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights displays alerts when
xref:{relative_path}task_create_monitor.html[monitored thresholds] are
exceeded.

TIP: Monitors and Alerting is available in Cloud Insights Standard Edition
and higher.

== Viewing and Managing Alerts

To view and manage alerts, do the following.

. Navigate to the *Alerts > All Alerts* page.
. A list of up to the most recent 1,000 alerts is displayed. You can sort
this list on any field by clicking the column header for the field. The
list displays the following information. Note that not all of these
columns are displayed by default. You can select columns to display by
clicking on the "gear" icon image:gear.png[gear icon]:

** *Alert ID*: System-generated unique alert ID
** *Triggered Time*: The time at which the relevant Monitor triggered the
```

```
alert
** *Current Severity* (Active alerts tab): The current severity of the
active alert
** *Top Severity* (Resolved alerts tab); The maximum severity of the alert
before it was resolved
** *Monitor*: The monitor configured to trigger the alert
** *Triggered On*: The object on which the monitored threshold was
breached
** *Status*: Current alert status, _New_ or _In Process_
** *Active Status*: _Active_ or _Resolved_
** *Condition*: The threshold condition that triggered the alert
** *Metric*: The object's metric on which the monitored threshold was
breached
** *Monitor Status*: Current status of the monitor that triggered the
alert
** *Has Corrective Action*: The alert has suggested corrective actions.
Open the alert page to view these.

You can manage an alert by clicking the menu to the right of the alert and
choosing one of the following:

* *In Process* to indicate that the alert is under investigation or
otherwise needs to be kept open
* *Dismiss* to remove the alert from the list of active alerts.

You can manage multiple alerts by selecting the checkbox to the left of
each Alert and clicking _Change Selected Alerts Status_.

Clicking on an Alert ID opens the Alert Detail Page.

== Alert Detail Page

The Alert Detail Page provides additional detail about the alert,
including a _Summary_, an _Expert View_ showing graphs related to the
object's data, any _Related Assets_, and _Comments_ entered by alert
investigators.

image:alert_detail_page.png[Alert Detail Page]

== Alerts When Data Is Missing

In a realtime system such as Cloud Insights, to trigger the analysis of a
Monitor to decide if an Alert should be generated, we rely on one of two
things:

* the next datapoint to arrive
* a timer to fire when there is no datapoint and you have waited long
```

```
enough

As is the case with slow data arrival--or no data arrival--the timer
mechanism needs to take over as the data arrival rate is insufficient to
trigger alerts in "real time." So the question typically becomes "How long
do I wait before I close the analysis window and look at what I have?" If
you wait too long then you are not generating the alerts fast enough to be
useful.

If you have a Monitor with a 30-minute window that notices that a
condition is violated by the last data point before a long-term loss-of-
data, an Alert will be generated because the Monitor received no other
information to use to confirm a recovery of the metric or notice that the
condition persisted.


== "Permanently Active" Alerts

It is possible to configure a monitor in such a way for the condition to
*always* exist on the monitored object--for example, IOPS > 1 or latency >
0. These are often created as 'test' monitors and then forgotten. Such
monitors create alerts that stay permanently open on the constituent
objects, which can cause system stress and stability issues over time.

To prevent this, Cloud Insights will automatically close any "permanently
active" alert after 7 days. Note that the underlying monitor conditions
may (probably will) continue to exist, causing a new alert to be issued
almost immediately, but this closing of "always active" alerts alleviates
some of the system stress that can otherwise occur.



[[ID3a7b28b8f4de7780e8f60fa5f08babc6]]
= Configuring Email Notifications
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can configure an email list for subscription-related notifications, as
well as a global email list of recipients for notification of performance
policy threshold violations.
//You can also configure a global email list of recipients for monitor-
```

```
related notifications.

To configure notification email recipient settings, go to the *Admin >
Notifications* page and select the _Email_ tab.

[.thumb]
image:Notifications_email_list.png[Email Notifications]

== Subscription Notification Recipients

To configure recipients for subscription-related event notifications, go
to the "Subscription Notification Recipients" section.
You can choose to have email notifications sent for subscription-related
events to any or all of the following recipients:

* All Account Owners
* All _Monitor & Optimize_ Administrators
* Additional Email Addresses that you specify

The following are examples of the types of notifications that might be
sent, and user actions you can take.

|===
|*Notification:*|*User Action:*
|Trial or subscription has been updated|Review subscription details on the
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Subscriptio
n] page
|Subscription will expire in 90 days
Subscription will expire in 30 days|No action needed if “Auto Renewal” is
enabled
Contact link:https://www.netapp.com/us/forms/sales-inquiry/cloud-insights-
sales-inquiries.aspx[NetApp sales] to renew the subscription
|Trial ends in 2 days|Renew trial from the
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Subscriptio
n] page. You can renew a trial one time.
Contact link:https://www.netapp.com/us/forms/sales-inquiry/cloud-insights-
sales-inquiries.aspx[NetApp sales] to purchase a subscription
|Trial or subscription has expired
Account will stop collecting data in 48 hours
Account will be deleted after 48 hours|Contact
link:https://www.netapp.com/us/forms/sales-inquiry/cloud-insights-sales-
inquiries.aspx[NetApp sales] to purchase a subscription
|===


== Global Recipient List for Alerts
```

```
Email notifications of alerts are sent to the alert recipient list for
every action on the alert. You can choose to send alert notifications to a
global recipient list.

To configure global alert recipients, choose the desired recipients in the
*Global Monitor Notification Recipients* section.

You can always override the global recipients list for an individual
monitor when creating or modifying the monitor.

NOTE: ONTAP Data Collector notifications take precedence over any specific
Monitor notifications that are relevant to the cluster/data collector. The
recipient list you set for the Data Collector itself will receive the data
collector alerts. If there are no active data collector alerts, then
monitor-generated alerts will be sent to specific monitor recipients.

//image:MonitorTeamNotifications.png[Override Global Notifications]



== Editing Notifications for ONTAP

You can modify notifications for ONTAP clusters by selecting _Edit
Notifications_ from the upper-right drop-down on a Storage landing page.

image:EditONTAPNotifications.png[ONTAP Edit Notifications]

From here, you can set notifications for Critical, Warning, Informational,
and/or Resolved alerts. Each scenario can notify the Global Recipient list
or other recipients you choose.

image:EditONTAPNotifications_MultipleScenarios.png[ONTAP Notifications for
different scenarios]



[[ID7b60d43812e045bbfcf7405e2f5d4d94]]
= System Monitors
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
```

```
Cloud Insights includes a number of system-defined monitors for both
metrics and logs. The system monitors available are dependent on the data
collectors present in your environment. Because of that, the monitors
available in Cloud Insights may change as data collectors are added or
their configurations changed.

NOTE: Many System Monitors are in _Paused_ state by default. You can
enable a system monitor by selecting the _Resume_ option for the monitor.
Ensure that _Advanced Counter Data Collection_ and _Enable ONTAP EMS log
collection_ are enabled in the Data Collector. These options can be found
in the ONTAP Data Collector under _Advanced Configuration_:
image:Enable_Log_Monitor_Collection.png[Enabling Advanced Counter and EMS
Log collection for ONTAP]


[#top]

toc::[]




////
== Create the Monitor

. From the Cloud Insights menu, click *Alerts > Manage Monitors*
+
The Monitors list page is displayed, showing currently configured
monitors.

. To modify an existing monitor, click the monitor name in the list.

. To add a monitor, Click *+ Monitor*.
+
image:Monitor_log_or_metric.png[Choose system or log monitor]
+
When you add a new monitor, you are prompted to create a Metric Monitor or
a Log Monitor.

* _Metric_ monitors alert on infrastructure- or performance-related
triggers
* _Log_ monitors alert on log-related activity

+
After you choose your monitor type, the Monitor Configuration dialog is
displayed.
```

```
==== Metric Monitor

. In the drop-down, search for and choose an object type and metric to
monitor.

You can set filters to narrow down which object attributes or metrics to
monitor.

//image:select_metric_to_monitor.png[Select Metric]

image:MonitorMetricFilter.png[Metrics Filtering]

//When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering works against the data samples themselves, not the
objects as with infrastructure data (storage, VMs, ports, etc.).

When working with integration data (Kubernetes, ONTAP Advanced Data,
etc.), metric filtering removes the individual/unmatched data points from
the plotted data series, unlike infrastructure data (storage, VM, ports
etc.) where filters work on the aggregated value of the data series and
potentially remove the entire object from the chart.

//image:IntegrationMetricFilterExample.png[Integration Metric Filtering]

TIP: To create a multi-condition monitor (e.g., IOPS > X and latency > Y),
define the first condition as a threshold and the second condition as a
filter.


===== Define the Conditions of the Monitor.

. After choosing the object and metric to monitor, set the Warning-level
and/or Critical-level thresholds.
. For the _Warning_ level, enter 200 for our example. The dashed line
indicating this Warning level displays in the example graph.
. For the _Critical_ level, enter 400. The dashed line indicating this
Critical level displays in the example graph.
+
The graph displays historical data. The Warning and Critical level lines
on the graph are a visual representation of the Monitor, so you can easily
see when the Monitor might trigger an alert in each case.

. For the occurence interval, choose _Continuously_ for a period of _15
Minutes_.
+
You can choose to trigger an alert the moment a threshold is breached, or
```

```
wait until the threshold has been in continuous breach for a period of
time. In our example, we do not want to be alerted every time the Total
IOPS peaks above the Warning or Critical level, but only when a monitored
object continuously exceeds one of these levels for at least 15 minutes.
+
//image:define_monitor_conditions.png[Define Conditions]
image:Monitor_metric_conditions.png[Define the monitor's conditions]


=== Log Monitor

When creating a *Log monitor*, first choose which log to monitor from the
available log list. You can then filter based on the available attributes
as above.

For example, you might choose to filter for "object.store.unavailable"
message type in the logs.netapp.ems source:

NOTE: The Log Monitor filter cannot be empty.

image:Monitor_log_monitor_filter.png[choose which log to monitor, and set
a filter]



==== Define the alert behavior

Choose how you want to alert when a log alert is triggered. You can set
the monitor to alert with _Warning_, _Critical_, or _Informational_
severity, based on the filter conditions you set above.

image:Monitor_log_alert_behavior.png[define the log behavior to monitor]


==== Define the alert resolution behavior

You can choose how an log monitor alert is resolved. You are presented
with three choices:

* *Resolve instantly*: The alert is immediately resolved with no further
action needed
* *Resolve based on time*: The alert is resolved after the specified time
has passed
* *Resolve based on log entry*: The alert is resolved when a subsequent
log activity has occurred. For example, when an object is logged as
"available".
```

```
image:Monitor_log_monitor_resolution.png[Alert Resolution]



==== Select notification type and recipients

In the _Set up team notification(s)_ section, you can choose whether to
alert your team via email or Webhook.

image:Webhook_Choose_Monitor_Notification.png[Choose alerting method]

*Alerting via Email:*

Specify the email recipients for alert notifications. If desired, you can
choose different recipients for warning or critical alerts.

image:email_monitor_alerts.png[Email Alert Recipients]

*Alerting via Webhook:*

Specify the webhook(s) for alert notifications. If desired, you can choose
different webhooks for warning or critical alerts.

image:Webhook_Monitor_Notifications.png[Webhook Alerting]


==== Setting Corrective Actions or Additional Information

You can add an optional description as well as additional insights and/or
corrective actions by filling in the *Add an Alert Description* section.
The description can be up to 1024 characters and will be sent with the
alert. The insights/corrective action field can be up to 67,000 characters
and will be displayed in the summary section of the alert landing page.

In these fields you can provide notes, links, or steps to take to correct
or otherwise address the alert.

image:Monitors_Alert_Description.png[Alert Corrective Actions and
Description]


==== Save your Monitor

. If desired, you can add a description of the monitor.
+
. Give the Monitor a meaningful name and click *Save*.
+
Your new monitor is added to the list of active Monitors.

==== Monitor List

The Monitor page lists the currently configured monitors, showing the
following:

* Monitor Name
* Status
* Object/metric being monitored
* Conditions of the Monitor

You can choose to temporarily pause monitoring of an object type by
clicking the menu to the right of the monitor and selecting *Pause*. When
you are ready to resume monitoring, click *Resume*.

You can copy a monitor by selecting *Duplicate* from the menu. You can
then modify the new monitor and change the object/metric, filter,
conditions, email recipients, etc.

If a monitor is no longer needed, you can delete it by selecting *Delete*
from the menu.
////

////
== Monitor Groups

Grouping allows you to view and manage related monitors. For example, you
can have a monitor group dedicated to the storage in your environment, or
monitors relevant to a certain recipient list.

image:Monitors_GroupList.png[Monitor Grouping]
////

////

Two groups are shown by default:

* *All Monitors* lists all monitors.
* *Custom Monitors* lists only user-created monitors.
////

////
The number of monitors contained in a group is shown next to the group
name.
```

```
NOTE: Custom monitors can be paused, resumed, deleted, or moved to another
group. System-defined monitors can be paused and resumed but can not be
deleted or moved.


=== Custom Monitor Groups

To create a new custom monitor group, click the *"+" Create New Monitor
Group* button. Enter a name for the group and click *Create Group*. An
empty group is created with that name.


To add monitors to the group, go to the _All Monitors_ group (recommended)
and do one of the following:

* To add a single monitor, click the menu to the right of the monitor and
select _Move to Group_. Choose the group to which to add the monitor.
* To add multiple monitors, select the ones you want to move, and click
_Bulk Actions_. Choose _Move to group_. You cannot move system-defined
monitors.
* Click on the monitor name to open the monitor's edit view, and select a
group in the _Associate to a monitor group_ section.
+
image:Monitors_AssociateToGroup.png[Associate to group]

//* To add multiple monitors to a group, select them by clicking the
checkbox next to each monitor, then click the *Bulk Actions* button and
select _Move to Group_.

Remove monitors by clicking on a group and selecting _Remove from Group_
from the menu. You can not remove monitors from the _All Monitors_ or
_Custom Monitors_ group, or from any of the system-defined monitor groups.
To delete a monitor from these groups, you must delete the monitor itself.

//To remove a monitor from a group while editing the monitor, in the
_Associate with a group_ section, click the *X* next to the group name.

NOTE: Removing a monitor from a group does not delete the monitor from
Cloud Insights. To completely remove a monitor, select the monitor and
click _Delete_. This also removes it from any group to which it belonged
and it is no longer available to any user.

You can also move a monitor to a different group in the same manner,
selecting _Move to Group_. You cannot move monitors from the system-
defined monitor groups; to move a monitor from one of these groups, you
must first _Duplicate_ the monitor, and then move the duplicated monitor
to the desired group.
```

```
To pause or resume all monitors in a group at once, select the menu for
the group and click _Pause_ or _Resume_.

Use the same menu to rename or delete a group. Deleting a group does not
delete the monitors from Cloud Insights; they are still available in _All
Monitors_. You cannot delete system-defined monitor groups.

image:Monitors_PauseGroup.png[Pause a group]
////



== Monitor Descriptions

System-defined monitors are comprised of pre-defined metrics and
conditions, as well as default descriptions and corrective actions, which
can not be modified. You _can_ modify the notification recipient list for
system-defined monitors. To view the metrics, conditions, description and
corrective actions, or to modify the recipient list, open a system-defined
monitor group and click the monitor name in the list.

System-defined monitor groups cannot be modified or removed.

The following system-defined monitors are available, in the noted groups.

* *ONTAP Infrastructure* includes monitors for infrastructure-related
issues in ONTAP clusters.
* *ONTAP Workload Examples* includes monitors for workload-related issues.
* Monitors in both group default to _Paused_ state.



Below are the system monitors currently included with Cloud Insights:

=== Metric Monitors

|===
|Monitor Name|Severity|Monitor Description|Corrective Action
|Fiber Channel Port Utilization High|CRITICAL|Fiber Channel Protocol ports
are used to receive and transfer the SAN traffic between the customer host
system and the ONTAP LUNs. If the port utilization is high, then it will
become a bottleneck and it will ultimately affect the performance of
sensitive of Fiber Channel Protocol workloads.…A warning alert indicates
that planned action should be taken to balance network traffic.…A critical
alert indicates that service disruption is imminent and emergency measures
should be taken to balance network traffic to ensure service
continuity.|If critical threshold is breached, consider immediate actions
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to minimize service disruption:
1. Move workloads to another lower utilized FCP port.
2. Limit the traffic of certain LUNs only to essential work, either via
QoS policies in ONTAP or host-side configuration to lighten the
utilization of the FCP ports.…
If warning threshold is breached, plan to take the following actions:
1. Configure more FCP ports to handle the data traffic so that the port
utilization gets distributed among more ports.
2. Move workloads to another lower utilized FCP port.
3. Limit the traffic of certain LUNs only to essential work, either via
QoS policies in ONTAP or host-side configuration to lighten the
utilization of the FCP ports.
|Lun Latency High|CRITICAL|LUNs are objects that serve the I/O traffic
often driven by performance sensitive applications such as databases. High
LUN latencies means that the applications themselves might suffer and be
unable to accomplish their tasks.…A warning alert indicates that planned
action should be taken to move the LUN to appropriate Node or Aggregate.…A
critical alert indicates that service disruption is imminent and emergency
measures should be taken to ensure service continuity. Following are
expected latencies based on media type - SSD up to 1-2 milliseconds; SAS
up to 8-10 milliseconds, and SATA HDD 17-20 milliseconds|If critical
threshold is breached, consider following actions to minimize service
disruption:
If the LUN or its volume has a QoS policy associated with it, then
evaluate its threshold limits and validate if they are causing the LUN
workload to get throttled.…
If warning threshold is breached, plan to take the following actions:
1. If aggregate is also experiencing high utilization, move the LUN to
another aggregate.
2. If the node is also experiencing high utilization, move the volume to
another node or reduce the total workload of the node.
3. If the LUN or its volume has a QoS policy associated with it, evaluate
its threshold limits and validate if they are causing the LUN workload to
get throttled.
|Network Port Utilization High |CRITICAL|Network ports are used to receive
and transfer the NFS, CIFS, and iSCSI protocol traffic between the
customer host systems and the ONTAP volumes. If the port utilization is
high, then it becomes a bottleneck and it will ultimately affect the
performance of NFS, CIFS and iSCSI workloads.…A warning alert indicates
that planned action should be taken to balance network traffic.…A critical
alert indicates that service disruption is imminent and emergency measures
should be taken to balance network traffic to ensure service
continuity.|If critical threshold is breached, consider following
immediate actions to minimize service disruption:
1. Limit the traffic of certain volumes only to essential work, either via
QoS policies in ONTAP or host-side analysis to decrease the utilization of
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the network ports.
2. Configure one or more volumes to use another lower utilized network
port.…
If warning threshold is breached, consider the following immediate
actions:
1. Configure more network ports to handle the data traffic so that the
port utilization gets distributed among more ports.
2. Configure one or more volumes to use another lower utilized network
port.
|NVMe Namespace Latency High |CRITICAL |NVMe Namespaces are objects that
serve the I/O traffic that is driven by performance sensitive applications
such as databases. High NVMe Namespaces latency means that the
applications themselves may suffer and be unable to accomplish their
tasks.…A warning alert indicates that planned action should be taken to
move the LUN to appropriate Node or Aggregate.…A critical alert indicates
that service disruption is imminent and emergency measures should be taken
to ensure service continuity.|If critical threshold is breached, consider
immediate actions to minimize service disruption:
If the NVMe namespace or its volume has a QoS policy assigned to them,
then evaluate its limit thresholds in case they are causing the NVMe
namespace workload to get throttled.…
If warning threshold is breached, consider to take the following actions:
1. If aggregate is also experiencing high utilization, move the LUN to
another aggregate.
2. If the node is also experiencing high utilization, move the volume to
another node or reduce the total workload of the node.
3. If the NVMe namespace or its volume has a QoS policy assigned to them,
evaluate its limit thresholds in case they are causing the NVMe namespace
workload to get throttled.
|QTree Capacity Full|CRITICAL|A qtree is a logically defined file system
that can exist as a special subdirectory of the root directory within a
volume. Each qtree has a default space quota or a quota defined by a quota
policy to limit amount of data stored in the tree within the volume
capacity.…A warning alert indicates that planned action should be taken to
increase the space.…A critical alert indicates that service disruption is
imminent and emergency measures should be taken to free up space to ensure
service continuity.|If critical threshold is breached, consider immediate
actions to minimize service disruption:
1. Increase the space of the qtree in order to accommodate the growth.
2. Delete unwanted data to free up space.…
If warning threshold is breached, plan to take the following immediate
actions:
1. Increase the space of the qtree in order to accommodate the growth.
2. Delete unwanted data to free up space.
|QTree Capacity Hard Limit|CRITICAL|A qtree is a logically defined file
system that can exist as a special subdirectory of the root directory
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within a volume. Each qtree has a space quota measured in KBytes that is
used to store data in order to control the growth of user data in volume
and not exceed its total capacity.…A qtree maintains a soft storage
capacity quota that provides alert to the user proactively before reaching
the total capacity quota limit in the qtree and being unable to store data
anymore. Monitoring the amount of data stored within a qtree ensures that
the user receives uninterrupted data service.|If critical threshold is
breached, consider following immediate actions to minimize service
disruption:
1. Increase the tree space quota in order to accommodate the growth
2. Instruct the user to delete unwanted data in the tree to free up space
|QTree Capacity Soft Limit|WARNING|A qtree is a logically defined file
system that can exist as a special subdirectory of the root directory
within a volume. Each qtree has a space quota measured in KBytes that it
can use to store data in order to control the growth of user data in
volume and not exceed its total capacity.…A qtree maintains a soft storage
capacity quota that provides alert to the user proactively before reaching
the total capacity quota limit in the qtree and being unable to store data
anymore. Monitoring the amount of data stored within a qtree ensures that
the user receives uninterrupted data service.|If warning threshold is
breached, consider the following immediate actions:
1. Increase the tree space quota to accommodate the growth.
2. Instruct the user to delete unwanted data in the tree to free up space.
|QTree Files Hard Limit|CRITICAL|A qtree is a logically defined file
system that can exist as a special subdirectory of the root directory
within a volume. Each qtree has a quota of the number of files that it can
contain to maintain a manageable file system size within the volume.…A
qtree maintains a hard file number quota beyond which new files in the
tree are denied. Monitoring the number of files within a qtree ensures
that the user receives uninterrupted data service.|If critical threshold
is breached, consider immediate actions to minimize service disruption:
1. Increase the file count quota for the qtree.
2. Delete unwanted files from the qtree file system.
|QTree Files Soft Limit|WARNING|A qtree is a logically defined file system
that can exist as a special subdirectory of the root directory within a
volume. Each qtree has a quota of the number of files that it can contain
in order to maintain a manageable file system size within the volume.…A
qtree maintains a soft file number quota to provide alert to the user
proactively before reaching the limit of files in the qtree and being
unable to store any additional files. Monitoring the number of files
within a qtree ensures that the user receives uninterrupted data
service.|If warning threshold is breached, plan to take the following
immediate actions:
1. Increase the file count quota for the qtree.
2. Delete unwanted files from the qtree file system.
|Snapshot Reserve Space Full|CRITICAL|Storage capacity of a volume is
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necessary to store application and customer data. A portion of that space,
called snapshot reserved space, is used to store snapshots which allow
data to be protected locally. The more new and updated data stored in the
ONTAP volume the more snapshot capacity is used and less snapshot storage
capacity is available for future new or updated data. If the snapshot data
capacity within a volume reaches the total snapshot reserve space, it
might lead to the customer being unable to store new snapshot data and
reduction in the level of protection for the data in the volume.
Monitoring the volume used snapshot capacity ensures data services
continuity.|If critical threshold is breached, consider immediate actions
to minimize service disruption:
1. Configure snapshots to use data space in the volume when the snapshot
reserve is full.
2. Delete some older unwanted snapshots to free up space.…
If warning threshold is breached, plan to take the following immediate
actions:
1. Increase the snapshot reserve space within the volume to accommodate
the growth.
2. Configure snapshots to use data space in the volume when the snapshot
reserve is full.
|Storage Capacity Limit|CRITICAL|When a storage pool (aggregate) is
filling up, I/O operations slow down and finally stop resulting in storage
outage incident. A warning alert indicates that planned action should be
taken soon to restore minimum free space. A critical alert indicates that
service disruption is imminent and emergency measures should be taken to
free up space to ensure service continuity.|If critical threshold is
breached, immediately consider the following actions to minimize service
disruption:
1. Delete Snapshots on non-critical volumes.
2. Delete Volumes or LUNs that are non-essential workloads and that may be
restored from off storage copies.……If warning threshold is breached, plan
the following immediate actions:
1. Move one or more volumes to a different storage location.
2. Add more storage capacity.
3. Change storage efficiency settings or tier inactive data to cloud
storage.
|Storage Performance Limit|CRITICAL|When a storage system reaches its
performance limit, operations slow down, latency goes up and workloads and
applications may start failing. ONTAP evaluates the storage pool
utilization for workloads and estimates what percent of performance has
been consumed.…A warning alert indicates that planned action should be
taken to reduce storage pool load to ensure that there will be enough
storage pool performance left to service workload peaks.…A critical alert
indicates that a performance brownout is imminent and emergency measures
should be taken to reduce storage pool load to ensure service
continuity.|If critical threshold is breached, consider following
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immediate actions to minimize service disruption:
1. Suspend scheduled tasks such as Snapshots or SnapMirror replication.
2. Idle non-essential workloads.…
If warning threshold is breached, take the following actions immediately:
1. Move one or more workloads to a different storage location.
2. Add more storage nodes (AFF) or disk shelves(FAS) and redistribute
workloads
3. Change workload characteristics(block size, application caching).
|User Quota Capacity Hard Limit|CRITICAL|ONTAP recognizes the users of
Unix or Windows systems who have the rights to access volumes, files or
directories within a volume. As a result, ONTAP allows the customers to
configure storage capacity for their users or groups of users of their
Linux or Windows systems. The user or group policy quota limits the amount
of space the user can utilize for their own data.…A hard limit of this
quota allows notification of the user when the amount of capacity used
within the volume is right before reaching the total capacity quota.
Monitoring the amount of data stored within a user or group quota ensures
that the user receives uninterrupted data service.|If critical threshold
is breached, consider following immediate actions to minimize service
disruption:
1. Increase the space of the user or group quota in order to accommodate
the growth.
2. Instruct the user or group to delete unwanted data to free up space.
|User Quota Capacity Soft Limit|WARNING|ONTAP recognizes the users of Unix
or Windows systems that have the rights to access volumes, files or
directories within a volume. As a result, ONTAP allows the customers to
configure storage capacity for their users or groups of users of their
Linux or Windows systems. The user or group policy quota limits the amount
of space the user can utilize for their own data.…A soft limit of this
quota allows proactive notification to the user when the amount of
capacity used within the volume is reaching the total capacity quota.
Monitoring the amount of data stored within a user or group quota ensures
that the user receives uninterrupted data service.|If warning threshold is
breached, plan to take the following immediate actions:
1. Increase the space of the user or group quota in order to accommodate
the growth.
2. Delete unwanted data to free up space.
|Volume Capacity Full|CRITICAL|Storage capacity of a volume is necessary
to store application and customer data. The more data stored in the ONTAP
volume the less storage availability for future data. If the data storage
capacity within a volume reaches the total storage capacity may lead to
the customer being unable to store data due to lack of storage capacity.
Monitoring the volume used storage capacity ensures data services
continuity.|If critical threshold is breached, consider following
immediate actions to minimize service disruption:
1. Increase the space of the volume to accommodate the growth.
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2. Delete unwanted data to free up space.
3. If snapshot copies occupy more space than the snapshot reserve, delete
old Snapshots or enable Volume Snapshot Autodelete.…If warning threshold
is breached, plan to take the following immediate actions:
1. Increase the space of the volume in order to accommodate the growth
2. If snapshot copies occupy more space than the snapshot reserve, delete
old Snapshots or enabling Volume Snapshot Autodelete.……
|Volume Inodes Limit|CRITICAL|Volumes that store files use index nodes
(inode) to store file metadata. When a volume exhausts its inode
allocation, no more files can be added to it.…A warning alert indicates
that planned action should be taken to increase the number of available
inodes.…A critical alert indicates that file limit exhaustion is imminent
and emergency measures should be taken to free up inodes to ensure service
continuity.|If critical threshold is breached, consider following
immediate actions to minimize service disruption:
1. Increase the inodes value for the volume. If the inodes value is
already at the max value, then split the volume into two or more volumes
because the file system has grown beyond the maximum size.
2. Use FlexGroup as it helps to accommodate large file systems.…
If warning threshold is breached, plan to take the following immediate
actions:
1. Increase the inodes value for the volume. If the inodes value is
already at the max, then split the volume into two or more volumes because
the file system has grown beyond the maximum size.
2. Use FlexGroup as it helps to accommodate large file systems
|Volume Latency High|CRITICAL|Volumes are objects that serve the I/O
traffic often driven by performance sensitive applications including
devOps applications, home directories, and databases. High volume
latencies means that the applications themselves may suffer and be unable
to accomplish their tasks. Monitoring volume latencies is critical to
maintain application consistent performance. The following are expected
latencies based on media type - SSD up to 1-2 milliseconds; SAS up to 8-10
milliseconds and SATA HDD 17-20 milliseconds.|If critical threshold is
breached, consider following immediate actions to minimize service
disruption:
If the volume has a QoS policy assigned to it, evaluate its limit
thresholds in case they are causing the volume workload to get throttled.…
If warning threshold is breached, consider the following immediate
actions:
1. If aggregate is also experiencing high utilization, move the volume to
another aggregate.
2. If the volume has a QoS policy assigned to it, evaluate its limit
thresholds in case they are causing the volume workload to get throttled.
3. If the node is also experiencing high utilization, move the volume to
another node or reduce the total workload of the node.
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|Monitor Name|Severity|Monitor Description|Corrective Action
|Node High Latency|WARNING / CRITICAL|Node latency has reached the levels
where it might affect the performance of the applications on the node.
Lower node latency ensures consistent performance of the applications. The
expected latencies based on media type are: SSD up to 1-2 milliseconds;
SAS up to 8-10 milliseconds and SATA HDD 17-20 milliseconds.|If critical
threshold is breached, then immediate actions should be taken to minimize
service disruption:
1. Suspend scheduled tasks, Snapshots or SnapMirror replication
2. Lower the demand of lower priority workloads via QoS limits
3. Inactivate non-essential workloads

Consider immediate actions when warning threshold is breached:
1. Move one or more workloads to a different storage location
2. Lower the demand of lower priority workloads via QoS limits
3. Add more storage nodes (AFF) or disk shelves (FAS) and redistribute
workloads
4. Change workload characteristics (block size, application caching etc)
|Node Performance Limit|WARNING / CRITICAL|Node performance utilization
has reached the levels where it might affect the performance of the IOs
and the applications supported by the node. Low node performance
utilization ensures consistent performance of the applications.|Immediate
actions should be taken to minimize service disruption if critical
threshold is breached:
1. Suspend scheduled tasks, Snapshots or SnapMirror replication
2. Lower the demand of lower priority workloads via QoS limits
3. Inactivate non-essential workloads

Consider the following actions if warning threshold is breached:
1. Move one or more workloads to a different storage location
2. Lower the demand of lower priority workloads via QoS limits
3. Add more storage nodes (AFF) or disk shelves (FAS)and redistribute
workloads
4. Change workload characteristics (block size, application caching etc)
|Storage VM High Latency|WARNING / CRITICAL|Storage VM (SVM) latency has
reached the levels where it might affect the performance of the
applications on the storage VM. Lower storage VM latency ensures
consistent performance of the applications. The expected latencies based
on media type are: SSD up to 1-2 milliseconds; SAS up to 8-10 milliseconds
and SATA HDD 17-20 milliseconds.|If critical threshold is breached, then
immediately evaluate the threshold limits for volumes of the storage VM
with a QoS policy assigned,  to verify whether they are causing the volume
workloads to get throttled

Consider following immediate actions when warning threshold is breached:
1. If aggregate is also experiencing high utilization, move some volumes
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of the  storage VM to another aggregate.
2. For volumes of the storage VM with a QoS policy assigned, evaluate the
threshold limits if they are causing the volume workloads to get throttled
3. If the node is experiencing high utilization, move some volumes of the
storage VM to another node or reduce the total workload of the node
|User Quota Files Hard Limit|CRITICAL|The number of files created within
the volume has reached the critical limit and additional files cannot be
created. Monitoring the number of files stored ensures that the user
receives uninterrupted data service.|Immediate actions are required to
minimize service disruption if critical threshold is breached.…Consider
taking following actions:
1. Increase the  file count quota for the specific user
2. Delete unwanted files to reduce the pressure on the files quota for the
specific user
|User Quota Files Soft Limit|WARNING|The number of files created within
the volume has reached the threshold limit of the quota and is near to the
critical limit. You cannot create additional files if quota reaches the
critical limit. Monitoring the number of files stored by a user ensures
that the user receives uninterrupted data service.|Consider immediate
actions if warning threshold is breached:
1. Increase the file count quota for the specific user quota
2. Delete unwanted files to reduce the pressure on the files quota for the
specific user
|Volume Cache Miss Ratio|WARNING / CRITICAL|Volume Cache Miss Ratio is the
percentage of read requests from the client applications that are returned
from the disk instead of being returned from the cache. This means that
the volume has reached the set threshold.|If critical threshold is
breached, then immediate actions should be taken to minimize service
disruption:
1. Move some workloads off of the node of the volume to reduce the IO load
2. If not already on the node of the volume, increase the WAFL cache by
purchasing and adding a Flash Cache
3. Lower the demand of lower priority workloads on the same node via QoS
limits

Consider immediate actions when warning threshold is breached:
1. Move some workloads off of the node of the volume to reduce the IO load
2. If not already on the node of the volume, increase the WAFL cache by
purchasing and adding a Flash Cache
3. Lower the demand of lower priority workloads on the same node via QoS
limits
4. Change workload characteristics (block size, application caching etc)
|Volume Qtree Quota Overcommit|WARNING / CRITICAL|Volume Qtree Quota
Overcommit specifies the percentage at which a volume is considered to be
overcommitted by the qtree quotas. The set threshold for the qtree quota
is reached for the volume. Monitoring the volume qtree quota overcommit
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ensures that the user receives uninterrupted data service.|If critical
threshold is breached, then immediate actions should be taken to minimize
service disruption:
1. Increase the space of the volume
2. Delete unwanted data

When warning threshold is breached, then consider increasing the space of
the volume.

|===

<<top,Back to Top>>

=== Log Monitors

|===
|Monitor Name|Severity|Description|Corrective Action
|AWS Credentials Not Initialized|INFO|This event occurs when a module
attempts to access Amazon Web Services (AWS) Identity and Access
Management (IAM) role-based credentials from the cloud credentials thread
before they are initialized. |Wait for the cloud credentials thread, as
well as the system, to complete initialization.
|Cloud Tier Unreachable|CRITICAL|A storage node cannot connect to Cloud
Tier object store API. Some data will be inaccessible.|If you use on-
premises products, perform the following corrective actions: …Verify that
your intercluster LIF is online and functional by using the "network
interface show" command.…Check the network connectivity to the object
store server by using the "ping" command over the destination node
intercluster LIF.…Ensure the following:…The configuration of your object
store has not changed.…The login and connectivity information is still
valid.…Contact NetApp technical support if the issue persists.

If you use Cloud Volumes ONTAP, perform the following corrective actions:
…Ensure that the configuration of your object store has not changed.…
Ensure that the login and connectivity information is still valid.…Contact
NetApp technical support if the issue persists.
|Disk Out of Service|INFO|This event occurs when a disk is removed from
service because it has been marked failed, is being sanitized, or has
entered the Maintenance Center.|None.
|FlexGroup Constituent Full|CRITICAL|A constituent within a FlexGroup
volume is full, which might cause a potential disruption of service. You
can still create or expand files on the FlexGroup volume. However, none of
the files that are stored on the constituent can be modified. As a result,
you might see random out-of-space errors when you try to perform write
operations on the FlexGroup volume.|It is recommended that you add
capacity to the FlexGroup volume by using the "volume modify -files +X"
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command.…Alternatively, delete files from the FlexGroup volume. However,
it is difficult to determine which files have landed on the constituent.
|Flexgroup Constituent Nearly Full|WARNING|A constituent within a
FlexGroup volume is nearly out of space, which might cause a potential
disruption of service. Files can be created and expanded. However, if the
constituent runs out of space, you might not be able to append to or
modify the files on the constituent. |It is recommended that you add
capacity to the FlexGroup volume by using the "volume modify -files +X"
command.…Alternatively, delete files from the FlexGroup volume. However,
it is difficult to determine which files have landed on the constituent.
|FlexGroup Constituent Nearly Out of Inodes|WARNING|A constituent within a
FlexGroup volume is almost out of inodes, which might cause a potential
disruption of service. The constituent receives lesser create requests
than average. This might impact the overall performance of the FlexGroup
volume, because the requests are routed to constituents with more
inodes.|It is recommended that you add capacity to the FlexGroup volume by
using the "volume modify -files +X" command.…Alternatively, delete files
from the FlexGroup volume. However, it is difficult to determine which
files have landed on the constituent.
|FlexGroup Constituent Out of Inodes|CRITICAL|A constituent of a FlexGroup
volume has run out of inodes, which might cause a potential disruption of
service. You cannot create new files on this constituent. This might lead
to an overall imbalanced distribution of content across the FlexGroup
volume.|It is recommended that you add capacity to the FlexGroup volume by
using the "volume modify -files +X" command.…Alternatively, delete files
from the FlexGroup volume. However, it is difficult to determine which
files have landed on the constituent.
|LUN Offline|INFO|This event occurs when a LUN is brought offline
manually. |Bring the LUN back online.
|Main Unit Fan Failed|WARNING|One or more main unit fans have failed. The
system remains operational.…However, if the condition persists for too
long, the overtemperature might trigger an automatic shutdown.|Reseat the
failed fans. If the error persists, replace them.
|Main Unit Fan in Warning State|INFO|This event occurs when one or more
main unit fans are in a warning state.|Replace the indicated fans to avoid
overheating.
|NVRAM Battery Low|WARNING|The NVRAM battery capacity is critically low.
There might be a potential data loss if the battery runs out of
power.…Your system generates and transmits an AutoSupport or "call home"
message to NetApp technical support and the configured destinations if it
is configured to do so. The successful delivery of an AutoSupport message
significantly improves problem determination and resolution. |Perform the
following corrective actions:…View the battery's current status, capacity,
and charging state by using the "system node environment sensors show"
command.…If the battery was replaced recently or the system was non-
operational for an extended period of time, monitor the battery to verify
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that it is charging properly.…Contact NetApp technical support if the
battery runtime continues to decrease below critical levels, and the
storage system shuts down automatically.
|Service Processor Not Configured|WARNING|This event occurs on a weekly
basis, to remind you to configure the Service Processor (SP). The SP is a
physical device that is incorporated into your system to provide remote
access and remote management capabilities. You should configure the SP to
use its full functionality. |Perform the following corrective
actions:…Configure the SP by using the "system service-processor network
modify" command.…Optionally, obtain the MAC address of the SP by using the
"system service-processor network show" command.…Verify the SP network
configuration by using the "system service-processor network show"
command.…Verify that the SP can send an AutoSupport email by using the
"system service-processor autosupport invoke" command.
NOTE: AutoSupport email hosts and recipients should be configured in ONTAP
before you issue this command.
|Service Processor Offline|CRITICAL|ONTAP is no longer receiving
heartbeats from the Service Processor (SP), even though all the SP
recovery actions have been taken. ONTAP cannot monitor the health of the
hardware without the SP.…The system will shut down to prevent hardware
damage and data loss. Set up a panic alert to be notified immediately if
the SP goes offline. |Power-cycle the system by performing the following
actions:…Pull the controller out from the chassis.…Push the controller
back in.…Turn the controller back on.…If the problem persists, replace the
controller module.
|Shelf Fans Failed|CRITICAL|The indicated cooling fan or fan module of the
shelf has failed. The disks in the shelf might not receive enough cooling
airflow, which might result in disk failure.|Perform the following
corrective actions:…Verify that the fan module is fully seated and
secured.
NOTE: The fan is integrated into the power supply module in some disk
shelves.…If the issue persists, replace the fan module.…If the issue still
persists, contact NetApp technical support for assistance.
|System Cannot Operate Due to Main Unit Fan Failure |CRITICAL|One or more
main unit fans have failed, disrupting system operation. This might lead
to a potential data loss. |Replace the failed fans.
|Unassigned Disks|INFO|System has unassigned disks - capacity is being
wasted and your system may have some misconfiguration or partial
configuration change applied.|Perform the following corrective
actions:…Determine which disks are unassigned by using the "disk show -n"
command.…Assign the disks to a system by using the "disk assign" command.

|Antivirus Server Busy|WARNING|The antivirus server is too busy to accept
any new scan requests.|If this message occurs frequently, ensure that
there are enough antivirus servers to handle the virus scan load generated
by the SVM.
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|AWS Credentials for IAM Role Expired|CRITICAL|Cloud Volume ONTAP has
become inaccessible. The Identity and Access Management (IAM) role-based
credentials have expired. The credentials are acquired from the Amazon Web
Services (AWS) metadata server using the IAM role, and are used to sign
API requests to Amazon Simple Storage Service (Amazon S3).|Perform the
following:…Log in to the AWS EC2 Management Console.…Navigate to the
Instances page.…Find the instance for the Cloud Volumes ONTAP deployment
and check its health.…Verify that the AWS IAM role associated with the
instance is valid and has been granted proper privileges to the instance.
|AWS Credentials for IAM Role Not Found|CRITICAL|The cloud credentials
thread cannot acquire the Amazon Web Services (AWS) Identity and Access
Management (IAM) role-based credentials from the AWS metadata server. The
credentials are used to sign API requests to Amazon Simple Storage Service
(Amazon S3). Cloud Volume ONTAP has become inaccessible.…|Perform the
following:…Log in to the AWS EC2 Management Console.…Navigate to the
Instances page.…Find the instance for the Cloud Volumes ONTAP deployment
and check its health.…Verify that the AWS IAM role associated with the
instance is valid and has been granted proper privileges to the instance.
|AWS Credentials for IAM Role Not Valid|CRITICAL|The Identity and Access
Management (IAM) role-based credentials are not valid. The credentials are
acquired from the Amazon Web Services (AWS) metadata server using the IAM
role, and are used to sign API requests to Amazon Simple Storage Service
(Amazon S3). Cloud Volume ONTAP has become inaccessible. |Perform the
following:…Log in to the AWS EC2 Management Console.…Navigate to the
Instances page.…Find the instance for the Cloud Volumes ONTAP deployment
and check its health.…Verify that the AWS IAM role associated with the
instance is valid and has been granted proper privileges to the instance.
|AWS IAM Role Not Found|CRITICAL|The Identity and Access Management (IAM)
roles thread cannot find an Amazon Web Services (AWS) IAM role on the AWS
metadata server. The IAM role is required to acquire role-based
credentials used to sign API requests to Amazon Simple Storage Service
(Amazon S3). Cloud Volume ONTAP has become inaccessible.…|Perform the
following:…Log in to the AWS EC2 Management Console.…Navigate to the
Instances page.…Find the instance for the Cloud Volumes ONTAP deployment
and check its health.…Verify that the AWS IAM role associated with the
instance is valid.
|AWS IAM Role Not Valid|CRITICAL|The Amazon Web Services (AWS) Identity
and Access Management (IAM) role on the AWS metadata server is not valid.
The Cloud Volume ONTAP has become inaccessible.…|Perform the
following:…Log in to the AWS EC2 Management Console.…Navigate to the
Instances page.…Find the instance for the Cloud Volumes ONTAP deployment
and check its health.…Verify that the AWS IAM role associated with the
instance is valid and has been granted proper privileges to the instance.
|AWS Metadata Server Connection Fail|CRITICAL|The Identity and Access
Management (IAM) roles thread cannot establish a communication link with
the Amazon Web Services (AWS) metadata server. Communication should be
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established to acquire the necessary AWS IAM role-based credentials used
to sign API requests to Amazon Simple Storage Service (Amazon S3). Cloud
Volume ONTAP has become inaccessible.…|Perform the following:…Log in to
the AWS EC2 Management Console.…Navigate to the Instances page.…Find the
instance for the Cloud Volumes ONTAP deployment and check its health.…
|FabricPool Space Usage Limit Nearly Reached|WARNING|The total cluster-
wide FabricPool space usage of object stores from capacity-licensed
providers has nearly reached the licensed limit.|Perform the following
corrective actions:…Check the percentage of the licensed capacity used by
each FabricPool storage tier by using the "storage aggregate object-store
show-space" command.…Delete Snapshot copies from volumes with the tiering
policy "snapshot" or "backup" by using the "volume snapshot delete"
command to clear up space.…Install a new license on the cluster to
increase the licensed capacity.
|FabricPool Space Usage Limit Reached|CRITICAL|The total cluster-wide
FabricPool space usage of object stores from capacity-licensed providers
has reached  the license limit.|Perform the following corrective
actions:…Check the percentage of the licensed capacity used by each
FabricPool storage tier by using the "storage aggregate object-store show-
space" command.…Delete Snapshot copies from volumes with the tiering
policy "snapshot" or "backup" by using the "volume snapshot delete"
command to clear up space.…Install a new license on the cluster to
increase the licensed capacity.
|Giveback of Aggregate Failed|CRITICAL|This event occurs during the
migration of an aggregate as part of a storage failover (SFO) giveback,
when the destination node cannot reach the object stores. |Perform the
following corrective actions:…Verify that your intercluster LIF is online
and functional by using the "network interface show" command.…Check
network connectivity to the object store server by using the"'ping"
command over the destination node intercluster LIF. …Verify that the
configuration of your object store has not changed and that login and
connectivity information is still accurate by using the "aggregate object-
store config show" command.…Alternatively, you can override the error by
specifying false for the "require-partner-waiting" parameter of the
giveback command.…Contact NetApp technical support for more information or
assistance.
|HA Interconnect Down|WARNING|The high-availability (HA) interconnect is
down. Risk of service outage when failover is not available.|Corrective
actions depend on the number and type of HA interconnect links supported
by the platform, as well as the reason why the interconnect is down. …If
the links are down:…Verify that both controllers in the HA pair are
operational.…For externally connected links, make sure that the
interconnect cables are connected properly and that the small form-factor
pluggables (SFPs), if applicable, are seated properly on both
controllers.…For internally connected links, disable and re-enable the
links, one after the other, by using the "ic link off" and "ic link on"
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commands. …If links are disabled, enable the links by using the "ic link
on" command. …If a peer is not connected, disable and re-enable the links,
one after the other, by using the "ic link off" and "ic link on"
commands.…Contact NetApp technical support if the issue persists.
|Max Sessions Per User Exceeded|WARNING
|You have exceeded the maximum number of sessions allowed per user over a
TCP connection. Any request to establish a session will be denied until
some sessions are released. …|Perform the following corrective actions:
…Inspect all the applications that run on the client, and terminate any
that are not operating properly.…Reboot the client.…Check if the issue is
caused by a new or existing application:…If the application is new, set a
higher threshold for the client by using the "cifs option modify -max
-opens-same-file-per-tree" command.
In some cases, clients operate as expected, but require a higher
threshold. You should have advanced privilege to set a higher threshold
for the client. …If the issue is caused by an existing application, there
might be an issue with the client. Contact NetApp technical support for
more information or assistance.
|Max Times Open Per File Exceeded|WARNING|You have exceeded the maximum
number of times that you can open the file over a TCP connection. Any
request to open this file will be denied until you close some open
instances of the file. This typically indicates abnormal application
behavior.…|Perform the following corrective actions:…Inspect the
applications that run on the client using this TCP connection.
The client might be operating incorrectly because of the application
running on it.…Reboot the client.…Check if the issue is caused by a new or
existing application:…If the application is new, set a higher threshold
for the client by using the "cifs option modify -max-opens-same-file-per
-tree" command.
In some cases, clients operate as expected, but require a higher
threshold. You should have advanced privilege to set a higher threshold
for the client. …If the issue is caused by an existing application, there
might be an issue with the client. Contact NetApp technical support for
more information or assistance.
|NetBIOS Name Conflict|CRITICAL
|The NetBIOS Name Service has received a negative response to a name
registration request, from a remote machine. This is typically caused by a
conflict in the NetBIOS name or an alias. As a result, clients might not
be able to access data or connect to the right data-serving node in the
cluster.|Perform any one of the following corrective actions:…If there is
a conflict in the NetBIOS name or an alias, perform one of the
following:…Delete the duplicate NetBIOS alias by using the "vserver cifs
delete -aliases alias -vserver vserver" command.…Rename a NetBIOS alias by
deleting the duplicate name and adding an alias with a new name by using
the "vserver cifs create -aliases alias -vserver vserver" command. …If
there are no aliases configured and there is a conflict in the NetBIOS
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name, then rename the CIFS server by using the "vserver cifs delete
-vserver vserver" and "vserver cifs create -cifs-server netbiosname"
commands.
NOTE: Deleting a CIFS server can make data inaccessible. …Remove NetBIOS
name or rename the NetBIOS on the remote machine.
|NFSv4 Store Pool Exhausted|CRITICAL|A NFSv4 store pool has been
exhausted.|If the NFS server is unresponsive for more than 10 minutes
after this event, contact NetApp technical support.
|No Registered Scan Engine|CRITICAL|The antivirus connector notified ONTAP
that it does not have a registered scan engine. This might cause data
unavailability if the "scan-mandatory" option is enabled. |Perform the
following corrective actions:…Ensure that the scan engine software
installed on the antivirus server is compatible with ONTAP.…Ensure that
scan engine software is running and configured to connect to the antivirus
connector over local loopback.
|No Vscan Connection|CRITICAL|ONTAP has no Vscan connection to service
virus scan requests. This might cause data unavailability if the "scan-
mandatory" option is enabled.|Ensure that the scanner pool is properly
configured and the antivirus servers are active and connected to ONTAP.
|Node Root Volume Space Low|CRITICAL|The system has detected that the root
volume is dangerously low on space. The node is not fully operational.
Data LIFs might have failed over within the cluster, because of which NFS
and CIFS access is limited on the node. Administrative capability is
limited to local recovery procedures for the node to clear up space on the
root volume.|Perform the following corrective actions:…Clear up space on
the root volume by deleting old Snapshot copies, deleting files you no
longer need from the /mroot directory, or expanding the root volume
capacity.…Reboot the controller.…Contact NetApp technical support for more
information or assistance.
|Nonexistent Admin Share|CRITICAL|Vscan issue: a client has attempted to
connect to a nonexistent ONTAP_ADMIN$ share. |Ensure that Vscan is enabled
for the mentioned SVM ID. Enabling Vscan on a SVM causes the ONTAP_ADMIN$
share to be created for the SVM automatically.
|NVMe Namespace Out of Space|CRITICAL|An NVMe namespace has been brought
offline because of a write failure caused by lack of space.|Add space to
the volume, and then bring the NVMe namespace online by using the "vserver
nvme namespace modify" command.
|NVMe-oF Grace Period Active|WARNING|This event occurs on a daily basis
when the NVMe over Fabrics (NVMe-oF) protocol is in use and the grace
period of the license is active. The NVMe-oF functionality requires a
license after the license grace period expires. NVMe-oF functionality is
disabled when the license grace period is over. |Contact your sales
representative to obtain an NVMe-oF license, and add it to the cluster, or
remove all instances of NVMe-oF configuration from the cluster.
|NVMe-oF Grace Period Expired|WARNING|The NVMe over Fabrics (NVMe-oF)
license grace period is over and the NVMe-oF functionality is
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disabled.|Contact your sales representative to obtain an NVMe-oF license,
and add it to the cluster.
|NVMe-oF Grace Period Start|WARNING|The NVMe over Fabrics (NVMe-oF)
configuration was detected during the upgrade to ONTAP 9.5 software. NVMe-
oF functionality requires a license after the license grace period
expires.|Contact your sales representative to obtain an NVMe-oF license,
and add it to the cluster.
|Object Store Host Unresolvable|CRITICAL|The object store server host name
cannot be resolved to an IP address. The object store client cannot
communicate with the object-store server without resolving to an IP
address. As a result, data might be inaccessible. |Check the DNS
configuration to verify that the host name is configured correctly with an
IP address.
|Object Store Intercluster LIF Down|CRITICAL|The object-store client
cannot find an operational LIF to communicate with the object store
server. The node will not allow object store client traffic until the
intercluster LIF is operational. As a result, data might be inaccessible.
|Perform the following corrective actions:…Check the intercluster LIF
status by using the "network interface show -role intercluster"
command.…Verify that the intercluster LIF is configured correctly and
operational.…If an intercluster LIF is not configured, add it by using the
"network interface create -role intercluster" command.
|Object Store Signature Mismatch|CRITICAL|The request signature sent to
the object store server does not match the signature calculated by the
client. As a result, data might be inaccessible. |Verify that the secret
access key is configured correctly. If it is configured correctly, contact
NetApp technical support for assistance.
|READDIR Timeout|CRITICAL|A READDIR file operation has exceeded the
timeout that it is allowed to run in WAFL. This can be because of very
large or sparse directories. Corrective action is recommended. |Perform
the following corrective actions:…Find information specific to recent
directories that have had READDIR file operations expire by using the
following 'diag' privilege nodeshell CLI command:
wafl readdir notice show.…Check if directories are indicated as sparse or
not:…If a directory is indicated as sparse, it is recommended that you
copy the contents of the directory to a new directory to remove the
sparseness of the directory file. …If a directory is not indicated as
sparse and the directory is large, it is recommended that you reduce the
size of the directory file by reducing the number of file entries in the
directory.
|Relocation of Aggregate Failed|CRITICAL|This event occurs during the
relocation of an aggregate, when the destination node cannot reach the
object stores. |Perform the following corrective actions:…Verify that your
intercluster LIF is online and functional by using the "network interface
show" command.…Check network connectivity to the object store server by
using the"'ping" command over the destination node intercluster LIF.
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…Verify that the configuration of your object store has not changed and
that login and connectivity information is still accurate by using the
"aggregate object-store config show" command.…Alternatively, you can
override the error by using the "override-destination-checks" parameter of
the relocation command.…Contact NetApp technical support for more
information or assistance.
|Shadow Copy Failed|CRITICAL|A Volume Shadow Copy Service (VSS), a
Microsoft Server backup and restore service operation, has failed.|Check
the following using the information provided in the event message:…Is
shadow copy configuration enabled?…Are the appropriate licenses installed?
…On which shares is the shadow copy operation performed?…Is the share name
correct?…Does the share path exist?…What are the states of the shadow copy
set and its shadow copies?
|Storage Switch Power Supplies Failed|WARNING|There is a missing power
supply in the cluster switch. Redundancy is reduced, risk of outage with
any further power failures.|Perform the following corrective
actions:…Ensure that the power supply mains, which supplies power to the
cluster switch, is turned on.…Ensure that the power cord is connected to
the power supply.…Contact NetApp technical support if the issue persists.
|Too Many CIFS Authentication|WARNING|Many authentication negotiations
have occurred simultaneously. There are 256 incomplete new session
requests from this client.|Investigate why the client has created 256 or
more new connection requests. You might have to contact the vendor of the
client or of the application to determine why the error occurred.
|Unauthorized User Access to Admin Share|WARNING|A client has attempted to
connect to the privileged ONTAP_ADMIN$ share even though their logged-in
user is not an allowed user.|Perform the following corrective
actions:…Ensure that the mentioned username and IP address is configured
in one of the active Vscan scanner pools.…Check the scanner pool
configuration that is currently active by using the "vserver vscan scanner
pool show-active" command.
|Virus Detected|WARNING|A Vscan server has reported an error to the
storage system. This typically indicates that a virus has been found.
However, other errors on the Vscan server can cause this event.…Client
access to the file is denied. The Vscan server might, depending on its
settings and configuration, clean the file, quarantine it, or delete
it.|Check the log of the Vscan server reported in the "syslog" event to
see if it was able to successfully clean, quarantine, or delete the
infected file. If it was not able to do so, a system administrator might
have to manually delete the file.

|Volume Offline|INFO|This message indicates that a volume is made
offline.|Bring the volume back online.
|Volume Restricted|INFO|This event indicates that a flexible volume is
made restricted.|Bring the volume back online.
|Storage VM Stop Succeeded|INFO|This message occurs when a 'vserver stop'
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operation succeeds.|Use 'vserver start' command to start the data access
on a storage VM.
|Node Panic|WARNING|This event is issued when a panic occurs|Contact
NetApp customer support.|1 day

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<<top,Back to Top>>

=== Anti-Ransomware Log Monitors

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|Monitor Name|Severity|Description|Corrective Action
|Storage VM Anti-ransomware Monitoring Disabled|WARNING|The anti-
ransomware monitoring for the storage VM is disabled. Enable anti-
ransomware to protect the storage VM.|None
|Storage VM Anti-ransomware Monitoring Enabled (Learning Mode)|INFO|The
anti-ransomware monitoring for the storage VM is enabled in learning
mode.|None
|Volume Anti-ransomware Monitoring Enabled|INFO|The anti-ransomware
monitoring for the volume is enabled.|None
|Volume Anti-ransomware Monitoring Disabled|WARNING|The anti-ransomware
monitoring for the volume is disabled. Enable anti-ransomware to protect
the volume.|None
|Volume Anti-ransomware Monitoring  Enabled (Learning Mode)|INFO|The anti-
ransomware monitoring for the volume is enabled in learning mode.|None
|Volume Anti-ransomware Monitoring Paused (Learning Mode)|WARNING|The
anti-ransomware monitoring for the volume is paused in learning mode.|None
|Volume Anti-ransomware Monitoring Paused|WARNING|The anti-ransomware
monitoring for the volume is paused.|None
|Volume Anti-ransomware Monitoring Disabling|WARNING|The anti-ransomware
monitoring for the volume is disabling.|None
|Ransomware Activity Detected|CRITICAL|To protect the data from the
detected ransomware, a Snapshot copy has been taken that can be used to
restore original data.
Your system generates and transmits an AutoSupport or "call home" message
to NetApp technical support and any configured destinations. AutoSupport
message improves problem determination and resolution.|Refer to the
"FINAL-DOCUMENT-NAME" to take remedial measures for ransomware activity.



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<<top,Back to Top>>


=== FSx for NetApp ONTAP Monitors

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|Monitor Name|Thresholds|Monitor Description|Corrective Action
|FSx Volume Capacity is Full|Warning @ > 85 %…Critical @ > 95 %|Storage
capacity of a volume is necessary to store application and customer data.
The more data stored in the ONTAP volume the less storage availability for
future data. If the data storage capacity within a volume reaches the
total storage capacity may lead to the customer being unable to store data
due to lack of storage capacity. Monitoring the volume used storage
capacity ensures data services continuity.|Immediate actions are required
to minimize service disruption if critical threshold is breached:…1.
Consider deleting data that is not needed anymore to free up space
|FSx Volume High Latency|Warning @ > 1000 µs…Critical @ >  2000 µs|Volumes
are objects that serve the IO traffic often driven by performance
sensitive applications including devOps applications, home directories,
and databases. High volume latencies means that the applications
themselves may suffer and be unable to accomplish their tasks. Monitoring
volume latencies is critical to maintain application consistent
performance.|Immediate actions are required to minimize service disruption
if critical threshold is breached:…1. If the volume has a QoS policy
assigned to it, evaluate its limit thresholds in case they are causing the
volume workload to get throttled……Plan to take the following actions soon
if warning threshold is breached:…1. If the volume has a QoS policy
assigned to it, evaluate its limit thresholds in case they are causing the
volume workload to get throttled.…2. If the node is also experiencing high
utilization, move the volume to another node or reduce the total workload
of the node.
|FSx Volume Inodes Limit|Warning @ > 85 %…Critical @ > 95 %|Volumes that
store files use index nodes (inode) to store file metadata. When a volume
exhausts its inode allocation no more files can be added to it. A warning
alert indicates that planned action should be taken to increase the number
of available inodes. A critical alert indicates that file limit exhaustion
is imminent and emergency measures should be taken to free up inodes to
ensure service continuity|Immediate actions are required to minimize
service disruption if critical threshold is breached:…1. Consider
increasing the inodes value for the volume. If the inodes value is already
at the max, then consider splitting the volume into two or more volumes
because the file system has grown beyond the maximum size……Plan to take
the following actions soon if warning threshold is breached:…1. Consider
increasing the inodes value for the volume. If the inodes value is already
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at the max, then consider splitting the volume into two or more volumes
because the file system has grown beyond the maximum size
|FSx Volume Qtree Quota Overcommit|Warning @ > 95 %…Critical @ > 100
%|Volume Qtree Quota Overcommit specifies the percentage at which a volume
is considered to be overcommitted by the qtree quotas. The set threshold
for the qtree quota is reached for the volume. Monitoring the volume qtree
quota overcommit ensures that the user receives uninterrupted data
service.|If critical threshold is breached, then immediate actions should
be taken to minimize service disruption:
1. Delete unwanted data…When warning threshold is breached, then consider
increasing the space of the volume.
|FSx Snapshot Reserve Space is Full|Warning @ > 90 %…Critical @ > 95
%|Storage capacity of a volume is necessary to store application and
customer data. A portion of that space, called snapshot reserved space, is
used to store snapshots which allow data to be protected locally. The more
new and updated data stored in the ONTAP volume the more snapshot capacity
is used and less snapshot storage capacity will be available for future
new or updated data. If the snapshot data capacity within a volume reaches
the total snapshot reserve space it may lead to the customer being unable
to store new snapshot data and reduction in the level of protection for
the data in the volume. Monitoring the volume used snapshot capacity
ensures data services continuity.|Immediate actions are required to
minimize service disruption if critical threshold is breached:…1. Consider
configuring snapshots to use data space in the volume when the snapshot
reserve is full…2. Consider deleting some older snapshots that may not be
needed anymore to free up space……Plan to take the following actions soon
if warning threshold is breached:…1. Consider increasing the snapshot
reserve space within the volume to accommodate the growth…2. Consider
configuring snapshots to use data space in the volume when the snapshot
reserve is full
|FSx Volume Cache Miss Ratio|Warning @ > 95 %…Critical @ > 100 %|Volume
Cache Miss Ratio is the percentage of read requests from the client
applications that are returned from the disk instead of being returned
from the cache. This means that the volume has reached the set
threshold.|If critical threshold is breached, then immediate actions
should be taken to minimize service disruption:
1. Move some workloads off of the node of the volume to reduce the IO load
2. Lower the demand of lower priority workloads on the same node via QoS
limits…Consider immediate actions when warning threshold is breached:
1. Move some workloads off of the node of the volume to reduce the IO load
2. Lower the demand of lower priority workloads on the same node via QoS
limits
3. Change workload characteristics (block size, application caching etc)

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<<top,Back to Top>>

=== K8s Monitors

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|Monitor Name|Description|Corrective Actions|Severity/Threshold
|Persistent Volume Latency High
|High persistent volume latencies means that the applications themselves
may suffer and be unable to accomplish their tasks. Monitoring persistent
volume latencies is critical to maintain application consistent
performance. The following are expected latencies based on media type -
SSD up to 1-2 milliseconds; SAS up to 8-10 milliseconds and SATA HDD 17-20
milliseconds.
|**Immediate Actions**
    If critical threshold is breached, consider immediate actions to
minimize service disruption:
        If the volume has a QoS policy assigned to it, evaluate its limit
thresholds in case they are causing the volume workload to get throttled.
        **Actions To Do Soon**
    If warning threshold is breached, plan the following immediate
actions:
        1. If storage pool is also experiencing high utilization, move the
volume to another storage pool.
    2. If the volume has a QoS policy assigned to it, evaluate its limit
thresholds in case they are causing the volume workload to get throttled.
    3. If the controller is also experiencing high utilization, move the
volume to another controller or reduce the total workload of the
controller.
|Warning @ > 6,000 μs
    Critical @ > 12,000 μs

|Cluster Memory Saturation High
|Cluster allocatable memory saturation is high.
    Cluster CPU saturation is calculated as the sum of memory usage
divided by the sum of allocatable memory across all K8s nodes.
|Add nodes.
    Fix any unscheduled nodes.
    Right-size pods to free up memory on nodes.
|Warning @ > 80 %
    Critical @ > 90 %

|POD Attach Failed
|This alert occurs when a volume attachment with POD is failed.
|
|Warning
```

```
|High Retransmit Rate
|High TCP Retransmit Rate
|Check for Network congestion - Identify workloads that consume a lot of
network bandwidth.
    Check for high Pod CPU utilization.
    Check hardware network performance.
|Warning @ > 10 %
    Critical @ > 25 %

|Node File System Capacity High
|Node File System Capacity High
|- Increase the size of the node disks to ensure that there is sufficient
room for the application files.
- Decrease application file usage.
|Warning @ > 80 %
 Critical @ > 90 %

|Workload Network Jitter High
|High TCP Jitter (high latency/response time variations)
|Check for Network congestion. Identify workloads that consume a lot of
network bandwidth.
Check for high Pod CPU utilization.
Check hardware network performance
|Warning @ > 30 ms
 Critical @ > 50 ms

|Persistent Volume Throughput
|MBPS thresholds on persistent volumes can be used to alert an
administrator when persistent volumes exceed predefined performance
expectations, potentially impacting other persistent volumes. Activating
this monitor will generate alerts appropriate for the typical throughput
profile of persistent volumes on SSDs. This monitor will cover all
persistent volumes in your environment. The warning and critical threshold
values can be adjusted based on your monitoring goals by duplicating this
monitor and setting thresholds appropriate for your storage class. A
duplicated monitor can be further targeted to a subset of the persistent
volumes in your environment.
|**Immediate Actions**
If critical threshold is breached, plan immediate actions to minimize
service disruption:
1. Introduce QoS MBPS limits for the volume.
2. Review the application driving the workload on the volume for
anomalies.
**Actions To Do Soon**
If warning threshold is breached, plan to take the following immediate
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actions:
1. Introduce QoS MBPS limits for the volume.
2. Review the application driving the workload on the volume for
anomalies.
|Warning @ > 10,000 MB/s
 Critical @ > 15,000 MB/s

|Container at Risk of Going OOM Killed
|The container's memory limits are set too low. The container is at risk
of eviction (Out of Memory Kill).
|Increase container memory limits.
|
 Warning @ > 95 %

|Workload Down
|Workload has no healthy pods.
|
|Critical @ < 1

|Persistent Volume Claim Failed Binding
|This alert occurs when a binding is failed on a PVC.
|
|Warning

|ResourceQuota Mem Limits About to Exceed
|Memory limits for Namespace are about to exceed ResourceQuota
|
|Warning @ > 80 %
 Critical @ > 90 %

|ResourceQuota Mem Requests About to Exceed
|Memory requests for Namespace are about to exceed ResourceQuota
|
|Warning @ > 80 %
 Critical @ > 90 %

|Node Creation Failed
|The node could not be scheduled because of a configuration error.
|Check the Kubernetes event log for the cause of the configuration
failure.
|Critical

|Persistent Volume Reclamation Failed
|The volume has failed its automatic reclamation.
|
|Warning @ > 0 B
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|Container CPU Throttling
|The container's CPU Limits are set too low. Container processes are
slowed.
|Increase container CPU limits.
|Warning @ > 95 %
 Critical @ > 98 %

|Service Load Balancer Failed to Delete
|
|
|Warning

|Persistent Volume IOPS
|IOPS thresholds on persistent volumes can be used to alert an
administrator when persistent volumes exceed predefined performance
expectations. Activating this monitor will generate alerts appropriate for
the typical IOPS profile of persistence volumes. This monitor will cover
all persistent volumes in your environment. The warning and critical
threshold values can be adjusted based on your monitoring goals by
duplicating this monitor and setting thresholds appropriate for your
workload.
|**Immediate Actions**
If critical threshold is breached, plan Immediate actions to minimize
service disruption :
1. Introduce QoS IOPS limits for the volume.
2. Review the application driving the workload on the volume for
anomalies.
**Actions To Do Soon**
If warning threshold is breached, plan the following immediate actions:
1. Introduce QoS IOPS limits for the volume.
2. Review the application driving the workload on the volume for
anomalies.
|Warning @ > 20,000 IO/s
 Critical @ > 25,000 IO/s

|Service Load Balancer Failed to Update
|
|
|Warning


|POD Failed Mount
|This alert occurs when a mount is failed on a POD.
|
|Warning
```

```
|Node PID Pressure
|Available process identifiers on the (Linux) node has fallen below an
eviction threshold.
|Find and fix pods that generate many processes and starve the node of
available process IDs.
Set up PodPidsLimit to protect your node against pods or containers that
spawn too many processes.
|Critical @ > 0

|Pod Image Pull Failure
|Kubernetes failed to pull the pod container image.
|- Make sure the pod's image is spelled correctly in the pod
configuration.
- Check image tag exists in your registry.
- Verify the credentials for the image registry.
- Check for registry connectivity issues.
- Verify you are not hitting the rate limits imposed by public registry
providers.
|Warning

|Job Running Too Long
|Job is running for too long
|
|Warning @ > 1 hr
 Critical @ > 5 hr

|Node Memory High
|Node memory usage is high
|Add nodes.
Fix any unscheduled nodes.
Right-size pods to free up memory on nodes.
|Warning @ > 85 %
 Critical @ > 90 %

|ResourceQuota CPU Limits About to Exceed
|CPU limits for Namespace are about to exceed ResourceQuota
|
|Warning @ > 80 %
 Critical @ > 90 %

|Pod Crash Loop Backoff
|Pod has crashed and attempted to restart multiple times.
|
|Critical @ > 3

|Node CPU High
```

```
|Node CPU usage is high.
|Add nodes.
Fix any unscheduled nodes.
Right-size pods to free up CPU on nodes.
|Warning @ > 80 %
 Critical @ > 90 %

|Workload Network Latency RTT High
|High TCP RTT (Round Trip Time) latency
|Check for Network congestion ▒ Identify workloads that consume a lot of
network bandwidth.
Check for high Pod CPU utilization.
Check hardware network performance.
|Warning @ > 150 ms
 Critical @ > 300 ms

|Job Failed
|Job did not complete successfully due to a node crash or reboot, resource
exhaustion, job timeout, or pod scheduling failure.
|Check the Kubernetes event logs for failure causes.
|Warning @ > 1

|Persistent Volume Full in a Few Days
|Persistent Volume will run out of space in a few days
|-Increase the volume size to ensure that there is sufficient room for the
application files.
-Reduce the amount of data stored in applications.
|Warning @ < 8 day
 Critical @ < 3 day

|Node Memory Pressure
|Node is running out of memory. Available memory has met eviction
threshold.
|Add nodes.
Fix any unscheduled nodes.
Right-size pods to free up memory on nodes.
|Critical @ > 0

|Node Unready
|Node has been unready for 5 minutes
|Verify the node have enough CPU, memory, and disk resources.
Check node network connectivity.
Check the Kubernetes event logs for failure causes.
|Critical @ < 1

|Persistent Volume Capacity High
```

```
|Persistent Volume backend used capacity is high.
|- Increase the volume size to ensure that there is sufficient room for
the application files.
- Reduce the amount of data stored in applications.
|Warning @ > 80 %
 Critical @ > 90 %

|Service Load Balancer Failed to Create
|Service Load Balancer Create Failed
|
|Critical

|Workload Replica Mismatch
|Some pods are currently not available for a Deployment or DaemonSet.
|
|Warning @ > 1

|ResourceQuota CPU Requests About to Exceed
|CPU requests for Namespace are about to exceed ResourceQuota
|
|Warning @ > 80 %
 Critical @ > 90 %

|High Retransmit Rate
|High TCP Retransmit Rate
|Check for Network congestion - Identify workloads that consume a lot of
network bandwidth.
Check for high Pod CPU utilization.
Check hardware network performance.
|Warning @ > 10 %
 Critical @ > 25 %

|Node Disk Pressure
|Available disk space and inodes on either the node's root filesystem or
image filesystem has satisfied an eviction threshold.
|- Increase the size of the node disks to ensure that there is sufficient
room for the application files.
- Decrease application file usage.
|Critical @ > 0

|Cluster CPU Saturation High
|Cluster allocatable CPU saturation is high.
Cluster CPU saturation is calculated as the sum of CPU usage divided by
the sum allocatable CPU across all K8s nodes.
|Add nodes.
Fix any unscheduled nodes.
```

```
Right-size pods to free up CPU on nodes.
|Warning @ > 80 %
 Critical @ > 90 %
|===


////
//Original:
|===

|Monitor Name|Severity|Monitor Description

|POD Created|Informational|This alert occurs when a POD is created.
|POD Deleted|Informational|This alert occurs when a POD is deleted.
|Daemonset Created|Informational|This alert occurs when a Daemonset is
created.
|Daemonset Deleted|Informational|This alert occurs when a Daemonset is
deleted.
|Replicaset Created|Informational|This alert occurs when a Replicaset is
created.
|Replicaset Deleted|Informational|This alert occurs when a Replicaset is
deleted.
|Deployment Created|Informational|This alert occurs when a Deployment is
created.
|POD Failed|WARNING|This alert occurs when a POD is failed.
|POD Attach Failed|WARNING|This alert occurs when a volume attachment with
POD is failed.
|Persistent Volume Claim Failed Binding|WARNING|This alert occurs when a
binding is failed on a PVC.
|POD Failed Mount|WARNING|This alert occurs when a mount is failed on a
POD.

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<<top,Back to Top>>

=== Change Log Monitors

|===

|Monitor Name|Severity|Monitor Description

|Internal Volume Discovered|Informational|This message occurs when an
Internal Volume is discovered.
|Internal Volume Modified|Informational|This message occurs when an
```

```
Internal Volume is modified.
|Storage Node Discovered|Informational|This message occurs when an Storage
Node is discovered.
|Storage Node Removed|Informational|This message occurs when an Storage
Node is removed.
|Storage Pool Discovered|Informational|This message occurs when an Storage
Pool is discovered.
|Storage Virtual Machine Discovered|Informational|This message occurs when
an Storage Virtual Machine is discovered.
|Storage Virtual Machine Modified|Informational|This message occurs when
an Storage Virtual Machine is modified.
|===



<<top,Back to Top>>



=== Data Collection Monitors

|===
Monitor Name|Description|Corrective Action
|Acquisition Unit Shutdown|Cloud Insights Acquisition Units periodically
restart as part of upgrades to introduce new features. This happens once a
month or less in a typical environment. A Warning Alert that an
Acquisition Unit has shutdown should be followed soon after by a
Resolution noting that the newly-restarted Acquisition Unit has completed
a registration with Cloud Insights. Typically this shutdown-to-
registration cycle takes 5 to 15 minutes. |If the alert occurs frequently
or lasts longer than 15 minutes, check on the operation of the system
hosting the Acquisition Unit, the network, and any proxy connecting the AU
to the Internet.
|Collector Failed|The poll of a data collector encountered an unexpected
failure situation.|Visit the data collector page in Cloud Insights to
learn more about the situation.
|Collector Warning|This Alert typically can arise because of an erroneous
configuration of the data collector or of the target system. Revisit the
configurations to prevent future Alerts. It can also be due to a retrieval
of less-than-complete data where the data collector gathered all the data
that it could. This can happen when situations change during data
collection (e.g., a virtual machine present at the beginning of data
collection is deleted during data collection and before its data is
captured).|Check the configuration of the data collector or target system.

Note that the monitor for Collector Warning can send more alerts than
other monitor types, so it is recommended to set no alert recipients
unless you are troubleshooting.
```

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<<top,Back to Top>>

=== Security Monitors

|===

|Monitor Name|Threshold|Monitor Description|Corrective Action
|AutoSupport HTTPS transport disabled|Warning @ < 1|AutoSupport supports
HTTPS, HTTP, and SMTP for transport protocols. Because of the sensitive
nature of AutoSupport messages, NetApp strongly recommends using HTTPS as
the default transport protocol for sending AutoSupport messages to NetApp
support.|To set HTTPS as the transport protocol for AutoSupport messages,
run the following ONTAP command:…system node autosupport modify -transport
https
|Cluster Insecure ciphers for SSH|Warning @ < 1|Indicates that SSH is
using insecure ciphers, for example ciphers beginning with *cbc.|To remove
the CBC ciphers, run the following ONTAP command:…security ssh remove
-vserver <admin vserver> -ciphers aes256-cbc,aes192-cbc,aes128-cbc,3des-
cbc
|Cluster Login Banner Disabled|Warning @ < 1|Indicates that the Login
banner is disabled for users accessing the ONTAP system. Displaying a
login banner is helpful for establishing expectations for access and use
of the system.|To configure the login banner for a cluster, run the
following ONTAP command:…security login banner modify -vserver <admin svm>
-message "Access restricted to authorized users"
|Cluster Peer Communication Not Encrypted|Warning @ < 1|When replicating
data for disaster recovery, caching, or backup, you must protect that data
during transport over the wire from one ONTAP cluster to another.
Encryption must be configured on both the source and destination
clusters.|To enable encryption on cluster peer relationships that were
created prior to ONTAP 9.6, the source and destination cluster must be
upgraded to 9.6. Then use the "cluster peer modify" command to change both
the source and destination cluster peers to use Cluster Peering
Encryption.…See the NetApp Security Hardening Guide for ONTAP 9 for
details.
|Default Local Admin User Enabled|Warning @ > 0|NetApp recommends locking
(disabling) any unneeded Default Admin User (built-in) accounts with the
lock command. They are primarily default accounts for which passwords were
never updated or changed.|To lock the built-in "admin" account, run the
following ONTAP command:…security login lock -username admin
|FIPS Mode Disabled|Warning @ < 1|When FIPS 140-2 compliance is enabled,
TLSv1 and SSLv3 are disabled, and only TLSv1.1 and TLSv1.2 remain enabled.
ONTAP prevents you from enabling TLSv1 and SSLv3 when FIPS 140-2
```

```
compliance is enabled.|To enable FIPS 140-2 compliance on a cluster, run
the following ONTAP command in advanced privilege mode:…security config
modify -interface SSL -is-fips-enabled true
|Log Forwarding Not Encrypted|Warning @ < 1|Offloading of syslog
information is necessary for limiting the scope or footprint of a breach
to a single system or solution. Therefore, NetApp recommends securely
offloading syslog information to a secure storage or retention
location.|Once a log forwarding destination is created, its protocol
cannot be changed. To change to an encrypted protocol, delete and recreate
the log forwarding destination using the following ONTAP command:…cluster
log-forwarding create -destination <destination ip> -protocol tcp-
encrypted
|MD5 Hashed password|Warning @ > 0|NetApp strongly recommends to use the
more secure SHA-512 hash function for ONTAP user account passwords.
Accounts using the less secure MD5 hash function should migrate to the
SHA-512 hash function.|NetApp strongly recommends user accounts migrate to
the more secure SHA-512 solution by having users change their
passwords.…to lock accounts with passwords that use the MD5 hash function,
run the following ONTAP command:…security login lock -vserver * -username
* -hash-function md5
|No NTP servers are configured|Warning @ < 1|Indicates that the cluster
has no configured NTP servers. For redundancy and optimum service, NetApp
recommends that you associate at least three NTP servers with the
cluster.|To associate an NTP server with the cluster, run the following
ONTAP command:

cluster time-service ntp server create -server <ntp server host name or ip
address>
|NTP server count is low|Warning @ < 3|Indicates that the cluster has less
than 3 configured NTP servers. For redundancy and optimum service, NetApp
recommends that you associate at least three NTP servers with the
cluster.|To associate an NTP server with the cluster, run the following
ONTAP command:…cluster time-service ntp server create -server <ntp server
host name or ip address>
|Remote Shell Enabled|Warning @ > 0|Remote Shell is not a secure method
for establishing command-line access to the ONTAP solution. Remote Shell
should be disabled for secure remote access.|NetApp recommends Secure
Shell (SSH) for secure remote access.…To disable Remote shell on a
cluster, run the following ONTAP command in advanced privilege
mode:…security protocol modify -application rsh- enabled false
|Storage VM Audit Log Disabled|Warning @ < 1|Indicates that Audit logging
is disabled for SVM.|To configure the Audit log for a vserver, run the
following ONTAP command:…vserver audit enable -vserver <svm>
|Storage VM Insecure ciphers for SSH|Warning @ < 1|Indicates that SSH is
using insecure ciphers, for example ciphers beginning with *cbc.|To remove
the CBC ciphers, run the following ONTAP command:…security ssh remove
```

```
-vserver <vserver> -ciphers aes256-cbc,aes192-cbc,aes128-cbc,3des-cbc
|Storage VM Login banner disabled|Warning @ < 1|Indicates that the Login
banner is disabled for users accessing SVMs on the system. Displaying a
login banner is helpful for establishing expectations for access and use
of the system.|To configure the login banner for a cluster, run the
following ONTAP command:…security login banner modify -vserver <svm>
-message "Access restricted to authorized users"
|Telnet Protocol Enabled|Warning @ > 0|Telnet is not a secure method for
establishing command-line access to the ONTAP solution. Telnet should be
disabled for secure remote access.|NetApp recommends Secure Shell (SSH)
for secure remote access.
To disable Telnet on a cluster, run the following ONTAP command in
advanced privilege mode:…security protocol modify -application telnet
-enabled false

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<<top,Back to Top>>

=== Data Protection Monitors

|===

|Monitor Name|Thresholds|Monitor Description|Corrective Action
|Insufficient Space for Lun Snapshot Copy|(Filter contains_luns = Yes)
Warning @ > 95 %…Critical @ > 100 %|Storage capacity of a volume is
necessary to store application and customer data. A portion of that space,
called snapshot reserved space, is used to store snapshots which allow
data to be protected locally. The more new and updated data stored in the
ONTAP volume the more snapshot capacity is used and less snapshot storage
capacity will be available for future new or updated data. If the snapshot
data capacity within a volume reaches the total snapshot reserve space it
may lead to the customer being unable to store new snapshot data and
reduction in the level of protection for the data in the LUNs in the
volume. Monitoring the volume used snapshot capacity ensures data services
continuity.| **Immediate Actions**
If critical threshold is breached, consider immediate actions to minimize
service disruption:

1. Configure snapshots to use data space in the volume when the snapshot
reserve is full.
2. Delete some older unwanted snapshots to free up space.

**Actions To Do Soon**
If warning threshold is breached, plan to take the following immediate
```

```
actions:

1. Increase the snapshot reserve space within the volume to accommodate
the growth.
2. Configure snapshots to use data space in the volume when the snapshot
reserve is full.
|SnapMirror Relationship Lag|Warning @ > 150%…Critical @ >
300%|SnapMirror relationship lag is the difference between the snapshot
timestamp and the time on the destination system. The lag_time_percent is
the ratio of lag time to the SnapMirror Policy's schedule interval. If the
lag time equals the schedule interval, the lag_time_percent will be 100%.
If the SnapMirror policy does not have a schedule, lag_time_percent will
not be calculated.|Monitor SnapMirror status using the "snapmirror show"
command. Check the SnapMirror transfer history using the "snapmirror show-
history" command
|===



<<top,Back to Top>>

=== Cloud Volume (CVO) Monitors

|===

|Monitor Name|CI Severity|Monitor Description|Corrective Action
|CVO Disk Out of Service|INFO|This event occurs when a disk is removed
from service because it has been marked failed, is being sanitized, or has
entered the Maintenance Center.|None
|CVO Giveback of Storage Pool Failed|CRITICAL|This event occurs during the
migration of an aggregate as part of a storage failover (SFO) giveback,
when the destination node cannot reach the object stores.|Perform the
following corrective actions:

Verify that your intercluster LIF is online and functional by using the
"network interface show" command.

Check network connectivity to the object store server by using the"'ping"
command over the destination node intercluster LIF.

Verify that the configuration of your object store has not changed and
that login and connectivity information is still accurate by using the
"aggregate object-store config show" command.

Alternatively, you can override the error by specifying false for the
"require-partner-waiting" parameter of the giveback command.
```

```
Contact NetApp technical support for more information or assistance.
|CVO HA Interconnect Down|WARNING|The high-availability (HA) interconnect
is down. Risk of service outage when failover is not available.|Corrective
actions depend on the number and type of HA interconnect links supported
by the platform, as well as the reason why the interconnect is down.

If the links are down:

Verify that both controllers in the HA pair are operational.

For externally connected links, make sure that the interconnect cables are
connected properly and that the small form-factor pluggables (SFPs), if
applicable, are seated properly on both controllers.

For internally connected links, disable and re-enable the links, one after
the other, by using the "ic link off" and "ic link on" commands.

If links are disabled, enable the links by using the "ic link on" command.

If a peer is not connected, disable and re-enable the links, one after the
other, by using the "ic link off" and "ic link on" commands.

Contact NetApp technical support if the issue persists.
|CVO Max Sessions Per User Exceeded|WARNING

|You have exceeded the maximum number of sessions allowed per user over a
TCP connection. Any request to establish a session will be denied until
some sessions are released.

|Perform the following corrective actions:

Inspect all the applications that run on the client, and terminate any
that are not operating properly.

Reboot the client.

Check if the issue is caused by a new or existing application:

If the application is new, set a higher threshold for the client by using
the "cifs option modify -max-opens-same-file-per-tree" command.
In some cases, clients operate as expected, but require a higher
threshold. You should have advanced privilege to set a higher threshold
for the client.

If the issue is caused by an existing application, there might be an issue
with the client. Contact NetApp technical support for more information or
assistance.
```

```
|CVO NetBIOS Name Conflict|CRITICAL

|The NetBIOS Name Service has received a negative response to a name
registration request, from a remote machine. This is typically caused by a
conflict in the NetBIOS name or an alias. As a result, clients might not
be able to access data or connect to the right data-serving node in the
cluster.|Perform any one of the following corrective actions:

If there is a conflict in the NetBIOS name or an alias, perform one of the
following:

Delete the duplicate NetBIOS alias by using the "vserver cifs delete
-aliases alias -vserver vserver" command.

Rename a NetBIOS alias by deleting the duplicate name and adding an alias
with a new name by using the "vserver cifs create -aliases alias -vserver
vserver" command.

If there are no aliases configured and there is a conflict in the NetBIOS
name, then rename the CIFS server by using the "vserver cifs delete
-vserver vserver" and "vserver cifs create -cifs-server netbiosname"
commands.
NOTE: Deleting a CIFS server can make data inaccessible.

Remove NetBIOS name or rename the NetBIOS on the remote machine.
|CVO NFSv4 Store Pool Exhausted|CRITICAL|A NFSv4 store pool has been
exhausted.|If the NFS server is unresponsive for more than 10 minutes
after this event, contact NetApp technical support.
|CVO Node Panic|WARNING|This event is issued when a panic occurs|Contact
NetApp customer support.
|CVO Node Root Volume Space Low|CRITICAL|The system has detected that the
root volume is dangerously low on space. The node is not fully
operational. Data LIFs might have failed over within the cluster, because
of which NFS and CIFS access is limited on the node. Administrative
capability is limited to local recovery procedures for the node to clear
up space on the root volume.|Perform the following corrective actions:

Clear up space on the root volume by deleting old Snapshot copies,
deleting files you no longer need from the /mroot directory, or expanding
the root volume capacity.

Reboot the controller.

Contact NetApp technical support for more information or assistance.
|CVO Nonexistent Admin Share|CRITICAL|Vscan issue: a client has attempted
to connect to a nonexistent ONTAP_ADMIN$ share. |Ensure that Vscan is
```

```
enabled for the mentioned SVM ID. Enabling Vscan on a SVM causes the
ONTAP_ADMIN$ share to be created for the SVM automatically.
|CVO Object Store Host Unresolvable|CRITICAL|The object store server host
name cannot be resolved to an IP address. The object store client cannot
communicate with the object-store server without resolving to an IP
address. As a result, data might be inaccessible. |Check the DNS
configuration to verify that the host name is configured correctly with an
IP address.
|CVO Object Store Intercluster LIF Down|CRITICAL|The object-store client
cannot find an operational LIF to communicate with the object store
server. The node will not allow object store client traffic until the
intercluster LIF is operational. As a result, data might be inaccessible.
|Perform the following corrective actions:

Check the intercluster LIF status by using the "network interface show
-role intercluster" command.

Verify that the intercluster LIF is configured correctly and operational.

If an intercluster LIF is not configured, add it by using the "network
interface create -role intercluster" command.
|CVO Object Store Signature Mismatch|CRITICAL|The request signature sent
to the object store server does not match the signature calculated by the
client. As a result, data might be inaccessible. |Verify that the secret
access key is configured correctly. If it is configured correctly, contact
NetApp technical support for assistance.
|CVO QoS Monitor Memory Maxed Out|CRITICAL|The QoS subsystem's dynamic
memory has reached its limit for the current platform hardware. Some QoS
features might operate in a limited capacity.|Delete some active workloads
or streams to free up memory. Use the “statistics show -object workload
-counter ops” command to determine which workloads are active. Active
workloads show non-zero ops. Then use the “workload delete
<workload_name>” command multiple times to remove specific workloads.
Alternatively, use the “stream delete -workload <workload name> *” command
to delete the associated streams from the active workload.
|CVO READDIR Timeout|CRITICAL|A READDIR file operation has exceeded the
timeout that it is allowed to run in WAFL. This can be because of very
large or sparse directories. Corrective action is recommended. |Perform
the following corrective actions:

Find information specific to recent directories that have had READDIR file
operations expire by using the following 'diag' privilege nodeshell CLI
command:
wafl readdir notice show.

Check if directories are indicated as sparse or not:
```

```
If a directory is indicated as sparse, it is recommended that you copy the
contents of the directory to a new directory to remove the sparseness of
the directory file.

If a directory is not indicated as sparse and the directory is large, it
is recommended that you reduce the size of the directory file by reducing
the number of file entries in the directory.
|CVO Relocation of Storage Pool Failed|CRITICAL|This event occurs during
the relocation of an aggregate, when the destination node cannot reach the
object stores. |Perform the following corrective actions:

Verify that your intercluster LIF is online and functional by using the
"network interface show" command.

Check network connectivity to the object store server by using the"'ping"
command over the destination node intercluster LIF.

Verify that the configuration of your object store has not changed and
that login and connectivity information is still accurate by using the
"aggregate object-store config show" command.

Alternatively, you can override the error by using the "override-
destination-checks" parameter of the relocation command.

Contact NetApp technical support for more information or assistance.
|CVO Shadow Copy Failed|CRITICAL|A Volume Shadow Copy Service (VSS), a
Microsoft Server backup and restore service operation, has failed.|Check
the following using the information provided in the event message:

Is shadow copy configuration enabled?

Are the appropriate licenses installed?

On which shares is the shadow copy operation performed?

Is the share name correct?

Does the share path exist?

What are the states of the shadow copy set and its shadow copies?
|CVO Storage VM Stop Succeeded|INFO|This message occurs when a 'vserver
stop' operation succeeds.|Use 'vserver start' command to start the data
access on a storage VM.
|CVO Too Many CIFS Authentication|WARNING|Many authentication negotiations
have occurred simultaneously. There are 256 incomplete new session
requests from this client.|Investigate why the client has created 256 or
more new connection requests. You might have to contact the vendor of the
```

```
client or of the application to determine why the error occurred.
|CVO Unassigned Disks|INFO|System has unassigned disks - capacity is being
wasted and your system may have some misconfiguration or partial
configuration change applied.|Perform the following corrective actions:

Determine which disks are unassigned by using the "disk show -n" command.

Assign the disks to a system by using the "disk assign" command.
|CVO Unauthorized User Access to Admin Share|WARNING|A client has
attempted to connect to the privileged ONTAP_ADMIN$ share even though
their logged-in user is not an allowed user.|Perform the following
corrective actions:

Ensure that the mentioned username and IP address is configured in one of
the active Vscan scanner pools.

Check the scanner pool configuration that is currently active by using the
"vserver vscan scanner pool show-active" command.
|CVO Virus Detected|WARNING|A Vscan server has reported an error to the
storage system. This typically indicates that a virus has been found.
However, other errors on the Vscan server can cause this event.

Client access to the file is denied. The Vscan server might, depending on
its settings and configuration, clean the file, quarantine it, or delete
it.|Check the log of the Vscan server reported in the "syslog" event to
see if it was able to successfully clean, quarantine, or delete the
infected file. If it was not able to do so, a system administrator might
have to manually delete the file.
|CVO Volume Offline|INFO|This message indicates that a volume is made
offline.|Bring the volume back online.
|CVO Volume Restricted|INFO|This event indicates that a flexible volume is
made restricted.|Bring the volume back online.

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<<top,Back to Top>>

=== SnapMirror for Business Continuity (SMBC) Mediator Log Monitors

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|Monitor Name|Severity|Monitor Description|Corrective Action

|ONTAP Mediator Added|INFO|This message occurs when ONTAP Mediator is
added successfully on a cluster.|None
```

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|ONTAP Mediator Not Accessible|CRITICAL|This message occurs when either
the ONTAP Mediator is repurposed or the Mediator package is no longer
installed on the Mediator server. As a result, SnapMirror failover is not
possible.|Remove the configuration of the current ONTAP Mediator by using
the "snapmirror mediator remove" command. Reconfigure access to the ONTAP
Mediator by using the "snapmirror mediator add" command.
|ONTAP Mediator Removed|INFO|This message occurs when ONTAP Mediator is
removed successfully from a cluster.|None
|ONTAP Mediator Unreachable|WARNING|This message occurs when the ONTAP
Mediator is unreachable on a cluster. As a result, SnapMirror failover is
not possible.|Check the network connectivity to the ONTAP Mediator by
using the "network ping" and "network traceroute" commands. If the issue
persists, remove the configuration of the current ONTAP Mediator by using
the "snapmirror mediator remove" command. Reconfigure access to the ONTAP
Mediator by using the "snapmirror mediator add" command.
|SMBC CA Certificate Expired|CRITICAL|This message occurs when the ONTAP
Mediator certificate authority (CA) certificate has expired. As a result,
all further communication to the ONTAP Mediator will not be
possible.|Remove the configuration of the current ONTAP Mediator by using
the "snapmirror mediator remove" command. Update a new CA certificate on
the ONTAP Mediator server. Reconfigure access to the ONTAP Mediator by
using the "snapmirror mediator add" command.
|SMBC CA Certificate Expiring|WARNING|This message occurs when the ONTAP
Mediator certificate authority (CA) certificate is due to expire within
the next 30 days.|Before this certificate expires, remove the
configuration of the current ONTAP Mediator by using the "snapmirror
mediator remove" command. Update a new CA certificate on the ONTAP
Mediator server. Reconfigure access to the ONTAP Mediator by using the
"snapmirror mediator add" command.
|SMBC Client Certificate Expired|CRITICAL|This message occurs when the
ONTAP Mediator client certificate has expired. As a result, all further
communication to the ONTAP Mediator will not be possible.|Remove the
configuration of the current ONTAP Mediator by using the "snapmirror
mediator remove" command. Reconfigure access to the ONTAP Mediator by
using the "snapmirror mediator add" command.
|SMBC Client Certificate Expiring|WARNING|This message occurs when the
ONTAP Mediator client certificate is due to expire within the next 30
days.|Before this certificate expires, remove the configuration of the
current ONTAP Mediator by using the "snapmirror mediator remove" command.
Reconfigure access to the ONTAP Mediator by using the "snapmirror mediator
add" command.
|SMBC Relationship Out of Sync
Note: UM doesn't have this one|CRITICAL|This message occurs when a
SnapMirror for Business Continuity (SMBC) relationship changes status from
"in-sync" to "out-of-sync". Due to this RPO=0 data protection will be
disrupted.|Check the network connection between the source and destination
```

```
volumes. Monitor the SMBC relationship status by using the "snapmirror
show" command on the destination, and by using the "snapmirror list-
destinations" command on the source. Auto-resync will attempt to bring the
relationship back to "in-sync" status. If the resync fails, verify that
all the nodes in the cluster are in quorum and are healthy.
|SMBC Server Certificate Expired|CRITICAL|This message occurs when the
ONTAP Mediator server certificate has expired. As a result, all further
communication to the ONTAP Mediator will not be possible.|Remove the
configuration of the current ONTAP Mediator by using the "snapmirror
mediator remove" command. Update a new server certificate on the ONTAP
Mediator server. Reconfigure access to the ONTAP Mediator by using the
"snapmirror mediator add" command.
|SMBC Server Certificate Expiring|WARNING|This message occurs when the
ONTAP Mediator server certificate is due to expire within the next 30
days.|Before this certificate expires, remove the configuration of the
current ONTAP Mediator by using the "snapmirror mediator remove" command.
Update a new server certificate on the ONTAP Mediator server. Reconfigure
access to the ONTAP Mediator by using the "snapmirror mediator add"
command.

|===

<<top,Back to Top>>

=== Additional Power, Heartbeat, and Miscellaneous System Monitors

|===
|Monitor Name|Severity|Monitor Description|Corrective Action

|Disk Shelf Power Supply Discovered|INFORMATIONAL|This message occurs when
a power supply unit is added to the disk shelf.|NONE
|Disk Shelves Power Supply Removed|INFORMATIONAL|This message occurs when
a power supply unit is removed from the disk shelf.|NONE
|MetroCluster Automatic Unplanned Switchover Disabled|CRITICAL|This
message occurs when automatic unplanned switchover capability is
disabled.|Run the "metrocluster modify -node-name <nodename> -automatic
-switchover-onfailure true" command for each node in the cluster to enable
automatic switchover.
|MetroCluster Storage Bridge Unreachable|CRITICAL|The storage bridge is
not reachable over the management network|1) If the bridge is monitored by
SNMP, verify that the node management LIF is up by using the "network
interface show" command. Verify that the bridge is alive by using the
"network ping" command.
2) If the bridge is monitored in-band, check the fabric cabling to the
bridge, and then verify that the bridge is powered up.
|MetroCluster Bridge Temperature Abnormal - Below Critical|CRITICAL|The
```

```
sensor on the Fibre Channel bridge is reporting a temperature that is
below the critical threshold.|1) Check the operational status of the fans
on the storage bridge.
2) Verify that the bridge is operating under recommended temperature
conditions.
|MetroCluster Bridge Temperature Abnormal - Above Critical|CRITICAL|The
sensor on the Fibre Channel bridge is reporting a temperature that is
above the critical threshold.|1) Check the operational status of the
chassis temperature sensor on the storage bridge using the command
"storage bridge show -cooling".
2) Verify that the storage bridge is operating under recommended
temperature conditions.
|MetroCluster Aggregate Left Behind|WARNING|The aggregate was left behind
during switchback.|1) Check the aggregate state by using the command "aggr
show".
2) If the aggregate is online, return it to its original owner by using
the command "metrocluster switchback".
|All Links Between Metrocluster Partners Down|CRITICAL|RDMA interconnect
adapters and intercluster LIFs have broken connections to the peered
cluster or the peered cluster is down.|1) Ensure that the intercluster
LIFs are up and running. Repair the intercluster LIFs if they are down.
2) Verify that the peered cluster is up and running by using  the "cluster
peer ping" command. See the MetroCluster Disaster Recovery Guide if the
peered cluster is down.
3) For fabric MetroCluster, verify that the back-end fabric ISLs are up
and running. Repair the back-end fabric ISLs if they are down.
4) For non-fabric MetroCluster configurations, verify that the cabling is
correct between the RDMA interconnect adapters. Reconfigure the cabling if
the links are down.
|MetroCluster Partners Not Reachable Over Peering Network|CRITICAL|The
connectivity to the peer cluster is broken.|1) Ensure that the port is
connected to the correct network/switch.
2) Ensure that the intercluster LIF is connected with the peered cluster.
3) Ensure that the peered cluster is up and running by using the command
"cluster peer ping". Refer to the MetroCluster Disaster Recovery Guide if
the peered cluster is down.
|MetroCluster Inter Switch All Links Down|CRITICAL|All Inter-Switch Links
(ISLs) on the storage switch are down.|1) Repair the back-end fabric ISLs
on the storage switch.
2) Ensure that the partner switch is up and its ISLs are operational.
3) Ensure that intermediate equipment, such as xWDM devices, are
operational.
|MetroCluster Node To Storage Stack SAS Link Down|WARNING|The SAS adapter
or its attached cable might be at fault.|1. Verify that the SAS adapter is
online and running.
2. Verify that the physical cable connection is secure and operating, and
```

```
replace the cable if necessary.
3. If the SAS adapter is connected to disk shelves, ensure IOMs and disks
are properly seated.
|MetroClusterFC Initiator Links Down|CRITICAL|The FC initiator adapter is
at fault.|1. Ensure that the FC initiator link has not been tampered with.
2. Verify the operational status of the FC initiator adapter by using the
command "system node run -node local -command storage show adapter".
|FC-VI Interconnect Link Down|CRITICAL|The physical link on the FC-VI port
is offline.|1. Ensure that the FC-VI link has not been tampered with.
2. Verify that the physical status of the FC-VI adapter is "Up" by using
the command "metrocluster interconnect adapter show".
3. If the configuration includes fabric switches, ensure that they are
properly cabled and configured.
|MetroCluster Spare Disks Left Behind|WARNING|The spare disk was left
behind during switchback.|If the disk is not failed, return it to its
original owner by using the command "metrocluster switchback".
|MetroCluster Storage Bridge Port Down|CRITICAL|The port on the storage
bridge is offline.|1) Check the operational status of the ports on the
storage bridge by using the command "storage bridge show -ports".
2) Verify logical and physical connectivity to the port.
|MetroCluster Storage Switch Fans Failed|CRITICAL|The fan on the storage
switch failed.|1) Ensure that the fans in the switch are operating
correctly by using the command "storage switch show -cooling".
2) Ensure that the fan FRUs are properly inserted and operational.
|MetroCluster Storage Switch Unreachable|CRITICAL|The storage switch is
not reachable over the management network.|1) Ensure that the node
management LIF is up by using the command "network interface show".
2) Ensure that the switch is alive by using the command "network ping".
3) Ensure that the switch is reachable over SNMP by checking its SNMP
settings after logging into the switch.
|MetroCluster Switch Power Supplies Failed|CRITICAL|A power supply unit on
the storage switch is not operational.|1) Check the error details by using
the command "storage switch show -error -switch-name <swtich name>".
2) Identify the faulty power supply unit by using the command "storage
switch show -power -switch-name <switch name>".
3) Ensure that the power supply unitis properly inserted into the chassis
of the storage switch and fully operational.
|MetroCluster Switch Temperature Sensors Failed|CRITICAL|The sensor on the
Fibre Channel switch failed.|1) Check the operational status of the
temperature sensors on the storage switch by using the command "storage
switch show -cooling".
2) Verify that the switch is operating under recommended temperature
conditions.
|MetroCluster Switch Temperature Abnormal|CRITICAL|The temperature sensor
on the Fibre Channel switch reported abnormal temperature.|1) Check the
operational status of the temperature sensors on the storage switch by
```

```
using the command "storage switch show -cooling".
2) Verify that the switch is operating under recommended temperature
conditions.
|Service Processor Heartbeat Missed |INFORMATIONAL|This message occurs
when ONTAP does not receive an expected "heartbeat" signal from the
Service Processor (SP). Along with this message, log files from SP will be
sent out for debugging. ONTAP will reset the SP to attempt to restore
communication. The SP will be unavailable for up to two minutes while it
reboots.|Contact NetApp technical support.
|Service Processor Heartbeat Stopped|WARNING|This message occurs when
ONTAP is no longer receiving heartbeats from the Service Processor (SP).
Depending on the hardware design, the system may continue to serve data or
may determine to shut down to prevent data loss or hardware damage. The
system continues to serve data, but because the SP might not be working,
the system cannot send notifications of down appliances, boot errors, or
Open Firmware (OFW) Power-On Self-Test (POST) errors. If your system is
configured to do so, it generates and transmits an AutoSupport (or 'call
home') message to NetApp technical support and to the configured
destinations. Successful delivery of an AutoSupport message significantly
improves problem determination and resolution.|If the system has shut
down, attempt a hard power cycle: Pull the controller out from the
chassis, push it back in then power on the system. Contact NetApp
technical support if the problem persists after the power cycle, or for
any other condition that may warrant attention.

|===

<<top,Back to Top>>


== More Information

//* xref:{relative_path}concept_notifications_email.html[Email Alerting]
for Monitors

* xref:{relative_path}task_view_and_manage_alerts.html[Viewing and
Dismissing Alerts]






:leveloffset: -1


[[IDca0b23332a47f2d9fdb8f4b6aa1b32d9]]
```

```
= Cloud Insights API
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Cloud Insights API enables NetApp customers and independent software
vendors (ISVs) to integrate Cloud Insights with other applications, such
as CMDB's or other ticketing systems.

//NOTE: This documentation is considered *Preview Documentation* and is
therefore subject to change.

//NOTE: The Cloud Insights API is available in *Cloud Insights Premium
Edition*.

Note that Cloud Insights APIs are available based on your current Edition:

[cols="<,^s,^s,^s"]
|===
|API Type|Basic|Standard|Premium

|Acquisition
Unit|image:SmallCheckMark.png[]|image:SmallCheckMark.png[]|image:SmallChec
kMark.png[]
|Data
Collection|image:SmallCheckMark.png[]|image:SmallCheckMark.png[]|image:Sma
llCheckMark.png[]
|Alerts| |image:SmallCheckMark.png[]|image:SmallCheckMark.png[]
|Assets| |image:SmallCheckMark.png[]|image:SmallCheckMark.png[]
|Data Ingestion| |image:SmallCheckMark.png[]|image:SmallCheckMark.png[]
|Log Ingestion| |image:SmallCheckMark.png[]|image:SmallCheckMark.png[]

|===



Additionally, your Cloud Insights link:https://docs.netapp.com/us-
en/cloudinsights/concept_user_roles.html#permission-levels[feature set
role] will determine which APIs you can access. User and Guest roles have
fewer privileges than Administrator role. For example, if you have
Administrator role in Monitor and Optimize, but User role in Reporting,
you can manage all API types except Data Warehouse.
```

```
== Requirements for API Access

* An API Access Token model is used to grant access.

* API Token management is performed by Cloud Insights users with the
Administrator role.


== API Documentation (Swagger)

The latest API information is found by logging in to Cloud Insights and
navigating to *Admin > API Acccess*. Click the *API Documentation* link.

//image:API_Types_Example.png[API Types]
//image:API_Documentation.png[API Documentation]
image:API_Swagger_Types.png[API types]

The API Documentation is Swagger-based, which provides a brief description
and usage information for the API, and allows you to try it out in your
environment. Depending on your user role and/or Cloud Insights edition,
the API types available to you may vary.

image:API_Swagger_Example.png[API Swagger Example]

== API Access Tokens

Before using the Cloud Insights API, you must create one or more *API
Access Tokens*. Access tokens are used for specified API types, and can
grant read and/or write permissions. You can also set the expiration for
each access token. All APIs under the specified types are valid for the
access token. Each token is void of a username or password.

To create an Access Token:

* Click *Admin > API Access*

* Click *+API Access Token*

    ** Enter Token Name

    ** Select API Types

    ** Specify the permissions granted for this API access

   ** Specify Token Expiration
```

```
NOTE: Your token will only be available for copying to the clipboard and
saving during the creation process. Tokens can not be retrieved after they
are created, so it is highly recommended to copy the token and save it in
a secure location. You will be prompted to click the *Copy API Access
Token* button before you can close the token creation screen.

You can disable, enable, and revoke tokens. Tokens that are disabled can
be enabled.

Tokens grant general purpose access to APIs from a customer perspective;
managing access to APIs in the scope of their own tenant. Customer
administrators may grant and revoke these tokens without direct
involvement from Cloud Insights back end personnel.

The application receives an Access Token after a user successfully
authenticates and authorizes access, then passes the Access Token as a
credential when it calls the target API. The passed token informs the API
that the bearer of the token has been authorized to access the API and
perform specific actions specified by the scope that was granted during
authorization.

The HTTP header where the Access Token is passed is *X-CloudInsights-
ApiKey:*.

For example, use the following to retrieve storages assets:

 curl https://<tenant_host_name>/rest/v1/assets/storages -H 'X-
CloudInsights-ApiKey:<API_Access_Token>'

Where _<API_Access_Token>_ is the token you saved during API access
creation.

See the swagger pages for examples specific to the API you wish to use.

== API Type

The Cloud Insights API is category-based, and currently contains the
following types:

* ASSETS type contains asset, query, and search APIs.
** Assets: Enumerate top-level objects and retrieve a specific object or
an object hierarchy.
** Query: Retrieve and manage Cloud Insights queries.
** Import: Import annotations or applications and assign them to objects
** Search: Locate a specific object without knowing the object’s unique ID
or full name.
```

```
* DATA COLLECTION type is used to retrieve and manage data collectors.

* DATA INGESTION type is used to retrieve and manage ingestion data and
custom metrics, such as from Telegraf agents

* LOG INGESTION is used to retrieve and manage log data

//* DATA WAREHOUSE type is available for environments with Cloud Insights
Reporting, and is used to manage data used with Reporting

Additional types and/or APIs may become available over time. You can find
the latest API information in the xref:{relative_path}#api-documentation-
swagger[API Swagger documentation].

Note that the API types to which a user has access depend also on the
xref:{relative_path}concept_user_roles.html[User Role] they have in each
Cloud Insights feature set (Monitoring, Workload Security, Reporting).

////
== API Commands

Each of the REST API commands comprises the API’s URL, an HTTP action, URL
parameters, and an expected API responses.

The Cloud Insights APIs can be generally separated into the following
sections:
////

////
admin::
Provides an entry point to the system for administrative operations in
Cloud Insights. Allowed roles are Any, User, and  Administrator and
includes the following:

** admin/acquisitionUnits
** admin/certificates
** admin/datasources
** admin/licenses
** admin/patches
** admin/users
////

////
=== ASSETS type

Assets::
Lets you enumerate top-level objects and retrieve a specific object or an
```

```
object hierarchy from a system when you know the object unique ID or full
name.

** /assets/<asset_type>

** /assets/annotations
** /assets/applications
** /assets/businessEntities
** /assets/dataStores
** /assets/devices
** /assets/disks
** /assets/fabrics
** /assets/fileSystems
** /assets/genericDevices
** /assets/hosts
** /assets/iSCSINetworkPortal
** /assets/iSCSISessions
** /assets/internalVolumes
** /assets/paths
** /assets/ports
** /assets/qtrees
** /assets/quotas
** /assets/risks
** /assets/shares
** /assets/storageNodes
** /assets/storeagePools
** /assets/storageVirtualMachines
** /assets/storages
** /assets/switches
** /assets/tapes
** /assets/virtualMachines
** /assets/vmdks
** /assets/volumes
** /assets/zones
** /assets/zoneMembers


Queries::
Retrieve and manage queries.


** /queries
** /query (to run an ad-hoc query)

login::
Perform user session management.
```

```
Search::
Locate a specific object without knowing the object’s unique ID or full
name.

** /search

=== DATA_COLLECTION type

Data Collectors::
Retrieve and manage data collectors

** /collector/datasourceTypes
** /collector/datasources
////

== Inventory Traversal

This section describes how to traverse a hierarchy of Cloud Insights
objects.

=== Top Level Objects

Individual objects are identified in requests by unique URL (called “self”
in JSON) and require knowledge of object type and internal id. For some of
the top level objects (Hosts, Storages, and so on), REST API provides
access to the complete collection.

The general format of an API URL is:

 https://<tenant>/rest/v1/<type>/<object>

For example, to retrieve all storages from a tenant named
_mysite.c01.cloudinsights.netapp.com_, the request URL is:

 https://mysite.c01.cloudinsights.netapp.com/rest/v1/assets/storages

=== Children and Related Objects

Top level objects, such as  Storage, can be used to traverse to other
children and related objects. For example, to retrieve all disks for a
specific storage, concatenate the storage “self” URL with “/disks”, for
example:

// https://<tenant> + “/rest/v1/assets/storages/4537” + “/disks”

 https://<tenant>/rest/v1/assets/storages/4537/disks
```

```
== Expands

Many API commands support the *expand* parameter, which provides
additional details about the object or URLs for related objects.

The one common expand parameter is _expands_. The response contains a list
of all available specific expands for the object.

For example, when you request the following:

 https://<tenant>/rest/v1/assets/storages/2782?expand=_expands

The API returns all available expands for the object as follows:

//comment here

// https://<tenant>/rest/v1/assets/storages/4537/disks

//lots of text here in the original as a picture.

image:expands.gif[expands example]

Each expand contains data, a URL, or both. The expand parameter supports
multiple and nested attributes, for example:

 https://<tenant>/rest/v1/assets/storages/2782?expand=performance,storageR
esources.storage

Expand allows you to bring in a lot of related data in one response.
NetApp advises that you do not request too much information at one time;
this can cause performance degradation.

To discourage this, requests for top-level collections cannot be expanded.
For example, you cannot request expand data for all storage objects at
once. Clients are required to retrieve the list of objects and then choose
specific objects to expand.


== Performance Data

Performance data is gathered across many devices as separate samples.
Every hour (the default), Cloud Insights aggregates and summarizes
performance samples.

The API allows access to both the samples and the summarized data. For an
object with performance data, a performance summary is available as
```

```
_expand=performance_. Performance history time series are available
through nested _expand=performance.history_.

Examples of Performance Data objects include:

* StoragePerformance
* StoragePoolPerformance
* PortPerformance
* DiskPerformance

A Performance Metric has a description and type and contains a collection
of performance summaries. For example, Latency, Traffic, and Rate.

A Performance Summary has a description, unit, sample start time, sample
end time, and a collection of summarized values (current, min, max, avg,
etc.) calculated from a single performance counter over a time range (1
hour, 24 hours, 3 days, and so on).

// == Performance Data

//The Performance data JSON...

image:API_Performance.png[API Performance Example]

The resulting Performance Data dictionary has the following keys:

* "self" is the object's unique URL
* “history” is the list of pairs of timestamp and map of counters values
* Every other dictionary key (“diskThroughput” and so on) is the name of a
performance metric.

Each performance data object type has a unique set of performance metrics.
For example, the Virtual Machine performance object supports
“diskThroughput” as a performance metric. Each supported performance
metric is of a certain “performanceCategory” presented in the metric
dictionary. Cloud Insights supports several performance metric type listed
later in this document. Each performance metric dictionary will also have
the “description” field that is a human-readable description of this
performance metric and a set of performance summary counter entries.

The Performance Summary counter is the summarization of performance
counters. It presents typical aggregated values like min, max, and avg for
a counter and also the latest observed value, time range for summarized
data, unit type for counter and thresholds for data. Only thresholds are
optional; the rest of attributes are mandatory.

Performance summaries are available for these types of counters:
```

```
* Read - Summary for read operations
* Write - Summary for write operations
* Total - Summary for all operations. It may be higher than the simple sum
of read and write; it may include other operations.
* Total Max - Summary for all operations. This is the maximum total value
in the specified time range.

== Object Performance Metrics

The API can return detailed metrics for objects in your environment, for
example:

* Storage Performance Metrics such as IOPS (Number of input/output
requests per second), Latency, or Throughput.

////
[cols=2*,options="header",cols="25,75"]
|===
| Performance Metric
| Description
| IOPS |Number of input/output requests per second
|Latency|Average time, in milliseconds, it takes to complete an IO request
|Cache hit ratio|Percentage of  requests satisfied from cache
|Utilization|Percent of theoretical maximum for average utilization of the
resource in specified time frame. The range is 0 to 100.
|Throughput|Number of bytes transferred in MB/second
|IO density|Number of IO per second per terabyte of used capacity. IO
density is used only for storage, volume and internal volume assets.
|===

The following table describes  performance metrics available for different
type of objects:

[cols=7*,options="header"]
|===
||IOPS|Latency|Throughput|Cache Hit|Utilization|IO Density
|Disk|X||X||X|
|Storage Pool|X||X||X||
Internal Volume|X|X|X|||X|
Volume|X|X|X|X||X|
StorageNode|X|X|X|X|X||
Storage|X|X|X|||X|
Data Store|X|X|X||||
VMDK |X|X|X||||
VM |X|X|X||X||
Host |X|X|X||X||
|===
////

* Switch Performance Metrics, such as Traffic Utilization, BB Credit Zero
data, or Port Errors.

See the xref:{relative_path}#api-documentation-swagger[API Swagger
documentation] for information on metrics for each object type.

////
The following table describes performance metrics available for switches:

[cols=5*,options="header"]
|===
|Type|REST Name|Unit|Range|Description

|Traffic Utilization|trafficUtilization.rx|%|0-100|Receive traffic
utilization. Calculated as 100 * total bytes received / receive capacity
during the sampling period.

|Traffic Utilization|trafficUtilization.tx|%|0-100|Transmit traffic
utilization. Calculated as 100 * total bytes transmitted / transmit
capacity during the sampling period

|Traffic Utilization|trafficUtilization.totaL|%|0-100|Total traffic
utilization. Calculated as 100 * total bytes received and transmitted /
port capacity during the sampling period.

|Traffic Utilization|trafficUtilization.rxMax|%|0-100
|Maximum of trafficUtilization.tx during the sampling period.
|Traffic Rate|trafficRate.rx|MiB/s|≥0|Traffic received during the sampling
period.
|Traffic Rate|trafficRate.tx|MiB/s|≥0|Traffic transmitted during the
sampling period.
|Traffic Frame|trafficFrameRate.rx|frames/s|≥0|Number of FC frames
received per second during the sampling period.
|Traffic Frame|trafficFrameRate.tx|frames/s|≥0|Number of FC frames
transmitted per second during the sampling period.
|Traffic Frame|trafficFrameRate.total|frames|s≥0|Number of FC frames
transmitted and received per second during the sampling period.
|Traffic Frame|trafficFrameSizeAvg.rx|Bytes/frame|0-2,148|Average length
of received FC frames during the sampling period.

|Zero BB Credit|bbCreditZero.rx|none (count)|≥0|Number of times the
receive buffer-to-buffer credit count transitioned to zero during the
```

```
sampling period. It represents the number of times the attached port had
to stop transmitting because this port was out of credits to provide.

|Zero BB Credit |bbCreditZero.tx|none (count)|≥0|Number of times the
transmit buffer-to-buffer credit count transitioned to zero during the
sampling period.

|Zero BB Credit|bbCreditZero.total|none (counnt)|≥0|Number of times the
transmit and receive buffer-to-buffer credit counts transitioned to zero
during the sampling period.

|Zero BB Credit|bbCreditZeroMs.tx|ms|≥0|Time in milliseconds during which
the transmit buffer-to-buffer credit count was zero during the sample
period.
|Port Errors|portErrors.timeoutDiscardTx|none (count)|≥0|Number of receive
link resets during the sample period. Represents the number of link resets
issued by the attached port to this port.
|Port Errors|portErrors.linkResetRx|none(count)|≥0|Number of receive link
resets during the sample period. Represents the number of link resets
issued by the attached port to this port.
|Port Errors|portErrors.syncLoss|none (count)|≥0|Number of loss of
synchronization failures during the sample period.
|Port Errors|portErrors.signalLoss|none (count)|≥0|Number of signal losses
during the sample period.
|Port Errors|portErrors.class3Discard|none (count)|≥0|Number of class 3 FC
frames discarded during the sample period.
|Port Errors|portErrors.frameTooLong|none(count)|≥0|Number of FC frames
discarded by this port during the sample period because their length
exceeded the agreed to maximum limit.
|Port Errors|portErrors.frameTooShort|none(count)|≥0|Number of FC frames
discarded by this port during the sample period because their actual
length was less than the length given in the frame header.
|Port Errors|portErrors.linkFailure|none (count)|≥0|Number of link
failures detected by this port during the sample period.
|Port Errors|portErrors.crc|none (count)|≥0|Number of frames with invalid
CRCs detected by this port during the sample period.
|Port Errors|portErrors.encIn (Brocade only)|none (count)|≥0|The number of
8b/10b encoding errors that have occurred inside frame boundaries. This
counter is generally a zero value, although occasional errors may occur on
a normal link and give a nonzero result.
|Port Errors|portErrors.encOut (Brocade only)|none (count)|≥0|The number
of 8b/10b encoding errors that have occurred outside frames boundaries.
This counter may become a nonzero value during link initialization but
indicates a problem if it increments faster than the link-bit error rate
allows (approximately once every 20 minutes for 1 Gb/s). This is usually
caused by corrupted primitive sequences.
```

```
|Port Errors|portErrors.total|none (count)|≥0|Total number of errors
detected by this port during the sample period. Is equal to the sum of all
error counters defined above (with portErrors. prefix in REST name).
|===
////

== Performance History Data

History data is presented in performance data as a list of timestamp and
counter maps pairs.

//graphic

History counters are named based on the performance metric object name.
For example, the virtual machine performance object supports
“diskThroughput” so the history map will contain keys named
“diskThroughput.read”, “diskThroughput.write” and “diskThroughput.total”.

NOTE: Timestamp is in UNIX time format.

The following is an example of a performance data JSON for a disk:

//Graphic

image:DiskPerformanceExample.png[Disk Performance JSON]


== Objects with Capacity Attributes

Objects with capacity attributes use basic data types and the CapacityItem
for representation.

=== CapacityItem

CapacityItem is a single logical unit of capacity. It has “value” and
“highThreshold” in units defined by its parent object. It also supports an
optional breakdown map that explains how the capacity value is
constructed. For example, the total capacity of a 100 TB storagePool would
be a CapacityItem with a value of 100. The breakdown may show 60 TB
allocated for “data” and 40 TB for “snapshots”.

Note:: “highThreshold” represents system defined thresholds for the
corresponding metrics, which a client can use to generate alerts or visual
cues on values that are out of acceptable configured ranges.

//Graphic
```

```
The following shows the capacity for StoragePools with multiple capacity
counters:

//Graphic

image:StoragePoolCapacity.png[Storage Pool Capacity Example]

== Using Search to Look Up Objects

The search API is a simple entry point to the system. The only input
parameter to the API is a free-form string and the resulting JSON contains
a categorized list of results. Types are different asset types from the
Inventory, such as storages, hosts, dataStores, and so on. Each type would
contain a list of objects of the type that match the search criteria.

Cloud Insights is an extensible (wide open) solution that allows
integrations with third party orchestration, business management, change
control and ticketing systems as well as custom CMDB integrations.

Cloud Insight’s RESTful API is a primary point of integration that allows
simple and effective movement of data as well as allows users to gain
seamless access to their data.

== Disabling or Revoking an API Token

To temporarily disable an API token, on the API token list page, click the
"three dots" menu for the API, and select _Disable_.  You can Re-enable
the token at any time using the same menu and selecting _Enable_.

To permanently remove an API token, from the menu, select "Revoke". You
cannot re-enable a revoked token; you must create a new token.

image:API_Disable_Token.png[Disable or Revoke and API token]



== Rotating Expired API Access Tokens

API access tokens have an expiration date. When an API access token
expires, users need to generate a new token (of type _Data Ingestion_ with
Read/Write permissions) and reconfigure Telegraf to use the newly-
generated token instead of the expired token. The steps below detail how
to do this.

==== Kubernetes
```

```
Note that these commands are using the default namespace "netapp-
monitoring".  If you have set your own namespace, substitute that
namespace in these and all subsequent commands and files.

Note: If you have the latest NetApp Kubernetes Monitoring Operator
installed and using an API access token that is renewable, expiring tokens
will automatically be replaced by new/refreshed API access tokens.  There
is no need to perform the manual steps listed below.



* Edit the the NetApp Kubernetes Monitoring Operator.
+
 kubectl -n netapp-monitoring edit agent agent-monitoring-netapp

* Modify the _spec.output-sink.api-key_ value, replacing the old API token
with the new API token.
+
 spec:
 …
   output-sink:
   - api-key:<NEW_API_TOKEN>


==== RHEL/CentOS and Debian/Ubuntu

* Edit the Telegraf configuration files, and replace all instances of the
old API token with the new API token.
+
 sudo sed -i.bkup ‘s/<OLD_API_TOKEN>/<NEW_API_TOKEN>/g’
/etc/telegraf/telegraf.d/*.conf

* Restart Telegraf.

 sudo systemctl restart telegraf



==== Windows

* For each Telegraf configuration file in _C:\Program
Files\telegraf\telegraf.d_, replace all instances of the old API token
with the new API token.
+
 cp <plugin>.conf <plugin>.conf.bkup
 (Get-Content <plugin>.conf).Replace(‘<OLD_API_TOKEN>’, ‘<NEW_API_TOKEN>’)
| Set-Content <plugin>.conf
```

```
* Restart Telegraf.
+
 Stop-Service telegraf
 Start-Service telegraf





[[ID54ecf4813aa1e06e4f4d5a3a90ea16dd]]
= Notification using Webhooks
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Webhooks allow users to send alert notifications to various applications
using a customized webhook channel.

Many commercial applications support webhooks as a standard input
interface, for example: Slack, PagerDuty, Teams, and Discord all support
webhooks. By supporting a generic, customizable webhook channel, Cloud
Insights can support many of these delivery channels. Information on
webhooks can be found on these application websites. For example, Slack
provides link:https://api.slack.com/messaging/webhooks[this useful guide].

You can create multiple webhook channels, each channel targeted for a
different purpose; separate applications, different recipients, etc.

The webhook channel instance is comprised of the following elements:

|===
|Name|Unique name
|URL|Webhook target URL, including the _http://_ or _https://_ prefix
along with the url params
|Method |GET, POST - Default is POST
|Custom Header|Specify any custom header lines here
|Message Body|Put the body of your message here
|Default Alert Parameters|Lists the default parameters for the webhook
|Custom Parameters and Secrets|Custom parameters and secrets allow you to
add unique parameters and secure elements such as passwords
|===
== Creating a Webhook

To create a Cloud Insights webhook, go to *Admin > Notifications* and
select the *Webhooks* tab.

The following image shows an example webhook configured for Slack:

image:Webhook_Example_Slack.png[Webhook Example]

Enter appropriate information for each of the fields, and click "Save"
when complete.

You can also click the "Test Webhook" button to test the connection. Note
that this will send the "Message Body" (without substitutions) to the
defined URL according to the selected Method.

Cloud Insights webhooks comprise a number of default parameters.
Additionally, you can create your own custom parameters or secrets.

image:Webhook_Default_Parameters.png[Cloud Insights Default Webhook
Parameters]




=== Parameters: What are they and how do I use them?

Alert Parameters are dynamic values populated per alert. For example, the
_%%TriggeredOn%%_ parameter will be replaced with the object on which the
alert was triggered.

Note that in this section, substitutions are _not_ performed when clicking
the "Test Webhook" button; the button sends a payload that shows the _%%_
substitutions but does not replace them with data.




=== Custom Parameters and Secrets

In this section you can add any custom parameters and/or secrets you wish.
For security reasons, if a secret is defined only the webhook creator can
modify this webhook channel. It is read-only for others. You can use
secrets in URL/Headers as _%%<secret_name>%%_.
```

```
=== Webhooks List Page

On the Webhooks list page, displayed are the Name, Created By, Created On,
Status, Secure, and Last Reported fields.




== Choosing Webhook Notification in a Monitor

To choose the webhook notification in a
xref:{relative_path}task_create_monitor.html#creating-a-monitor[monitor],
go to *Alerts > Manage Monitors* and select the desired monitor, or add a
new monitor. In the _Set up team notifications_ section, choose _Webhook_
as the delivery method. Select the alert levels (Critical, Warning,
Resolved), then choose the desired webhook.

image:Webhook_Monitor_Notify.png[Webhook Monitor Notification]

//To be published after Feb 5:
//Select the alert levels (Critical, Warning, Resolved), then choose the
desired webhook(s). You can choose multiple webhooks for each alert, and
you can choose the same webhook for different alerts.

//image:Webhook_Monitor_Notifications.png[Webhook Monitor Notifications]





== Webhook Examples:

Webhooks for xref:{relative_path}task_webhook_example_slack.html[Slack]
Webhooks for
xref:{relative_path}task_webhook_example_pagerduty.html[PagerDuty]
Webhooks for xref:{relative_path}task_webhook_example_teams.html[Teams]
Webhooks for
xref:{relative_path}task_webhook_example_discord.html[Discord]





= Monitoring your Environment
```

```
:leveloffset: +1


[[ID80c4ff78cefbd7d2c73d58ddc89b9d9e]]
= Auditing
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
To identify changes both expected (for tracking) or unexpected (for
troubleshooting), you can view an audit trail of the Cloud Insights system
events and user activities.

== Viewing Audited Events

To View the Audit page, click *Admin > Audit* in the menu. The Audit page
is displayed, providing the following details for each audit entry:

* *Time* - Date and time of the event or activity
* *User* - The User who initiated the activity
* *Role* - The user's role in Cloud Insights (guest, user, administrator)
* *IP* - The IP address associated with the event
* *Action* - Type of activity, for example Login, Create, Update
* *Category* - The category of activity
* *Details* - Details of the activity

//When there is a user activity that affects a resource, such as a data
collector or an application, the details include a link to the resource's
landing page.

//*Note* When a data collector is deleted, the user activity details
related to the data collector no longer contain a link to the data
collector's landing page.

== Displaying audit entries

There are a number of different ways to view audit entries:

* You can display audit entries by choosing a particular time period (1
hour, 24 hours, 3 days, etc.).
```

```
* You can change the sort order of entries to either ascending (up arrow)
or descending (down arrow) by clicking the arrow in the column header.
+
By default, the table displays the entries in descending time order.

* You can use the filter fields to show only the entries you want in the
table. Click the [+] button to add additional filters.
+
image:Audit_Filters.png[Audit Filters]

=== More on Filtering

You can use any of the following to refine your filter:

|===
|Filter|What it does | Example | Result
| * (Asterisk) |enables you to search for everything | vol*rhel |returns
all resources that start with "vol" and end with "rhel"
| ? (question mark) |enables you to search for a specific number of
characters|  BOS-PRD??-S12 |returns BOS-PRD**__12__**-S12, BOS-
PRD**__23__**-S12, and so on
| OR |enables you to specify multiple entities | FAS2240 OR CX600 OR
FAS3270 |returns any of FAS2440, CX600, or FAS3270
| NOT |allows you to exclude text from the search results |  NOT EMC*
|returns everything that does not start with "EMC"
| _None_ |searches for blank/NULL/None in any field where selected |
_None_ |returns results where the target field is not empty
| Not * |as with _None_ above, but you can also use this form to search
for NULL values in _text-only_ fields | Not * |returns results where the
target field is not empty.
| "" |searches for an exact match| "NetApp*" | returns results containing
the exact literal string _NetApp*_
|===

If you enclose a filter string in double quotes, Insight treats everything
between the first and last quote as an exact match. Any special characters
or operators inside the quotes will be treated as literals. For example,
filtering for "*" will return results that are a literal asterisk; the
asterisk will not be treated as a wildcard in this case. The operators OR
and NOT will also be treated as literal strings when enclosed in double
quotes.

== Audited Events and Actions

The events and actions audited by Cloud insights can be categorized in the
following broad areas:
```

```
* *User account*: Log in, log out, role change, etc.
+
Example: _User *Tony Lavoie* logged in from *10.1.120.15*, user agent
*Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like
Gecko) Chrome/85.0.4183.121 Safari/537.36*, login method(s) *Cloud Central
Portal Login_*

* *Acquisition Unit*: create, delete, etc.
+
Example: _Acquisition unit *AU-Boston-1* removed_.

* *Data Collector*: add, remove, modify, postpone/resume, change
acquisition unit, start/stop, etc.
+
Example: _Datasource *FlexPod Lab* removed, vendor *NetApp*, model *ONTAP
Data Management Software*, ip *192.168.106.5_*.

* *Application*: add, assign to object, remove, etc.
+
Example: _Internal Volume *ocisedev:t1appSVM01:t1appFlexVol01* added to
application *Test App_*.

* *Annotation*: add, assign, remove, annotation rule actions, annotation
value changes, etc.
+
Example: _Annotation value *Boston* added to annotation type
*SalesOffice_*.

* *Query*: add, remove, etc.
+
Example: _Query *TL Sales Query* is added_.

* *Monitor*: add, remove, etc.
+
Example: Monitor _Aggr Size - CI Alerts Notifications Dev_ updated

* *Notification*: change email, etc.
+
Example: Recipient _ci-alerts-notifications-dl_ created

== Exporting Audit Events

You can export the results of your Audit display to a .CSV file, which
will allow you to analyze the data or import it into another application.

.Steps
```

```
. On the Audit page, set the desired time range and any filters you want.
Cloud Insights will export only the Audit entries that match the filtering
and time range you have set.

. Click the _Export_ button image:ExportButton.png[Export Button] in the
upper right of the table.

The displayed Audit events will be exported to a .CSV file, up to a
maximum of 10,000 rows.


== Retention of Audit Data

The amount of time Cloud Insights retains Audit data is based on your
Edition:

* Basic Edition: Audit data is retained for 30 days
* Standard and Premium Editions: Audit data is retained for 1 year plus 1
day

Audit entries older than the retention time are automatically purged. No
user interaction is needed.


== Troubleshooting

[.lead]
Here you will find suggestions for troubleshooting problems with Audit.

|===
|*Problem:* |*Try this:*
|I see Audit messages telling me that a monitor has been exported.
|Export of a custom monitor configuration is typically used by NetApp
engineers during development and testing of new features. If you did not
expect to see this message, please consider exploring the actions of the
user named in the audited action or contact support.
|===






:leveloffset: -1


= Asset Page Information
```

```
:leveloffset: +1


[[IDa19085ab1c700496a456832ec222bca4]]
= Asset Page Overview
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Asset pages summarize the current status of an asset and contain links to
additional information about the asset and its related assets.

== Types of Asset Pages

Cloud Insights provides asset pages for the following assets:

* Virtual machine
* Storage Virtual Machine (SVM)
* Volume
* Internal volume
* Host (including Hypervisor)
* Storage pool
* Storage
* Datastore
* Application
* Storage node
* Qtree
* Disk
* VMDK
* Port
* Switch
* Fabric
//* Object storage (for example, Atmos, Centera, Amazon S3)
//* Zone

//Mapping and Masking information can be viewed in tables on Zone, Volume,
VM, and Host/Hypervisor asset pages.

//Note: Summary information is available for object storage assets;
however, you can only access this information from the Data sources detail
```

```
page.

== Changing the Time Range of Displayed Data

By default, an asset page displays the last 24 hours of data; however, you
can change the segment of data displayed by selecting another fixed time
range or a custom range of time to view less or more data.

You can change the time segment of displayed data by using an option that
is located on every asset page, regardless of asset type. To change the
time range, click the displayed time range in the top bar and choose from
among the following time segments:

* Last 15 Minutes
* Last 30 Minutes
* Last 60 Minutes
* Last 2 Hours
* Last 3 Hours (this is the default)
* Last 6 Hours
* Last 12 Hours
* Last 24 Hours
* Last 2 Days
* Last 3 Days
* Last 7 Days
* Last 30 Days
* Custom time range

The Custom time range allows you to select up to 31 consecutive days. You
can also set the Start Time and End Time of day for this range. The
default Start Time is 12:00 AM on the first day selected and the default
End Time is 11:59 PM on the last day selected. Clicking Apply will apply
the custom time range to the asset page.

The information in an asset page summary section, as well as in any tables
or custom widgets on the page, refreshes automatically based on the
selected time range. The current refresh rate is displayed in the upper-
right corner of the Summary section as well as on any relevant tables or
widgets on the page.

== Add Custom Widgets

You can add your own widgets to any asset page.  Widgets you add will
appear on asset pages for all objects of that type. For example, adding a
custom widget to a storage asset page will display that widget on asset
pages for all storage assets.
```

```
[[ID4ad21205efa62d96ca33ced0d7b7734a]]
= Filtering for Objects In-Context
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
When configuring a widget on an asset's landing page, you can set _in-
context_ filters to show only objects directly related to the current
asset. By default, when you add a widget, _all_ objects of the selected
type in your environment are displayed. In-context filters allow you to
display only the data relevant to your current asset.

On most asset landing pages, widgets allow you to filter for objects
related to the current asset. In filter drop-downs, object types that
display a link icon image:LinkIcon.png[Link Icon] can be filtered in-
context to the current asset.

For example, on a Storage asset page, you can add a Bar Chart widget to
show the top IOPS on internal volumes only on that storage. By default,
when you add a widget, _all_ internal volumes in your environment are
displayed.

To show only internal volumes on the current storage asset, do the
following:

.Steps
. Open an asset page for any *Storage* asset.
. Click *Edit* to open the asset page in Edit mode.
. Click *Add Widget* and select _Bar Chart_.
. Select *Internal Volume* for the object type to display on the bar
chart. Notice that the internal volume object type has a link icon
image:LinkIcon.png[Link Icon] beside it. The "linked" icon is enabled by
default.
+
image:LinkingObjects.png[bar chart volumes]
. Choose _IOPS - Total_ and set any additional filters you like.
. Collapse the *Roll Up* field by clicking the [X] beside it. The *Show*
field is displayed.
. Choose to show Top 10.
. Save the widget.
```

```
+
The bar chart shows only the internal volumes that reside on the current
storage asset.

The widget will be displayed on the asset pages for all storage objects.
When the in-context link is enabled in the widget, the bar chart shows
data for internal volumes related only to the currently-displayed storage
asset.

To unlink the object data, edit the widget and click the link icon
image:LinkIconEnabled.png[Link Icon Enabled] next to the object type. The
link becomes disabled image:LinkIconDisabled.png[Link Icon Disabled] and
the chart displays data for _all_ objects in your environment.

You can also use
xref:{relative_path}concept_dashboard_features.html#variables[*special
variables in widgets*] to display asset-related information on landing
pages.



[[IDeb483595aefc478d54f03bb88374d43e]]
= Asset Page Summary section
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]

The Summary section of an asset page displays general information about an
asset, including whether any metrics or performance policies are cause for
concern. Potential problem areas are indicated by a red circle.

The information in the summary section, as well as in any tables or custom
widgets on the asset page, refreshes automatically based on the selected
time range. You can see the current refresh rate in the upper-right corner
of the Summary section, the tables, and any custom widgets.

image:Summary_Section_Example.png[]

Note: The information displayed in the Summary section varies, depending
on the type of asset you are viewing.
```

```
//For example, if your Storage Pool is experiencing an active
link:https://docs.netapp.com/us-
en/cloudinsights/insights_overview.html[_Shared Resource Under Stress_]
Insight, the Summary section will include a link to that Insight.

You can click any of the asset links to view their asset pages. For
example, if you are viewing a storage node, you can click a link to view
the asset page of the storage it is associated with.

You can view the metrics associated with the asset. A red circle next to a
metric indicates that you might need to diagnose and resolve potential
problems.

NOTE: You may notice that volume capacity might show greater than 100% on
some storage assets. This is due to metadata related to the capacity of
the volume being part of the consumed capacity data reported by the asset.

If applicable, you can click an alert link to view the alert and monitor
associated with the asset.


== Topology

On certain asset pages, the summary section contains a link to view the
topology of the asset and its connections.

Topology is available for the following asset types:

* Application
* Disk
* Fabric
* Host
* Internal Volume
* Port
* Switch
* Virtual Machine
* VMDK
* Volume

image:TopologyExample.png[]





[[IDf1733ae91408ca23ab93d3624a49f2eb]]
= Expert View
```

```
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Expert View section of an asset page enables you to view a performance
sample for the base asset based on any number of applicable metrics in
context with a chosen time period in the performance chart and any assets
related to it.  The data in the charts refreshes automatically as data
collectors poll and updated data is acquired.

== Using the Expert View section

The following is an example of the Expert View section in a storage asset
page:

//image:ExpertViewExample1.png[Expert View Example]
image:Expert_View_2021.png[Expert View Example]

You can select the metrics you want to view in the performance chart for
the time period selected. Click on the _Display Metrics_ drop-down and
choose from the metrics listed.

The *Resources* section shows the name of the base asset and the color
representing the base asset in the performance chart. If the *Top
Correlated* section does not contain an asset you want to view in the
performance chart, you can use the *Search Assets* box in the *Additional
Resources* section to locate the asset and add it to the performance
chart. As you add resources, they appear in the Additional resources
section.

Also shown in the Resources section, when applicable, are any assets
related to the base asset in the following categories:

* Top correlated
+
Shows the assets that have a high correlation (percentage) with one or
more performance metrics to the base asset.

* Top contributors
+
Shows the assets that contribute (percentage) to the base asset.
```

```
* Workload Contentions
+
Shows the assets that impact or are impacted by other shared resources,
such as hosts, networks, and storage. These are sometimes called _greedy_
and _degraded_ resources.

////
* Degraded
+
Shows the assets that are depleted of system resources due to this asset.
////


== Alerts in Expert View

Alerts are also displayed in the Expert View section of an asset landing
page, showing the time and duration of the alert as well as the monitor
condition that triggered it.

image:Alerts_In_Expert_View.png[Alerts in Expert View]


== Expert View metric definitions

The Expert View section of an asset page displays several metrics based on
the time period selected for the asset. Each metric is displayed in its
own performance chart. You can add or remove metrics and related assets
from the charts depending on what data you want to see. The metrics you
can choose will vary depending on asset type.

|===
| *Metric* | *Description*
| BB credit zero Rx, Tx | Number of times the receive/transmit buffer-to-
buffer credit count transitioned to zero during the sampling period. This
metric represents the number of times the attached port had to stop
transmitting because this port was out of credits to provide.
| BB credit zero duration Tx | Time in milliseconds during which the
transmit BB credit was zero during the sampling interval.
| Cache hit ratio (Total, Read, Write) % | Percentage of requests that
result in cache hits. The higher the number of hits versus accesses to the
volume, the better is the performance. This column is empty for storage
arrays that do not collect cache hit information.
| Cache utilization (Total) % | Total percentage of cache requests that
result in cache hits
| Class 3 discards | Count of Fibre Channel Class 3 data transport
discards.
```

```
| CPU utilization (Total) % | Amount of actively used CPU resources, as a
percentage of total available (over all virtual CPUs).
| CRC error | Number of frames with invalid cyclic redundancy checks
(CRCs) detected by the port during the sampling period
| Frame rate | Transmit frame rate in frames per second (FPS)
| Frame size average (Rx, Tx) | Ratio of traffic to frame size. This
metric enables you to identify whether there are any overhead frames in
the fabric.
| Frame size too long | Count of Fibre Channel data transmission frames
that are too long.
| Frame size too short | Count of Fibre Channel data transmission frames
that are too short.
| I/O density (Total, Read, Write) | Number of IOPS divided by used
capacity (as acquired from the most recent inventory poll of the data
source) for the Volume, Internal Volume or Storage element. Measured in
number of I/O operations per second per TB.
| IOPS (Total, Read, Write) | Number of read/write I/O service requests
passing through the I/O channel or a portion of that channel per unit of
time (measured in I/O per sec)
| IP throughput (Total, Read, Write) | Total: Aggregated rate at which IP
data was transmitted and received in megabytes per second.
| Read: IP Throughput (Receive):  | Average rate at which IP data was
received in megabytes per second.
| Write: IP Throughput (Transmit):  | Average rate at which IP data was
transmitted in megabytes per second.
| Latency (Total, Read, Write) | Latency (R&W): Rate at which data is read
or written to the virtual machines in a fixed amount of time. The value is
measured in megabytes per second.
| Latency:  | Average response time from the virtual machines in a data
store.
| Top Latency:  | The highest response time from the virtual machines in a
data store.
| Link failure | Number of link failures detected by the port during the
sampling period.
| Link reset Rx, Tx | Number of receive or transmit link resets during the
sampling period. This metric represents the number of link resets that
were issued by the attached port to this port.
| Memory utilization (Total) % | Threshold for the memory used by the
host.
| Partial R/W (Total) % | Total number of times that a read/write
operation crosses a stripe boundary on any disk module in a RAID 5, RAID
1/0, or RAID 0 LUN Generally, stripe crossings are not beneficial, because
each one requires an additional I/O. A low percentage indicates an
efficient stripe element size and is an indication of improper alignment
of a volume (or a NetApp LUN). For CLARiiON, this value is the number of
stripe crossings divided by the total number of IOPS.
```

```
| Port errors | Report of port errors over the sampling period/given time
span.
| Signal loss count | Number of signal loss errors. If a signal loss error
occurs, there is no electrical connection, and a physical problem exists.
| Swap rate (Total Rate, In rate, Out rate) | Rate at which memory is
swapped in, out, or both from disk to active memory during the sampling
period. This counter applies to virtual machines.
| Sync loss count | Number of synchronization loss errors. If a
synchronization loss error occurs, the hardware cannot make sense of the
traffic or lock onto it. All the equipment might not be using the same
data rate, or the optics or physical connections might be of poor quality.
The port must resynchronize after each such error, which impacts system
performance. Measured in KB/sec.
| Throughput (Total, Read, Write) | Rate at which data is being
transmitted, received, or both in a fixed amount of time in response to
I/O service requests (measured in MB per sec).
| Timeout discard frames - Tx | Count of discarded transmit frames caused
by timeout.
| Traffic rate (Total, Read, Write) | Traffic transmitted, received, or
both received during the sampling period, in mebibytes per second.
| Traffic utilization (Total, Read, Write) | Ratio of traffic
received/transmitted/total to receive/transmit/total capacity, during the
sampling period.
| Utilization (Total, Read, Write) % | Percentage of available bandwidth
used for transmission (Tx) and reception (Rx).
| Write pending (Total) | Number of write I/O service requests that are
pending.
|===

== Using the Expert View section

The Expert view section enables you to view performance charts for an
asset based on any number of applicable metrics during a chosen time
period, and to add related assets to compare and contrast asset and
related asset performance over different time periods.

.Steps
. Locate an asset page by doing either of the following:
+
* Search for and select a specific asset.
+
* Select an asset from a dashboard widget.
+
* Query for a set of assets and select one from the results list.
+
The asset page displays. By default, the performance chart shows two
```

```
metrics for time period selected for the asset page. For example, for a
storage, the performance chart shows latency and total IOPS by default.
The Resources section displays the resource name and an Additional
resources section, which enables you to search for assets. Depending on
the asset, you might also see assets in the Top correlated, Top
contributor, Greedy, and Degraded sections. If there are no assets
relevant to these sections, they are not displayed.

. You can add a performance chart for a metric by clicking *Display
Metrics* and selecting the metrics you want displayed.
+
A separate chart is displayed for each metric selected. The chart displays
the data for the selected time period. You can change the time period by
clicking on another time period in the top right corner of the asset page,
or by zooming in on any chart.
+
Click on *Display Metrics* to de-select any chart. The performance chart
for the metric is removed from Expert View.

. You can position your cursor over the chart and change the metric data
that displays for that chart by clicking any of the following, depending
on the asset:
+
* Read, Write, or Total
+
* Tx, Rx, or Total
+
Total is the default.
+
You can drag your cursor over the data points in the chart to see how the
value of the metric changes over the time period selected.
. In the Resources section, you can add any related assets to the
performance charts:
+
* You can select a related asset in the *Top Correlated*, *Top
Contributors*, *Greedy*, and *Degraded* sections to add data from that
asset to the performance chart for each selected metric.
+
After you select the asset, a color block appears next to the asset to
denote the color of its data points in the chart.
. Click on *Hide Resources* to hide the additional resources pane. Click
on *Resources* to show the pane.
+
* For any asset shown, you can click the asset name to display its asset
page, or you can click the percentage that the asset correlates or
contributes to the base asset to view more information about the asset's
```

```
relation to the base asset.
+
For example, clicking the linked percentage next to a top correlated asset
displays an informational message comparing the type of correlation that
asset has with the base asset.
+
* If the Top correlated section does not contain an asset you want to
display in a performance chart for comparison purposes, you can use the
Search assets box in the Additional resources section to locate other
assets.

After you select an asset, it displays in the additional resources
section. When you no longer want to view information about the asset,
click image:TrashCanIcon.png[Delete].




[[ID8fd4c7b6c09ae7f12b4c0a968fd7c1aa]]
= User Data Section
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The User Data section of an asset page displays and enables you to change
any user-defined data such as applications and annotations.

== Using the User Data section to assign or modify applications

You can assign applications running in your environment to certain assets
(host, virtual machines, volumes, internal volumes, qtrees, and
hypervisors). The User Data section enables you to add, change, or remove
the applications assigned to an asset. For all of these asset types except
for volumes, you can assign more than one application.

.Steps
. Locate an asset page by doing any of the following:
.. Query for a list of assets and then select one from the list.
.. On a Dashboard, locate an asset name and click it.
.. Perform a search and choose an asset from the results.
+
The asset page displays. The User Data section of the page shows
```

```
currently-assigned applications or annotations.

To change the application assigned, or to assign an application or
additional applications, drop down the *Application* list and select the
application(s) you want to assign to the asset. You can type to search for
an application, or select one from the list.

// If you choose an application that is associated with a business entity,
the business entity is automatically assigned to the asset. In this case,
when you place your cursor over the business entity name, the word derived
displays. If you want to maintain the entity for only the asset and not
the associated application, you can manually override the assignment of
the application.

To remove an application, drop down the application list and un-check the
application.

== Using the User Data section to assign or modify annotations

When customizing Cloud Insights to track data for your corporate
requirements, you can define specialized notes called annotations, and
assign them to your assets. The User Data section of an asset page
displays annotations assigned to an asset and also enables you to change
the annotations assigned to that asset.

.Steps

. To add an annotation to the asset, in the User Data section of the asset
page, click *+Annotation*.
. Select an annotation from the list.
. Click Value and do either of the following, depending on type of
annotation you selected:
.. If the annotation type is list, date, or Boolean, select a value from
the list.
.. If the annotation type is text, type a value.
. Click Save.

The annotation is assigned to the asset. You can later filter assets by
annotation using a query.

If you want to change the value of the annotation after you assign it,
drop down the annotation list and enter a different value.

If the annotation is of list type for which the _Add new values on the
fly_ option is selected, you can type to add a new value in addition to
selecting an existing value.
```

```
[[ID6187304bd1cd0feba7f4a45e93539b15]]
= Asset Page Related Alerts section
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can use the Related Alerts section of an asset page to see any alerts
that occur in your environment as a result of a monitor assigned to an
asset. Monitors generate alerts based on conditions you set, and enable
you to identify the implication and analyze the impact and root cause of
the problem in a manner that enables rapid and effective correction.

The following example shows a typical Related Alerts section that displays
on an asset page:

image:Alerts_on_Landing_Page.png[Related Alerts Table]

The Related Alerts section enables you to view and manage the alerts that
occur in your network as the result of monitor conditions assigned to an
asset.

.Steps
* Locate an asset page by doing any of the following:

** Type the name of the asset in the Search area, and then select the
asset from the list.

** In a dashboard widget, click on the name of an asset.

** Query for a set of assets and select on from the results list.

The asset page displays. The Related Alerts section displays the time the
alert was triggered as well as current status of the alert and the monitor
that triggered it. You can click the Alert ID to open the landing page for
the alert for further investigation.

////
You can perform any of the following optional tasks:
```

```
* Use the filter box to show only specific alerts.
* Change the sort order of the columns in a table to either ascending (up
arrow) or descending (down arrow) by clicking the arrow in the column
header.
* Click the asset name in any description to display its asset page; a red
circle indicates issues that need further investigation.
* You can click the performance policy, which displays the Edit Policy
dialog box, to review the performance policy and make changes to the
policy if necessary.

If you determine the issue is no longer a cause for concern, click the
"three dots" menu on the right and select "Dismiss Violation" to remove a
violation from the list.
///




[[IDa8c44a8cecdff13cb638ca44ac762e4d]]
= Storage Virtualization
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights can differentiate between a storage array having local
storage or virtualization of other storage arrays. This gives you the
ability to relate cost and distinguish performance from the front-end all
the way to the back-end of your infrastructure.

=== Virtualization in a Table Widget

One of the easiest ways to begin looking at your storage virtualization is
to create a dashboard table widget showing Virtualized type. When building
the query for the widget, simply add "virtualizedType" to your grouping or
filter.

image:StorageVirtualization_TableWidgetSettings.png[Basic query to show
storage virtualizedTypes]

The resulting table widget shows you the _Standard_, _Backend_, and
_Virtual_ storages in your environment.
```

```
image:StorageVirtualization_TableWidgetShowingVirtualizedTypes.png[Table
showing virtualized types]

=== Landing Pages show Virtualized information

On a storage, volume, internal volume, or disk landing page, you can see
relevant virtualization information. For example, looking at the storage
landing page below, you can see that this is a Virtual storage, and which
backend storage system applies. Any relevant tables on landing pages will
also show virtualization information as applicable.

image:StorageVirtualization_StorageSummary.png[Storage Landing Page
showing Virtual and backed storage information]

//In the _Volumes_ table on that landing page, you can also see
virtualization information, and selecting one of those volumes to display
its landing page will also display virtualization information in the
Summary and relevant tables, including a table showing the Internal
Volumes as well as a table listing Virtual Volume Relations, if any.

=== Existing landing pages and dashboards

Be aware that if you currently have customized landing pages or dashboards
in your environment, these will not automatically show all virtualization
information by default. However, you can _Revert to Default_ any
customized dashboard or landing page (you will have to re-implement your
customizations), or modify the relevant widgets to include the desired
virtualization attributes or metrics.

_Revert to Default_ is available in the upper-right corner of a custom
dashboard or landing page screen.

image:RevertToDefault.png[Revert to Default button]










[[IDd95f3ff39196ae8deeb85f406310744f]]
= Hints and Tips to Search for Assets and Alerts
:toc: macro
:hardbreaks:
:toclevels: 1
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Multiple search techniques can be used to search for data or objects in
your monitored environment.

* *Wildcard search*
+
You can perform multiple character wildcard search using the * character.
For example, _applic*n_ would return _application_.

* *Phrases used in search*
+
A phrase is a group of words surrounded by double quotation marks; for
example, "VNX LUN 5". You can use double quotes to search for documents
that contain spaces in their names or attributes.

* *Boolean Operators*
+
Using Boolean operators OR, AND, and NOT, you can combine multiple terms
to form a more complex query.
+
OR
+
The OR operator is the default conjunction operator.
+
If there is no Boolean operator between two terms, the OR operator is
used.
+
The OR operator links two terms and finds a matching document if either of
the terms exists in a document.
+
For example, _storage OR netapp_ searches for documents that contain
either _storage_ or _netapp_.
+
High scores are given to documents that match most of the terms.
+
AND
+
You can use the AND operator to find documents in which both the search
terms exist in a single document. For example, _storage AND netapp_
searches for documents that contain both _storage_ and _netapp_.
+
You can use the symbol *&&* instead of the word AND.
+
NOT
+
When you use the NOT operator, all the documents that contain the term
after NOT are excluded from the search results. For example, _storage NOT
netapp_ searches for documents that contains only _storage_ and not
_netapp_.
+
You can use the symbol *!* instead of the word NOT.

////
== Prefix and suffix search

As soon as you start typing a search string, the search engine does a
prefix and suffix search to find the best match.

Exact matches are given a higher score than a prefix or suffix match. The
score is calculated based on the distance of the search term from the
actual search result. For example, we have three storages: "aurora",
"aurora1", and "aurora11". Searching for "aur" will return all three
storages. However, the search result for "aurora" will have the highest
score because it has the closest distance to the prefix search string.

The search engine also searches for terms in reverse order, which allows
you to perform a suffix search. For example, when you type "345" in the
search box, the search engine searches for "345".
////

Search is case-insensitive.

== Search using indexed terms
Searches that match more of the indexed terms result in higher scores.

The search string is split into separate search terms by space. For
example, the search string "storage aurora netapp" is split into three
keywords: "storage", "aurora", and "netapp". The search is performed using
all three terms. The documents that match most of these terms will have
the highest score. The more information you provide, the better are the
search results. For example, you can search for a storage by its name and
model.

The UI displays the search results across categories, with the three top
results per category. If you did not find an object that you were
expecting, you can include more terms in the search string to improve the
search results.
```

```
The following table provides a list of indexed terms that can be added to
the search string.

|===
|Category |Indexed terms

|Storage |"storage"
name
vendor
model

|StoragePool |"storagepool"
name
name of the storage
IP addresses of the storage
serial number of the storage
storage vendor
storage model
names for all associated internal volumes
names for all associated disks

|Internal Volume |"internalvolume"
name
name of the storage
IP addresses of the storage
serial number of the storage
storage vendor
storage model
name of the storage pool
names of all associated shares
names of all associated applications
//and business entities

|Volume |"volume"
name
label
names of all internal volumes
name of the storage pool
name of the storage
IP addresses of the storage
serial number of the storage
storage vendor
storage model

|Storage Node |"storagenode"
name
```

```
name of the storage
IP addresses of the storage
serialnumber of the storage
storage vendor
storage model

|Host |"host"
name
IP addresses
names of all associated applications
//and business entities

|Datastore |"datastore"
name
virtual center IP
names of all volumes
names of all internal volumes

|Virtual Machines |"virtualmachine"
name
DNS name
IP addresses
name of the host
IP addresses of the host
names of all datastores
names of all associated applications
//and business entities

|Switches (regular and NPV) |"switch"
IP address
wwn
name
serial number
model
domain ID
name of the fabric
wwn of the fabric

|Application |"application"
name
tenant
line of business
business unit
project

|Tape |"tape"
```

```
IP address
name
serial number
vendor

|Port |"port"
wwn
name

|Fabric |"fabric"
wwn
name

|Storage Virtual Machine (SVM)|"storagevirtualmachine"
name
UUID

|===



:leveloffset: -1


= Reporting

:leveloffset: +1


[[ID4fd3f893bbc52bc194e70a687b5b820c]]
= Cloud Insights Reporting Overview
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights reporting is a business intelligence tool that enables you
to view pre-defined reports or create custom reports.

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].
```

```
With Cloud Insights reporting you can perform the following tasks:

* Run a pre-defined report
* Create a custom report
* Customize a report's format and delivery method
* Schedule reports to run automatically
* Email reports
* Use colors to represent thresholds on data

Cloud Insights Reporting can generate custom reports for areas like
chargeback, consumption analysis, and forecasting, and can help answer
questions such as the following:

* What inventory do I have?
* Where is my inventory?
* Who is using our assets?
* What is the chargeback for allocated storage for a business unit?
* How long until I need to acquire additional storage capacity?
* Are business units aligned along the proper storage tiers?
* How is storage allocation changing over a month, quarter, or year?

== Accessing Cloud Insights Reporting

You can access Cloud Insights Reporting by clicking the *Reports* link in
the menu.
//image:ReportsMenu.png[Reports Menu Link]

You will be taken to the Reporting interface. Cloud Insights uses IBM
Cognos Analytics for its reporting engine.

== What is ETL?

When working with Reporting, you will hear the terms "Data Warehouse" and
"ETL".  ETL stands for "Extract, Transform, and Load". The ETL process
retrieves data collected in Cloud Insights, and transforms the data into a
format for use in Reporting. "Data Warehouse" refers to the collected data
available for Reporting.

The ETL process includes these individual processes:

* *Extract*: Takes data from Cloud Insights.

* *Transform*: Applies business logic rules or functions to the data as it
is extracted from Cloud Insights.

* *Load*: Saves the transformed data into the data warehouse for use in
Reporting.
```

```
[[ID2bc95ddd7e1306e9b54874b4c82bee7d]]
= Cloud Insights Reporting User Roles
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/


[.lead]
If you have Cloud Insights Premium Edition with Reporting, every Cloud
Insights user in your environment also has a Single Sign-On (SSO) login to
the Reporting application (i.e. Cognos). Simply click the *Reports* link
in the menu and you will automatically be logged in to Reporting.

Your user role in Cloud Insights determines your Reporting user role:

|===
|Cloud Insights Role|Reporting Role|Reporting Permissions
|Guest|Consumer|Can view, schedule, and run reports and set personal
preferences such as those for languages and time zones. Consumers cannot
create reports or perform administrative tasks.
|User|Author|Can perform all Consumer functions as well as create and
manage reports and dashboards.
|Administrator|Administrator|Can perform all Author functions as well as
all administrative tasks such as configuration of reports and the shutdown
and restart of reporting tasks.
|===



The following table shows the functions available to each Reporting role.

|===
|Feature    |Consumer   |Author |Administrator
|View reports in the Team Content tab   |Yes    |Yes    |Yes
|Run reports    |Yes    |Yes    |Yes
|Schedule reports   |Yes |Yes   |Yes
|Upload external files  |No |Yes    |Yes
|Create Jobs| No|Yes|Yes
//|Create Users|No|No|Yes
```

```
|Create stories |No |Yes    |Yes
|Create reports |No |Yes    |Yes
|Create Packages and Data Modules   |No |Yes|Yes
|Perform administrative tasks   |No |No |Yes

|Add/Edit HTML Item |No |No |Yes
|Run report with HTML Item  |Yes    |Yes    |Yes
|Add/Edit Custom SQL    |No |No |Yes
|Run reports with Custom SQL    |Yes    |Yes    |Yes

|===

== Setting Reporting (Cognos) email preferences

NOTE: If you change your user email preferences within Cloud Insights
Reporting (i.e. the Cognos application), those preferences are active
_only for the current session_. Logging out of Cognos and back in again
will reset your email preferences.


== Important note for existing customers

If you are new to Cloud Insights with Reporting, welcome!  There is
nothing more you need to do to begin enjoying Reporting.

If you are a current Premium Edition customer, SSO is not automatically
enabled for your environment. When you enable SSO, the administrator user
for the reporting portal (Cognos) ceases to exist. This means that any
reports that are in the _My Content_ folder are removed and must be
reinstalled or re-created in _Team Content_. Additionally, scheduled
reports will need to be configured once SSO is enabled.

=== What steps should I take to prepare my existing environment for
enabling SSO?

To ensure your reports are retained, migrate all reports from _My Content_
to _Team Content_ using the following steps. You must do this prior to
enabling SSO in your environment:

. Navigate to *Menu > Content*

image:Reporting_Menu.png[Cognos upper-left Menu]

. Create a new folder in *_Team Content_*

.. If multiple users have been created, please create a separate folder
for each user to avoid overwriting reports with duplicate names
```

```
. Navigate to _My Content_

. Select all of the reports you wish to retain.

. In the upper right corner of the menu, select "Copy or move"

. Navigate to the newly created folder in _Team Content_

. Paste the reports to the newly created folder using the "Copy to" or
"Move to" buttons

. Once SSO is enabled for Cognos, log into Cloud Insights with the email
address used to create your account.

. Navigate to the _Team Content_ folder within Cognos, and Copy or Move
the previously saved reports back to _My Content_.









[[ID83057b363dd656776131892a9aa84ab4]]
= Predefined Reports Made Easy
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights Reporting includes predefined reports that address a number
of common reporting requirements, providing critical insight that
stakeholders need to make informed decisions about their storage
infrastructure.

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].

You can generate pre-defined reports from the Cloud Insights Reporting
Portal, email them to other users, and even modify them. Several reports
```

```
enable you to filter by device, business entity, or tier. The reporting
tools use IBM Cognos as a foundation and give you many data presentation
options.

The pre-defined reports show your inventory, storage capacity, chargeback,
performance, storage efficiency, and cloud cost data. You can modify these
pre-defined reports and save your modifications.


You can generate reports in various formats, including HTML, PDF, CSV,
XML, and Excel.

////
Cloud Insights accommodates multiple tenancy in reporting by enabling you
to associate users with business units. With this feature, administrators
can separate data or reports according to the attributes of a user or
his/her affiliation.
////

== Navigating to Pre-defined Reports

When you open the Reporting Portal, the _Team Content_ folder is the
starting point for you to select the type of information that you require
in the Cloud Insights reports.

. In the left navigation pane, select *Content > Team Content*.
. Select *Reports* to access the pre-defined reports.

image:Reporting_Menu.png[Reporting menu]
image:Reporting_Team_Content.png[Team Content showing Reports highlighted]

== Using predefined reports to answer common questions

The following predefined reports are available in *Team content >
Reports*.


=== Application Service Level Capacity and Performance
The Application Service Level Capacity and Performance report provides a
high level overview of your applications. You can use this information for
capacity planning or for a migration plan.

=== Chargeback
The Chargeback report provides storage capacity chargeback and
accountability information by hosts, application, and business entities,
and includes both current and historical data.
```

```
To prevent double counting do not include ESX servers, only monitor the
VMs.

//An updated version of this report is available at the NetApp Storage
Automation Store.

=== Data Sources
The Data Sources report shows all the data sources that are installed on
your site, the status of the data source (success/failure), and status
messages. The report provides information about where to start
troubleshooting data sources. Failed data sources impact the accuracy of
reporting and the general usability of the product.

=== ESX vs VM Performance
The ESX vs VM Performance report provides a comparison of ESX servers and
VMs, showing average and peak IOPs, throughput, and latency and
utilizations for ESX servers and VMs. To prevent double counting, exclude
the ESX servers; only include the VMs.
An updated version of this report is available at the NetApp Storage
Automation Store.

=== Fabric Summary
The Fabric Summary report identifies switches and switch information,
including port counts, firmware versions, and license status. The report
does not include NPV switch ports.

=== Host HBAs
The Host HBAs report provides an overview of the hosts in the environment
and provides the vendor, model, and firmware version of HBAs, and the
firmware level of the switches to which they are connected. This report
can be used to analyze firmware compatibility when planning a firmware
upgrade for a switch or an HBA.

=== Host Service Level Capacity and Performance
The Host Service Level Capacity and Performance report provides an
overview of storage utilization by host for block only applications.

=== Host Summary
The Host Summary report provides an overview of storage utilization by
each selected host with information for Fibre Channel and iSCSI hosts. The
report enables you to compare ports and paths, the Fibre Channel and ISCSI
capacity, and violation counts.

=== License Details
The License Details report shows the entitled quantity of resources you
are licensed for across all sites with active licenses. The report also
```

```
shows a summation of actual quantity across all the sites with active
licenses. The summation may include overlaps of storage arrays managed by
multiple servers.

=== Mapped but not Masked Volumes
The Mapped but not Masked Volumes report lists the volumes whose logical
unit number (LUN) has been mapped for use by a particular host, but is not
masked to that host. In some cases these could be decommissioned LUNs that
have been unmasked. Unmasked volumes can be accessed by any host, making
them vulnerable to data corruption.

=== NetApp Capacity and Performance
The NetApp Capacity and Performance report provides global data for
allocated, utilized, and committed capacity with trending and performance
data for NetApp capacity.

=== Scorecard
The Scorecard report provides a summary and general status of all assets
acquired by Cloud Insights. Status is indicated with green, yellow, and
red flags:

* Green indicates normal condition
* Yellow indicates a potential issue in the environment
* Red indicates an issue that requires attention

All of the fields in the report are described in the Data Dictionary
provided with the report.

=== Storage Summary
The Storage Summary report provides a global summary of used and unused
capacity data for raw, allocated, storage pools, and volumes. This report
provides an overview of all of the storage discovered.

//A newer version of this report is available at the NetApp Storage
Automation Store.

=== VM Capacity and Performance
Describes the virtual machine (VM) environment and its capacity usage. VM
tools must be enabled to view some data, such as when VMs were powered
down.

=== VM Paths
The VM Paths report provides data store capacity data and performance
metrics for which virtual machine is running on which host, which hosts
are accessing which shared volumes, what the active access path is, and
what comprises capacity allocation and usage.
```

```
=== HDS Capacity by Thin Pool
The HDS Capacity by Thin Pool report shows the amount of usable capacity
on a storage pool that is thin provisioned.

=== NetApp Capacity by Aggregate
The NetApp Capacity by Aggregate report shows raw total, total, used,
available, and committed space of aggregates.

=== Symmetrix Capacity by Thick Array
The Symmetrix Capacity by Thick Array report shows raw capacity, useable
capacity, free capacity, mapped, masked, and total free capacity.

=== Symmetrix Capacity by Thin Pool
The Symmetrix Capacity by Thin Pool report shows raw capacity, useable
capacity, used capacity, free capacity, used percentage, subscribed
capacity, and subscription rate.

=== XIV Capacity by Array
The XIV Capacity by Array report shows used and unused capacity for the
array.

=== XIV Capacity by Pool
The XIV Capacity by Pool report shows used and unused capacity for storage
pools.




[[ID139fef8627ad58f0ca431a31226acf92]]
= Storage Manager Dashboard
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Storage Manager Dashboard provides you with a centralized
visualization that enables you to compare and contrast resource usage over
time against the acceptable ranges and previous days of activity. Showing
only the key performance metrics for your storage services, you can make
decisions about how to maintain your data centers.

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].



== Summary

Selecting *Storage Manager Dashboard* from Team Content gives you several
reports that provide information on of your traffic and storage.

image:Reporting_Storage_Manager_Dashboard_Choices.png[Storage Manager
Dashboard Options]

For an at-a-glance view, the *Storage Manager Report* comprises seven
components that contain contextual information on many aspects of your
storage environment. You can drill down on the aspects of your storage
services to perform an in-depth of analysis of a section that interests
you most.

image:Reporting-SMD.png[Storage Manager Dashboard]

This component shows the used versus usable storage capacity, total switch
ports versus the number of switch ports connected, and total connected
switch port utilization versus the total bandwidth, and how each of these
trend over time. You can view the actual utilization compared against the
low, mid, and high ranges, which enables you to compare and contrast usage
between projections and your desired actuals, based on a target. For
capacity and switch ports, you can configure this target. The forecast is
based on an extrapolation of the current growth rate and the date you set.
When the forecasted used capacity, which is based on future usage
projection date, exceeds the target, an alert (solid red circle) appears
next to Capacity.

=== Storage Tiers Capacity
This component shows the tier capacity used versus the capacity allocated
to the tier, which indicates how the used capacity increases or decreases
over a 12-month period and how many months are remaining to full capacity.
Capacity usage is shown with values provided for actual usage, the usage
forecast, and a target for capacity, which you can configure. When the
forecasted used capacity, which is based on future usage projection date,
exceeds the target capacity, an alert (solid red circle) appears next to a
tier.

You can click any tier to display the Storage Pools Capacity and
Performance Details report, which shows free versus used capacities,
number of days to full, and performance (IOPS and Response Time) details
for all the pools in the selected tier. You can also click any storage or
storage pool name in this report to display the asset page summarizing the
```

```
current state of that resource.

=== Daily Storage Traffic
This component shows how the environment is performing, if there is any
large growth, changes, or potential issues compared to the previous six
months. It also shows the average traffic versus the traffic for the
previous seven days, and for the previous day. You can visualize any
abnormalities in the way the infrastructure is performing because it
provides information that highlights both cyclical (previous seven days)
and seasonal variations (previous six months).

You can click the title (Daily Storage Traffic) to display the Storage
Traffic Details report, which shows the heat map of the hourly storage
traffic for the previous day for each storage system. Click any storage
name in this report to display the asset page summarizing the current
state of that resource.

=== Data Centers Time to Full
This component shows all the data centers versus all of the tiers and how
much capacity remains in each data center for each tier of storage based
on forecasted growth rates. Tier capacity level is shown in blue; the
darker the color, the lesser time the tier at the location has left before
it is full.

You can click a section of a tier to display the Storage Pools Days to
Full Details report, which shows total capacity, free capacity, and number
of days to full for all the pools in the selected tier and the data
center. Click any storage or storage pool name in this report to display
the asset page summarizing the current state of that resource.

=== Top 10 Applications
This component shows the top 10 applications based on the used capacity.
Regardless of how the tier organizes the data, this area displays the
current used capacity and share of the infrastructure. You can visualize
the range of user experience for the previous seven days to see if
consumers experience acceptable (or, more importantly, unacceptable)
response times.

This area also shows trending, which indicates if the applications meet
their performance service level objectives (SLO). You can view the
previous week's minimum response time, the first quartile, the third
quartile, and the maximum response time, with a median shown against an
acceptable SLO, which you can configure. When the median response time for
any application is out of the acceptable SLO range, an alert (solid red
circle) appears next to the application. You can click an application to
display the asset page summarizing the current state of that resource.
```

```
=== Storage Tiers Daily Performance
This component shows a summary of the tier's performance for response time
and IOPS for the previous seven days. This performance is compared against
a SLO, which you can configure, enabling you to see if there is
opportunity to consolidate tiers, realign workloads delivered from those
tiers, or identify issues with particular tiers. When median response time
or median IOPS is out of the acceptable SLO range, an alert (solid red
circle) appears next to a tier.

You can click a tier name to display the Storage Pools Capacity and
Performance Details report, which shows free versus used capacities,
number of days to full, and performance (IOPS and response time) details
for all the pools in the selected tier. Click any storage or storage pool
in this report to display the asset page summarizing the current state of
that resource.

=== Orphaned Capacity
This component shows the total orphaned capacity and orphaned capacity by
tier, comparing it against acceptable ranges for total usable capacity and
showing the actual capacity that is orphaned. Orphaned capacity is defined
by configuration and by performance. Storage orphaned by configuration
describes a situation in which there is storage allocated to a host.
However, the configuration has not been performed properly and the host
cannot access the storage. Orphaned by performance is when the storage is
correctly configured to be accessed by a host. However, there has been no
storage traffic.

The horizontal stacked bar shows the acceptable ranges. The darker the
gray, the more unacceptable the situation is. The actual situation is
shown with the narrow bronze bar that shows the actual capacity that is
orphaned.

You can click a tier to display the Orphaned Storage Details report, which
shows all the volumes identified as orphaned by configuration and
performance for the selected tier. Click any storage, storage pool, or
volume in this report to display the asset page summarizing the current
state of that resource.




[[IDa8ec453cc78b114e61ab5cff36a3e9ec]]
= Creating a Report (Example)
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Use the steps in this example to generate a simple report on physical
capacity of storage and storage pools in a number of data centers.

.Steps

. Navigate to *Menu > Content > Team Content > Reports*
. In the upper-right of the screen, select *[New +]*
. Select *Report*
+
image:Reporting_New_Report.png[Creating a New Report]
+
. On the *Templates* tab, select _Blank_
+
The Source and Data tabs is displayed
. Open *Select a source +*
. Under *Team content*, open *Packages*
+
A list of available packages is displayed.
. Choose *Storage and Storage Pool Capacity*
image:Reporting_Select_Source_For_Report.png[Selecting a source for the
report]
+
. Select *Open*
+
The available styles for your report are displayed.
. Select *List*
+
Add appropriate names for List and Query
. Select *OK*
. Expand _Physical Capacity_
. Expand to the lowest level of _Data Center_
. Drag _Data Center_ to the Reporting palate.
. Expand _Capacity (MB)_
. Drag _Capacity (MB)_ to the Reporting palate.
. Drag _Used Capacity (MB)_ to the Reporting palate.
. Run the report by selecting an output type from the *Run* menu.
+
image:Reporting_Running_A_Report.png[Selecting a Report Output]

.Result
```

```
A report similar to the following is created:

image:Reporting-Example1.png[Report Example]




[[IDdc4ac107645563ff5c3bb56d257d3274]]
= Managing Reports
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can customize a report’s output format and delivery, set report
properties or schedules, and email reports.

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].

== Customizing a report's output format and delivery

You can customize the format and delivery method of reports.

. In the Cloud Insights Reporting Portal, Go to *Menu > Content > My
Content/Team Content*. Mouse over the report you want to customize and
open the "three dots" menu.

//image:ReportCustomizationMenu.png[Report Customization Menu]
image:Reporting_Output_and_Delivery.png[Report Output and Delivery]

. Click *Properties > Schedule*

//image:ReportSchedule.png[Scheduling a Report]

. You can set the following options:
** *Schedule* when you want reports to run.
** Choose *Options* for report format and delivery (Save, Print, Email)
and Languages for the report.

. Click *Save* to produce the report using the selections you made.
```

```
== Copying a report to the clipboard

Use this process to copy a report to the clipboard.

. Select a report to copy from (*Menu > Content > My Content or Team
Content*)
. Choose _Edit report_ from the report's drop-down menu
+
image:Reporting_Edit_Report.png[Editing a Report]
+
. In the upper-right of the screen, open the "three dots" menu next to
"Properties".
. Select *Copy Report to Clipboard*.
+
image:Reporting_Copy_To_Clipboard.png[Copying a report to the clipboard]


== Opening reports from the clipboard
You can open a report specification that was previously copied to the
clipboard.

About this task
Start by creating a new report or opening an existing report that you wish
to replace with the copied report. The steps below are for a new report.

. Select *Menu > +New > Report* and create a blank report.
. In the upper-right of the screen, open the "three dots" menu next to
"Properties".
. Select *Open Report from Clipboard*.

image:Reporting_Open_From_Clipboard.png[Opening a report from the
clipboard]

. Paste the copied code into the window and select *OK*.
. Select the floppy disk icon to save the report.
. Choose where to save the report (_My Content_, _Team Content_, or create
a new folder).
. Give the new report a meaningful name and select *Save*.


== Editing an existing report

Be aware that editing files in their default location runs a risk of those
reports being overwritten upon the next report catalog refresh. It is
recommended to save the edited report under a new name or store it in a
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```
non-default location.


== Troubleshooting

Here you will find suggestions for troubleshooting problems with
Reporting.

|===
|*Problem:* |*Try this:*
|When scheduling a report to be sent via email, the name of the user
logged in is pre-populated to the email's “To” field. However, the name is
in the form of "firstname lastname" (first name, space, last name). Since
this is not a valid email address, the email will fail to send when the
scheduled report is run.
|When scheduling the report to be sent via email, clear the pre-populated
name and enter a valid, properly-formatted email address in the “To”
field.

|===




[[ID49e684accaa92d0946f9b49132e46a9b]]
= Creating Custom Reports
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]

You can use the report authoring tools to create custom reports. After
creating reports, you can save them and run them on a regular schedule.
The results of reports can be automatically sent by email to yourself and
others.

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].

The examples in this section show the following process, which can be used
for any of the Cloud Insights Reporting data models:
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* Identifying a question to be answered with a report
* Determining the data needed to support the results
* Selecting data elements for the report

Before designing your custom report, you need to complete some
prerequisite tasks. If you do not complete these, reports could be
inaccurate or incomplete.

For example, if you do not finish the device identification process, your
capacity reports will not be accurate. Or, if you do not finish setting
annotations (such as tiers, business units, and data centers), your custom
reports might not accurately report data across your domain or might show
"N/A" for some data points.

Before you design your reports, complete the following tasks:

* Configure all
xref:{relative_path}task_configure_data_collectors.html[data collectors]
properly.
* Enter annotations (such as tiers, data centers, and business units) on
devices and resources in your environment. It is beneficial to have
annotations stable before generating reports, because Cloud Insights
Reporting collects historical information.
//* Configure OnCommand Insight Data Warehouse to accept the data from the
OnCommand Insight server in the Extract, Transform, and Load (ETL)
process.

== Report Creation Process

The process of creating custom (also called "ad hoc") reports involves
several tasks:

* Plan the results of your report.
* Identify data to support your results.
* Select the data model (for example, Chargeback data model, Inventory
data model, and so on) that contains the data.
* Select data elements for the report.
* Optionally format, sort, and filter report results.

=== Planning the Results of Your Custom Report

Before you open the report authoring tools, you might want to plan the
results you want from the report. With report authoring tools, you can
create reports easily and might not need a great deal of planning;
however, it is a good idea to get a sense from the report requestor about
the report requirements.
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```
* Identify the exact question you want to answer. For example:
** How much capacity do I have left?
** What are the chargeback costs per business unit?
** What is the capacity by tier to ensure that business units are aligned
at the proper tier of storage?
** How can I forecast power and cooling requirements? (Add customized
metadata by adding annotations to resources.)
* Identify the data elements that you need to support the answer.
* Identify the relationships between data that you want to see in the
answer. Do not include illogical relationships in your question, for
example, “I want to see the ports that relate to capacity.”
* Identify any calculations needed on data.
* Determine what types of filtering are needed to limit the results.
* Determine if you need to use current or historical data.
* Determine if you need to set access privileges on reports to limit the
data to specific audiences.
* Identify how the report will be distributed. For example, should it be
emailed on a set schedule or included in the Team content folder area?
* Determine who will maintain the report. This might affect the complexity
of the design.
* Create a mockup of the report.

=== Tips for designing reports
Several tips might be helpful when you are designing reports.

* Determine whether you need to use current or historical data.
+
Most reports only need to report on the latest data available in the Cloud
Insights.

* Cloud Insights Reporting provides historical information on capacity and
performance, but not on inventory.
* Everybody sees all data; however, you might need to limit data to
specific audiences.
+
To segment the information for different users, you can create reports and
set access permissions on them.

== Reporting data models

Cloud Insights includes several data models from which you can either
select predefined reports or create your own custom report.

Each data model contains a simple data mart and an advanced data mart:

* The simple data mart provides quick access to the most commonly used
```

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data elements and includes only the last snapshot of Data Warehouse data;
it does not include historical data.

* The advanced data mart provides all values and details available from
the simple data mart and includes access to historical data values.

=== Capacity data models

Enables you to answer questions about storage capacity, file system
utilization, internal volume capacity, port capacity, qtree capacity, and
virtual machine (VM) capacity. The Capacity data model is a container for
several capacity data models. You can create reports answering various
types of questions using this data model:

==== Storage and Storage Pool Capacity data model

Enables you to answer questions about storage capacity resource planning,
including storage and storage pools, and includes both physical and
virtual storage pool data. This simple data model can help you answer
questions related to capacity on the floor and the capacity usage of
storage pools by tier and data center over time.
If you are new to capacity reporting, you should start with this data
model because it is a simpler, targeted data model. You can answer
questions similar to the following using this data model:

* What is the projected date for reaching the capacity threshold of 80% of
my physical storage?
* What is the physical storage capacity on an array for a given tier?
* What is my storage capacity by manufacturer and family as well as by
data center?
* What is the storage utilization trend on an array for all of the tiers?
* What are my top 10 storage systems with the highest utilization?
* What is the storage utilization trend of the storage pools?
* How much capacity is already allocated?
* What capacity is available for allocation?

==== File System Utilization data model

This data model provides visibility about capacity utilization by hosts at
the file system level. Administrators can determine allocated and used
capacity per file system, determine the type of file system, and identify
trending statistics by file system type. You can answer the following
questions using this data model:

* What is the size of the file system?
* Where is the data kept and how is it accessed, for example, local or
SAN?
```

```
* What are the historical trends for the file system capacity? Then, based
on this, what can we anticipate for future needs?

==== Internal Volume Capacity data model

Enables you to answer questions about internal volume used capacity,
allocated capacity, and capacity usage over time:

* Which internal volumes have a utilization higher than a predefined
threshold?
* Which internal volumes are in danger of running out of capacity based on
a trend?
8 What is the used capacity versus the allocated capacity on our internal
volumes?

==== Port Capacity data model

Enables you to answer questions about switch port connectivity, port
status, and port speed over time. You can answer questions similar the
following to help you plan for purchases of new switches:
How can I create a port consumption forecast that predicts resource (port)
availability (according to data center, switch vendor and port speed)?

* Which ports are likely to run out of capacity, providing data speed,
data center, vendor and number of Host and storage ports?
* What are the switch port capacity trends over time?
* What are the port speeds?
* What type of port capacity is needed and which organization is about to
run out of a certain port type or vendor?
* What is the optimal time to purchase that capacity and make it
available?

==== Qtree Capacity data model

Enables you to trend qtree utilization (with data such as used versus
allocated capacity) over time. You can view the information by different
dimensions—for example, by business entity, application, tier, and service
level. You can answer the following questions using this data model:

* What is the used capacity for qtrees versus the limits set per
application or business entity?
* What are the trends of our used and free capacity so that we can do
capacity planning?
* Which business entities are using the most capacity?
* Which applications consume the most capacity?

==== VM Capacity data model
```

```
Enables you to report your virtual environment and its capacity usage.
This data model lets you report on changes in capacity usage over time for
VMs and data stores. The data model also provides thin provisioning and
virtual machine chargeback data.

* How can I determine capacity chargeback based on capacity provisioned to
VMs and data stores?
* What capacity is not used by VMs and which portion of unused is free,
orphaned, or other?
* What do we need to purchase based on consumption trends?
* What are my storage efficiency savings achieved by using storage thin
provisioning and deduplication technologies?

Capacities in the VM Capacity data model are taken from virtual disks
(VMDKs). This means that the provisioned size of a VM using the VM
Capacity data model is the size of its virtual disks. This is different
from the provisioned capacity in the Virtual Machines view in Cloud
Insights, which shows the provisioned size for the VM itself.

==== Volume Capacity data model

Enables you to analyze all aspects of the volumes in your environment and
organize data by vendor, model, tier, service level, and data center.

You can view the capacity related to orphaned volumes, unused volumes, and
protection volumes (used for replication). You can also see different
volume technologies (iSCSI or FC), and compare virtual volumes to non-
virtual volumes for array virtualization issues.

You can answer questions similar to the following with this data model:

* Which volumes have a utilization higher than a predefined threshold?
* What is the trend in my data center for orphan volume capacity?
* How much of my data center capacity is virtualized or thin provisioned?
* How much of my data center capacity must be reserved for replication?

=== Chargeback data model

Enables you to answer questions about used capacity and allocated capacity
on storage resources (volumes, internal volumes, and qtrees). This data
model provides storage capacity chargeback and accountability information
by hosts, application, and business entities, and includes both current
and historical data. Report data can be categorized by service level and
storage tier.

You can use this data model to generate chargeback reports by finding the
```

```
amount of capacity that is used by a business entity. This data model
enables you to create unified reporting of multiple protocols (including
NAS, SAN, FC, and iSCSI).

* For storage without internal volumes, chargeback reports show chargeback
by volumes.

* For storage with internal volumes:
** If business entities are assigned to volumes, chargeback reports show
chargeback by volumes.
** If business entities are not assigned to volumes but assigned to
qtrees, chargeback reports show chargeback by qtrees.
** If business entities are not assigned to volumes and not assigned to
qtrees, chargeback reports show the internal volume.
** The decision whether to show chargeback by volume, qtree or internal
volume is made per each internal volume, so it is possible for different
internal volumes in the same storage pool to show chargeback at different
levels.

Capacity facts are purged after a default time interval. For details, see
Data Warehouse processes.

Reports using the Chargeback data model might display different values
than reports using the Storage Capacity data model.

* For storage arrays that are not NetApp storage systems, the data from
both data models is the same.

* For NetApp and Celerra storage systems, the Chargeback data model uses a
single layer (of volumes, internal volumes, or qtrees) to base its
charges, while the Storage Capacity data model uses multiple layers (of
volumes and internal volumes) to base its charges.

=== Inventory data model

Enables you to answer questions about inventory resources including hosts,
storage systems, switches, disks, tapes, qtrees, quotas, virtual machines
and servers, and generic devices. The Inventory data model includes
several submarts that enable you to view information about replications,
FC paths, iSCSI paths, NFS paths, and violations. The Inventory data model
does not include historical data. Questions you can answer with this data

* What assets do I have and where are they?
* Who is using the assets?
* What types of devices do I have and what are components of those
devices?
* How many hosts per OS do I have and how many ports exist on those hosts?
* What storage arrays per vendor exist in each data center?
* How many switches per vendor do I have in each data center?
* How many ports are not licensed?
* What vendor tapes are we using and how many ports exist on each tape?re
all the generic devices identified before we begin working on reports?
* What are the paths between hosts and storage volumes or tapes?
* What are the paths between generic devices and storage volumes or tapes?
* How many violations of each type do I have per data center?
* For each replicated volume, what are the source and target volumes?
* Do I have any firmware incompatibilities or port speed mismatches
between Fibre Channel host HBAs and switches?

=== Performance data model

Enables you to answer questions about performance for volumes, application
volumes, internal volumes, switches, applications, VMs, VMDKs, ESX versus
VM, hosts, and application nodes. Many of these report _Hourly_ data,
_Daily_ data, or both. Using this data model, you can create reports that
answer several types of performance management questions:

* What volumes or internal volumes have not been used or accessed during a
specific period?
* Can we pinpoint any potential misconfiguration for storage for an
application (unused)?
* What was the overall access behavior pattern for an application?
* Are tiered volumes assigned appropriately for a given application?
* Could we use cheaper storage for an application currently running
without impact to application performance?
* What are the applications that are producing more accesses to currently
configured storage?

When you use the switch performance tables, you can obtain the following
information:

* Is my host traffic through connected ports balanced?

* Which switches or ports are exhibiting a high number of errors?

* What are the most used switches based on port performance?

* What are the underutilized switches based on port performance?

* What is the host trending throughput based on port performance?

* What is the performance utilization for last X days for one specified
host, storage system, tape, or switch?
```

```
* Which devices are producing traffic on a specific switch (for example,
which devices are responsible for use of a highly utilized switch)?

* What is the throughput for a specific business unit in our environment?

When you use the disk performance tables, you can obtain the following
information:

* What is the throughput for a specified storage pool based on disk
performance data?

* What is the highest used storage pool?

* What is the average disk utilization for a specific storage?

* What is the trend of usage for a storage system or storage pool based on
disk performance data?

* What is the disk usage trending for a specific storage pool?

When you use VM and VMDK performance tables, you can obtain the following
information:

* Is my virtual environment performing optimally?

* Which VMDKs are reporting the highest workloads?

* How can I use the performance reported from VMDs mapped to different
datastores to make decisions about re-tiering.

The Performance data model includes information that helps you determine
the appropriateness of tiers, storage misconfigurations for applications,
and last access times of volumes and internal volumes. This data model
provides data such as response times, IOPs, throughput, number of writes
pending, and accessed status.

=== Storage Efficiency data model

Enables you to track the storage efficiency score and potential over time.
This data model stores measurements of not only the provisioned capacity,
but also the amount that is used or consumed (the physical measurement).
For example, when thin provisioning is enabled, Cloud Insights indicates
how much capacity is taken from the device. You can also use this model to
determine efficiency when deduplication is enabled. You can answer various
questions using the Storage Efficiency data mart:

* What is our storage efficiency savings as a result of implementing thin
```

```
provisioning and deduplication technologies?

* What are the storage savings across data centers?

* Based on historical capacity trends, when do we need to purchase
additional storage?

* What would be the capacity gain if we enabled technologies such as thin
provisioning and deduplication?

* Regarding storage capacity, am I at risk now?

=== Data model fact and dimension tables

Each data model includes both fact and dimension tables.

* Fact tables: Contain data that is measured, for example, quantity, raw
and usable capacity. Contain foreign keys to dimension tables.

* Dimension tables: Contain descriptive information about facts, for
example, data center and business units. A dimension is a structure, often
composed of hierarchies, that categorizes data. Dimensional attributes
help describe the dimensional values.

Using different or multiple dimension attributes (seen as columns in the
reports), you construct reports that access data for each dimension
described in the data model.

=== Colors used in data model elements

Colors on data model elements have different indications.

* Yellow assets: Represent measurements.

* Non-yellow assets: Represent attributes. These values do not aggregate.


=== Using multiple data models in one report

Typically, you use one data model per report. However, you can write a
report that combines data from multiple data models.

To write a report that combines data from multiple data models, choose one
of the data models to use as the base, then write SQL queries to access
the data from the additional data marts. You can use the SQL Join feature
to combine the data from the different queries into a single query that
you can use to write the report.
```

```
For example, say you want the current capacity for each storage array and
you want to capture custom annotations on the arrays. You could create the
report using the Storage Capacity data model. You could use the elements
from the Current Capacity and dimension tables and add a separate SQL
query to access the annotations information in the Inventory data model.
Finally, you could combine the data by linking the Inventory storage data
to the Storage Dimension table using the storage name and the join
criteria.




[[ID0247ebfe26efee39e3b8b193a40b9980]]
= Access the Reporting Database via API
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/


[.lead]
Cloud Insights' powerful API allows users to query the Cloud Insights
Reporting database directly, without going through the Cognos Reporting
environment.

NOTE: This documentation refers to the Cloud Insights Reporting feature,
which is available in the
xref:{relative_path}/concept_subscribing_to_cloud_insights.html#editions[P
remium Edition].

== Odata

The Cloud Insights Reporting API follows the
link:https://www.odata.org/[OData v4] (Open Data Protocol) standard for
its querying of the Reporting database.
For more information or to learn more, check out
link:https://www.odata.org/getting-started/basic-tutorial/[this tutorial]
on OData.

All requests will start with the url _\https://<Cloud Insights
URL>/rest/v1/dwh-management/odata_

== Generating an APIKey
```

```
Read more about xref:{relative_path}API_Overview.html[Cloud Insights
APIs].

To generate an API key, do the following:

* Log into your Cloud Insights environment and select *Admin > API
Access*.
* Click “+ API Access Token”.
* Enter a Name & Description.
* For type, choose _Data Warehouse_.
* Set Permissions as Read/Write.
* Set a desires Expiration date.
* Click “Save”, then *copy the key and save it* somewhere safe. You will
not be able to access the full key later.

APIkeys are good for _Sync_ or _Async_.

//<TBD More information>


== Direct query of tables

With the API Key in place, direct queries of the Reporting database are
now possible. Long URLs may be simplified to \https://.../odata/ for
display purposes rather than the full \https://<Cloud Insights
URL>/rest/v1/dwh-management/odata/

Try simple queries like

* \https://<Cloud Insights URL>/rest/v1/dwh-management/odata/dwh_custom
* \https://<Cloud Insights URL>/rest/v1/dwh-management/odata/dwh_inventory
* \https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_inventory/storage
* \https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_inventory/disk
* \https://.../odata/dwh_custom/custom_queries


== REST API Examples

The URL for all calls is _\https://<Cloud Insights URL>/rest/v1/dwh-
management/odata_.

* GET /{schema}/** - Retrieves data from the Reporting Database.

Format: _\https://<Cloud Insights URL>/rest/v1/dwh-
```

```
management/odata/<schema_name>/<query>_

Example:

 https://<domain>/rest/v1/dwh-
management/odata/dwh_inventory/fabric?$count=true&$orderby=name

Result:

 {
    "@odata.context": "$metadata#fabric",
    "@odata.count": 2,
    "value": [
        {
            "id": 851,
            "identifier": "10:00:50:EB:1A:40:3B:44",
            "wwn": "10:00:50:EB:1A:40:3B:44",
            "name": "10:00:50:EB:1A:40:3B:44",
            "vsanEnabled": "0",
            "vsanId": null,
            "zoningEnabled": "0",
            "url": "https://<domain>/web/#/assets/fabrics/941716"
        },
        {
            "id": 852,
            "identifier": "10:00:50:EB:1A:40:44:0C",
            "wwn": "10:00:50:EB:1A:40:44:0C",
            "name": "10:00:50:EB:1A:40:44:0C",
            "vsanEnabled": "0",
            "vsanId": null,
            "zoningEnabled": "0",
            "url": "https://<domain>/web/#/assets/fabrics/941836"
         }
     ]
 }

// Example: get all Storage Pools of storage with id 287 with expanded
Internal Volume data: https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_inventory/storage(287)/storage_pool?$expand=internal_
volume


////
 * POST /{schema}/** - Write data and create queries in dwh_custom schema
of Data Warehouse database through ODATA protocol, requires ADMIN role
```

```
 Format: https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/<schema_name>/<table_name>. The body contains the record
in JSON format

 Example: add a new record to the storage table: https://<Cloud Insights
URL>/rest/v1/dwh-management/odata/dwh_custom/storage , Request body:
{"storageId": 123, "storageName": "storage123"}

Creating queries: POST https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_custom/custom_queries -d '{"queryName":
"<query_name>", "querySql": "<query_sql>"}'



 * PATCH /{schema}/** - Modify data and modify queries in dwh_custom
schema of Data Warehouse database through ODATA protocol, requires ADMIN
role

 Format: https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/<schema_name>/<table_name>('<record_id>'). The body
contains the record in JSON format

 Example: modify a record in the storage table: https://<Cloud Insights
URL>/rest/v1/dwh-management/odata/dwh_custom/storage('123') , Request
body: {"storageId": 123, "storageName": "storage123"}

Modifying queries: PATCH https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_custom/custom_queries('queryName') -d '{"queryName":
"<query_name>", "querySql": "<query_sql>"}'



 * DELETE /{schema}/** - Delete data and delete queries in dwh_custom
schema of Data Warehouse database through ODATA protocol, requires ADMIN
role

 Format: https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/<schema_name>/<table_name>('<record_id>')

 Example: delete a record from the storage table: https://<Cloud Insights
URL>/rest/v1/dwh-management/odata/dwh_custom/storage('123')

Deleting queries: DELETE https://<Cloud Insights URL>/rest/v1/dwh-
management/odata/dwh_custom/custom_queries('queryName')
////
```

```
== Helpful Hints

Keep the following in mind when working with Reporting API queries.

* The query payload must be a valid JSON string
* The query payload must be contained in a single line
* Double quotes must be escaped, i.e. \"
* Tabs are supported as \t
* Avoid comments
* Lower-case table names are supported

Additionally:

* 2 Headers are required:
** Name “X-CloudInsights-ApiKey”
** Attribute Value “<apikey>”

Your API key will be specific to your Cloud Insights environment.




[[ID10dcbd24e8982bd95a4e5869840ba490]]
= How historical data is retained for Reporting
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights retains historical data for use in Reporting based on the
data marts and granularity of the data, as shown in the following table.

|===
|Data mart | Measured object | Granularity | Retention period
|Performance marts | Volumes and internal volumes | Hourly | 14 days
|Performance marts | Volumes and internal volumes | Daily | 13 months
|Performance marts | Application | Hourly | 13 months
|Performance marts | Host | Hourly | 13 months
|Performance marts | Switch performance for port | Hourly | 35 days
|Performance marts | Switch performance for host, storage, and tape |
Hourly | 13 months
|Performance marts | Storage node | Hourly | 14 days
```

```
|Performance marts | Storage node | Daily | 13 months
|Performance marts | VM performance | Hourly | 14 days
|Performance marts | VM performance | Daily | 13 months
|Performance marts | Hypervisor performance | Hourly | 35 days
|Performance marts | Hypervisor performance | Daily | 13 months
|Performance marts | VMDK performance | Hourly | 35 days
|Performance marts | VMDK performance | Daily | 13 months
|Performance marts | Disk performance | Hourly | 14 days
|Performance marts | Disk performance | Daily | 13 months
|Capacity marts | All (except individual volumes) | Daily | 13 months
|Capacity marts | All (except individual volumes) | Monthly representative
| 14 months and beyond
|Inventory marts | Individual volumes | Current state | 1 day (or until
next ETL)
|===



[[ID09bdedcdcce86d2f420f85fb726a2748]]
= Cloud Insights Reporting Schema Diagrams
:toc: macro
:hardbreaks:
:toclevekls: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/


[.lead]

This document provides the schema diagrams for the Reporting Database. You
can also download a file containing the
xref:{relative_path}ci_reporting_database_schema.pdf[schema tables].

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].





== Inventory Datamart


The following images describe the inventory datamart.
```

```
=== Annotations

image:annotations.png[]

=== Applications

image:apps_annot.png[]



=== Kubernetes Metrics

image:k8s_schema.jpg[Kubernetes]

==== Kubernetes Cluster Metrics Fact

image:k8s_cluster_metrics_fact.jpg[Kubernetes Cluster Metrics Fact]

==== Kubernetes Namespace Metrics Fact

image:k8s_namespace_metrics_fact.jpg[Kubernetes Namespace Metrics Fact]

==== Kubernetes Node Metrics Fact

image:k8s_node_metrics_fact.jpg[Kubernetes Node Metrics Fact]

==== Kubernetes PVC Metrics Fact

image:k8s_pvc_metrics_fact.jpg[Kubernetes PVC Metrics Fact]

==== Kubernetes Workload Metrics Fact

image:k8s_workload_metrics_fact.jpg[Kubernetes Workload Metrics Fact]



=== NAS

image:nas.png[]

=== Paths and Violations

image:logical.png[]

=== Port Connectivity
```

```
image:connectivity.png[]

=== SAN Fabric

image:fabric.png[]

=== Storage

image:storage.png[]

=== Storage Node

image:storage_node.png[]

=== VM

image:vm.png[]


'''

== Capacity Datamart

The following images describe the capacity datamart.


=== Chargeback

image:Chargeback_Fact.png[]

=== Disk Group Capacity

image:Disk_Group_Capacity.png[]


=== File System Utilization

image:fs_util.png[]



=== Internal Volume Capacity

image:Internal_Volume_Capacity_Fact.png[]
```

```
=== Kubernetes PV Capacity

image:k8s_pvc_capacity_fact.jpg[]



=== Port Capacity

image:ports.png[]



=== Qtree Capacity

image:Qtree_Capacity_Fact.png[]




=== Storage Capacity Efficiency

image:efficiency.png[]

=== Storage and Storage Pool Capacity

image:Storage_and_Storage_Pool_Capacity_Fact.png[]

=== Storage Node Capacity

image:Storage_Node_Capacity_Fact.jpg[]



=== VM Capacity

image:VM_Capacity_Fact.png[]

=== Volume Capacity

image:Volume_Capacity.png[]
```

```
'''

== Performance Datamart

The following images describe the performance datamart.


=== Application Volume Hourly Performance

image:application_performance_fact.jpg[]


=== Disk Daily Performance

image:disk_daily_performance_fact.png[]

=== Disk Hourly Performance

image:disk_hourly_performance_fact.png[]




=== Host Hourly Performance

image:host_performance_fact.jpg[]

=== Internal Volume Hourly Performance

image:internal_volume_performance_fact.jpg[]

=== Internal Volume Daily Performance

image:internal_volume_daily_performance_fact.jpg[]





=== Qtree Daily Performance

image:QtreeDailyPerformanceFact.png[]



=== Storage Node Daily Performance
```

```
image:storage_node_daily_performance_fact.jpg[]

=== Storage Node Hourly Performance

image:storage_node_hourly_performance_fact.jpg[]




=== Switch Hourly Performance for Host

image:switch_performance_for_host_hourly_fact.png[]

=== Switch Hourly Performance for Port

image:switch_performance_for_port_hourly_fact.png[]

=== Switch Hourly Performance for Storage

image:switch_performance_for_storage_hourly_fact.png[]


=== Switch Hourly Performance for Tape

image:switch_performance_for_tape_hourly_fact.png[]



=== VM Performance

image:vm_hourly_performance_fact.png[]

=== VM Daily Performance for Host

image:vm_daily_performance_fact.png[]

=== VM Hourly Performance for Host

image:vm_hourly_performance_fact.png[]


=== VM Daily Performance for Host

image:vm_daily_performance_fact.png[]

=== VM Hourly Performance for Host
```

```
image:vm_hourly_performance_fact.png[]

=== VMDK Daily Performance

image:vmdk_daily_performance_fact.png[]

=== VMDK Hourly Performance

image:vmdk_hourly_performance_fact.png[]




=== Volume Hourly Performance

image:volume_performance_fact.jpg[]

=== Volume Daily Performance

image:volume_daily_performance_fact.jpg[]






// == Kubernetes Capacity
// Moved to Capacity section above

////
=== Kubernetes PV Capacity

image:k8s_pvc_capacity_fact.jpg[]
////


// Moved to Inventory section above:
////
=== Kubernetes Metrics

image:k8s_schema.jpg[Kubernetes]

==== Kubernetes Cluster Metrics Fact

image:k8s_cluster_metrics_fact.jpg[Kubernetes Cluster Metrics Fact]

==== Kubernetes Namespace Metrics Fact
```

```
image:k8s_namespace_metrics_fact.jpg[Kubernetes Namespace Metrics Fact]


==== Kubernetes Node Metrics Fact

image:k8s_node_metrics_fact.jpg[Kubernetes Node Metrics Fact]



==== Kubernetes PVC Metrics Fact

image:k8s_pvc_metrics_fact.jpg[Kubernetes PVC Metrics Fact]

==== Kubernetes Workload Metrics Fact

image:k8s_workload_metrics_fact.jpg[Kubernetes Workload Metrics Fact]
////



[[ID63181e2196487d92430e5ab3388a329a]]
= Cloud Insights Schemas for Reporting
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
These schema tables and diagrams are provided here as a reference for
Cloud Insights Reporting.

link:https://docs.netapp.com/us-
en/cloudinsights/ci_reporting_database_schema.pdf[*Schema Tables*] in .PDF
format. Click the link to open, or right-click and choose _Save as..._ to
download.

xref:{relative_path}reporting_schema_diagrams.html[*Schema Diagrams*]

NOTE: The Reporting feature is available in Cloud Insights
xref:{relative_path}concept_subscribing_to_cloud_insights.html[Premium
Edition].
```

```
:leveloffset: -1


= Workload Security

:leveloffset: +1


[[ID4fec82d76406ae3f9c5e47b88a02a048]]
= About Storage Workload Security
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights Storage Workload Security (formerly Cloud Secure) helps
protect your data with actionable intelligence on insider threats. It
provides centralized visibility and control of all corporate data access
across hybrid cloud environments to ensure security and compliance goals
are met.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

== Visibility

Gain centralized visibility and control of user access to your critical
corporate data stored on-premise or in the cloud.

Replace tools and manual processes that fail to provide timely and
accurate visibility into data access and control. Workload Security
uniquely operates on both cloud and on-premise storage systems to give you
real-time alerts of malicious user behavior.
```

```
== Protection

Protect organizational data from being misused by malicious or compromised
users through advanced machine learning and anomaly detection.

Alerts you to any abnormal data access through advanced machine learning
and anomaly detection of user behavior.

== Compliance

Ensure corporate compliance by auditing user data access to your critical
corporate data stored on-premise or in the cloud.



= Getting Started

:leveloffset: +1


[[ID0658a047603dcd22f5526018db7050a0]]
= Getting Started with Workload Security
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
There are configuration tasks that need to be completed before you can
start using Workload Security to monitor user activity.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

//not complete? 4/17

The Workload Security system uses an agent to collect access data from
storage systems and user information from  Directory Services servers.

//not complete? 4/17

You need to configure the following before you can start collecting data:
```

```
[cols="2*"]
|===
|Task|Related information
| Configure an Agent a|
xref:{relative_path}concept_cs_agent_requirements.html[Agent Requirements]

xref:{relative_path}task_cs_add_agent.html[Add Agent]

link:https://netapp.hubs.vidyard.com/watch/Lce7EaGg7NZfvCUw4Jwy5P?[*Video*
: Agent Deployment]

|Configure a User Directory
Connector|link:task_config_user_dir_connect.html[Add User Directory
Connector]

link:https://netapp.hubs.vidyard.com/watch/NEmbmYrFjCHvPps7QMy8me?[*Video*
: Active Directory Connection]

|Configure data collectors | Click *Workload Security > Collectors*

Click the data collector you want to configure.

See the Data Collector Vendor Reference section of the documentation.

link:https://netapp.hubs.vidyard.com/watch/YSQrcYA7DKXbj1UGeLYnSF?[*Video*
: ONTAP SVM Connection]

|Create  Users Accounts|
xref:{relative_path}concept_user_roles.html[Manage User Accounts]

|Troubleshooting|link:https://netapp.hubs.vidyard.com/watch/Fs8N2w9wBtsFGr
hRH9X85U?[*Video*: Troubleshooting]

|===



Workload Security can integrate with other tools as well.  For example,
link:http://docs.netapp.com/us-
en/cloudinsights/CloudInsights_CloudSecure_Splunk_integration_guide.pdf[se
e this guide] on integration with Splunk.





[[ID43c57ad6c72a800a8c122ccf2649a664]]
= Workload Security Agent Requirements
```

```
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You must xref:{relative_path}task_cs_add_agent.html[install an Agent] in
order to acquire information from your data collectors. Before you install
the Agent, you should ensure that your environment meets operating system,
CPU, memory, and disk space requirements.

NOTE: Storage Workload Security is not available in Cloud Insights Federal
Edition.

[cols=2*,options="header",cols="36,60"]
|===
|Component|Linux Requirement
|Operating system|A computer running a licensed version of one of the
following:

Red Hat Enterprise Linux 7.x, 8.x 64-bit, SELinux
CentOS 7.x 64-bit, SELinux
CentOS 8 Stream, SELinux
Ubuntu 20 through 22 64-bit
Rocky 8.x 64-bit, Rocky 9.x 64-bit, SELinux
SUSE Linux Enterprise Server 15 SP3, SUSE Linux Enterprise Server 15 SP4,
SELinux on SUSE 15 SP3

This computer should be running no other application-level software. A
dedicated server is recommended.

|Commands|'unzip' is required for installation. Additionally, the 'sudo su
-' command is required for installation, running scripts, and uninstall.

//|Docker | The Docker CE package must be installed on the VM hosting the
agent.
//The agent systems should always have the Docker CE package installed.
Users should not install the Docker-client-xx or Docker-common-xx native
RHEL Docker packages since these do not support the 'docker run' CLI
format that Workload Security supports.
//|Java |OpenJDK Java is required.
|CPU    |4 CPU cores
|Memory |16 GB RAM
```

```
|Available disk space   |Disk space should be allocated in this manner:
//50 GB available for the root partition
/opt/netapp 35 GB (minimum)

Note: It is recommended to allocate a little extra disk space to allow for
the creation of the filesystem. Ensure that there is at least 35 GB free
space in the filesystem.


If /opt is a mounted folder from a NAS storage, make sure that local users
have access to this folder. Agent or Data collector may fail to install if
local users do not have permission to this folder. see the
xref:{relative_path}task_cs_add_agent.html#troubleshooting-agent-
errors[troubleshooting] section for more details.

|Network|100 Mbps to 1 Gbps Ethernet connection, static IP address, IP
connectivity to all devices, and a required port to the Workload Security
instance (80 or 443).

|===

Please note: The Workload Security agent can be installed in the same
machine as a Cloud Insights acquisition unit and/or agent. However, it is
a best practice to install these in separate machines. In the event that
these are installed on the same machine, please allocate disk space as
shown below:

|===
|Available disk space   |50-55 GB
For Linux, disk space should be allocated in this manner:
/opt/netapp 25-30 GB
/var/log/netapp 25 GB


|===

== Additional recommendations
* It is strongly recommended to synchronize the time on both the ONTAP
system and the Agent machine using *Network Time Protocol (NTP)* or
*Simple Network Time Protocol (SNTP)*.

////

Removed from Table:

|Agent outbound URLs (port 433)|
\https://<site_name>.cs01.cloudinsights.netapp.com
//You can get the site ID from the product URL. For example:
https://*ab1234*.cs01.cloudinsights.netapp.com
You can use a broader range to specify the tenant ID:
\https://*.cs01.cloudinsights.netapp.com/

\https://gateway.c01.cloudinsights.netapp.com

\https://agentlogin.cs01.cloudinsights.netapp.com

////



== Cloud Network Access Rules

For *US-based* Workload Security environments:

[cols=5*,options="header"]
|===
|Protocol|Port|Source   |Destination |Description
|TCP|443|Workload Security Agent|<site_name>.cs01.cloudinsights.netapp.com
<site_name>.c01.cloudinsights.netapp.com
<site_name>.c02.cloudinsights.netapp.com|Access to Cloud Insights
|TCP|443|Workload Security Agent|gateway.c01.cloudinsights.netapp.com
agentlogin.cs01.cloudinsights.netapp.com|Access to authentication services
|===

For *Europe-based* Workload Security environments:

[cols=5*,options="header"]
|===
|Protocol|Port|Source   |Destination |Description
|TCP|443|Workload Security Agent|<site_name>.cs01-eu-
1.cloudinsights.netapp.com
<site_name>.c01-eu-1.cloudinsights.netapp.com
<site_name>.c02-eu-1.cloudinsights.netapp.com
|Access to Cloud Insights
|TCP|443|Workload Security Agent|gateway.c01.cloudinsights.netapp.com
agentlogin.cs01-eu-1.cloudinsights.netapp.com
|Access to authentication services
|===

For *APAC-based* Workload Security environments:

[cols=5*,options="header"]
|===
|Protocol|Port|Source   |Destination |Description
|TCP|443|Workload Security Agent|<site_name>.cs01-ap-
1.cloudinsights.netapp.com
<site_name>.c01-ap-1.cloudinsights.netapp.com
<site_name>.c02-ap-1.cloudinsights.netapp.com
|Access to Cloud Insights
|TCP|443|Workload Security Agent|gateway.c01.cloudinsights.netapp.com
agentlogin.cs01-ap-1.cloudinsights.netapp.com
|Access to authentication services
|===

== In-network rules

//Note that when adding _link:task_add_collector_svm.html#permissions-
when-adding-via-cluster-management-ip[csuser]_, that user requires SSH
access to the ONTAP management LIF.


[cols=5*,options="header"]
|===
|Protocol|Port|Source   |Destination |Description
|TCP|389(LDAP)
636 (LDAPs / start-tls) |Workload Security Agent|LDAP Server URL|Connect
to LDAP
|TCP|443|Workload Security Agent|Cluster or SVM Management IP Address
(depending on SVM collector configuration)|API communication with ONTAP
|TCP|35000 - 55000|SVM data LIF IP Addresses|Workload Security
Agent|Communication from ONTAP to the Workload Security Agent for Fpolicy
events.  These ports must be opened towards the Workload Security Agent in
order for ONTAP to send events to it, including any firewall on the
Workload Security Agent itself (if present).
|TCP|7|Workload Security Agent|SVM data LIF IP Addresses|Echo from Agent
to SVM Data LIFs
|SSH |22|Workload Security Agent| Cluster management |Needed for CIFS/SMB
user blocking.
|===

//link:task_cs_add_agent.html[Configure an Agent]

// Supported browsers a
// * Internet Explorer 11
// * Firefox ESR 60
// * Chrome latest nightly (73.0)6

== System Sizing
```

```
See the xref:{relative_path}concept_cs_event_rate_checker.html[Event Rate
Checker] documentation for information about sizing.



[[IDdb6b887d512c0b3ed6add7fd84ae290e]]
= Workload Security Agent Installation
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Workload Security (formerly Cloud Secure) collects user activity data
using one or more agents. Agents connect to devices in your environment
and collect data that is sent to the Workload Security SaaS layer for
analysis. See xref:{relative_path}concept_cs_agent_requirements.html[Agent
Requirements] to configure an agent VM.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

== Before You Begin

* The sudo privilege is required for installation, running scripts, and
uninstall.
* While installing the agent, a local user _cssys_ and a local group
_cssys_ are created on the machine. If permission settings do not allow
creation of a local user, and instead require Active Directory, a user
with the username _cssys_ must be created in the Active Directory server.
* You can read about Cloud Insights security
xref:{relative_path}security_overview.html[here].


== Steps to Install Agent

. Log in as Administrator or Account Owner to your Workload Security
environment.
. Select *Collectors > Agents > +Agent*
+
The system displays the Add an Agent page:
+
image::Add-agent-1.png[]
```

```
. Verify that the agent server meets the minimum system requirements.

. To verify that the agent server is running a supported version of Linux,
click _Versions Supported (i)_.

. If your network is using proxy server, please set the proxy server
details by following the instructions in the Proxy section.
+
image:CloudSecureAgentWithProxy_Instructions.png[Agent Install with Proxy
Note]
//image::add-agent-2.png[]


. Click the Copy to Clipboard icon to copy the installation command.
. Run the installation command in a terminal window.

. The system displays the following message when the installation
completes successfully:
+
image::new-agent-detect.png[]

//cd /var NEW
//Grep /var/

.After You Finish

//. Verify that the agent is installed using the following command:
//`sudo grep -irn register agent.log`

. You need to configure a
xref:{relative_path}task_config_user_dir_connect.html[User Directory
Collector ].
. You need to configure one or more Data Collectors.

////
== Files Created During Installation

* Installation directory:
+
/opt/netapp/cloudsecure/agent

* Installation logs:
+
/var/log/netapp/cloudsecure/install
/opt/netapp/cloud-secure/logs

* Agent Logs:
```

```
* You can use the following command to verify the agent installed
correctly:
`sudo grep -irn register /opt/netapp/cloudsecure/agent/logs/agent.log`

//* Use the following script to control the Workload Security service:
//`sudo cloud-secure-agent-service.sh --help`

* Use the following script to uninstall the agent:
`sudo cloudsecure-agent-uninstall.sh`
////

== Network Configuration

Run the following commands on the local system to open ports that will be
used by Workload Security. If there is a security concern regarding the
port range, you can use a lesser port range, for example _35000:35100_.
Each SVM uses two ports.

.Steps

. `sudo firewall-cmd --permanent --zone=public --add-port=35000-55000/tcp`
. `sudo firewall-cmd --reload`

Follow the next steps according to your platform:

*CentOS 7.x / RHEL 7.x*:

. `sudo iptables-save | grep 35000`

Sample output:

 -A IN_public_allow -p tcp -m tcp --dport 35000:55000 -m conntrack
-ctstate NEW,UNTRACKED -j ACCEPT

*CentOS 8.x / RHEL 8.x*:

. `sudo firewall-cmd --zone=public --list-ports | grep 35000` (for CentOS
8)

Sample output:

 35000-55000/tcp


== Troubleshooting Agent Errors
```

```
Known problems and their resolutions are described in the following table.

[cols=2*, options="header", cols"30,70"]

|===
|Problem: | Resolution:

|Agent installation fails to create the
/opt/netapp/cloudsecure/agent/logs/agent.log folder and the install.log
file provides no relevant information.|This error occurs during
bootstrapping of the agent. The error is not logged in log files because
it occurs before logger is initialized.
The error is redirected to standard output, and is visible in the service
log using the `journalctl -u cloudsecure-agent.service` command. This
command can be used for troubleshooting the issue further.

|Agent installation fails with ‘This linux distribution is not supported.
Exiting the installation’.|This error appears when you attempt to install
the Agent on an unsupported system. See
xref:{relative_path}concept_cs_agent_requirements.html[Agent
Requirements].

|Agent Installation failed with the error:
"-bash: unzip: command not found"
|Install unzip and then run the installation command again. If Yum is
installed on the machine, try “yum install unzip” to install unzip
software.
After that, re-copy the command from the Agent installation UI and paste
it in the CLI to execute the installation again.

|Agent was installed and was running. However agent has stopped suddenly.
|SSH to the Agent machine. Check the status of the agent service via `sudo
systemctl status cloudsecure-agent.service`.
1. Check if the logs shows a message“Failed to start Workload Security
daemon service” .
2. Check if cssys user exists in the Agent machine or not. Execute the
following commands one by one with root permission and check if the cssys
user and group exists.
`sudo id cssys`
`sudo groups cssys`
3. If none exists, then a centralized monitoring policy may have deleted
the cssys user.
4. Create cssys user and group manually by executing the following
commands.
`sudo useradd cssys`
`sudo groupadd cssys`
```

```
5. Restart the agent service after that by executing the following
command:
`sudo systemctl restart cloudsecure-agent.service`
6. If it is still not running, please check the other troubleshooting
options.

|Unable to add more than 50 Data collectors to an Agent.
|Only 50 Data collectors can be added to an Agent. This can be a
combination of all the collector types, for example, Active Directory, SVM
and other collectors.

|UI shows Agent is in NOT_CONNECTED state.
|Steps to restart the Agent.
1. SSH to the Agent machine.
2. Restart the agent service after that by executing the following
command:
`sudo systemctl restart cloudsecure-agent.service`
3. Check the status of the agent service via `sudo systemctl status
cloudsecure-agent.service`.
4. Agent should go to CONNECTED state.

|Agent VM is behind Zscaler proxy and the agent installation is failing.
Because of Zscaler proxy’s SSL inspection, the Workload Security
certificates are presented as it is signed by Zscaler CA so the agent is
not trusting the communication.
|Disable SSL inspection in the Zscaler proxy for the
*.cloudinsights.netapp.com url. If Zscaler does SSL inspection and
replaces the certificates, Workload Security will not work.

|While installing the agent, the installation hangs after unzipping.
|“chmod 755 -Rf” command is failing.
The command fails when the agent installation command is being run by a
non-root sudo user that has files in the working directory, belonging to
another user, and permissions of those files cannot be changed. Because of
the failing chmod command, the rest of the installation does not execute.

1.  Create a new directory named “cloudsecure”.
2.  Go to that directory.
3.  Copy and paste the full “token=…… … ./cloudsecure-agent-install.sh"
installation command and press enter.
4.  Installation should be able to proceed.

|If the Agent is still not able to connect to Saas, please open a case
with NetApp Support. Provide the Cloud Insights serial number to open a
case, and attach logs to the case as noted.
|To attach logs to the case:
 1. Execute the following script with root permission and share the output
file (cloudsecure-agent-symptoms.zip).
    a.  /opt/netapp/cloudsecure/agent/bin/cloudsecure-agent-symptom-
collector.sh
 2. Execute the following commands one by one with root permission and
share the output.
    a.  id cssys
    b.  groups cssys
    c.  cat /etc/os-release

|The cloudsecure-agent-symptom-collector.sh script fails with the
following error.

[root@machine tmp]# /opt/netapp/cloudsecure/agent/bin/cloudsecure-agent-
symptom-collector.sh
Collecting service log
Collecting application logs
Collecting agent configurations
Taking service status snapshot
Taking agent directory structure snapshot
………………….
………………….
/opt/netapp/cloudsecure/agent/bin/cloudsecure-agent-symptom-collector.sh:
line 52: zip: command not found
ERROR: Failed to create /tmp/cloudsecure-agent-symptoms.zip

|Zip tool is not installed..
Install the zip tool by running the command “yum install zip”.
Then run the cloudsecure-agent-symptom-collector.sh again.


|Agent installation Fails with useradd: cannot create directory
/home/cssys
|This error can occur if user's login directory cannot be created under
/home, due to lack of permissions.

The workaround would be to create cssys user and add its login directory
manually using the following command:

_sudo useradd user_name -m -d HOME_DIR_

-m :Create the user's home directory if it does not exist.
-d : The new user is created using HOME_DIR as the value for the user's
login directory.

For instance, _sudo useradd cssys -m -d /cssys_, adds a user _cssys_ and
creates its login directory under root.
```

```
|Agent is not running after installation.
_Systemctl status cloudsecure-agent.service_ shows the following:

[root@demo ~]# systemctl status cloudsecure-agent.service
agent.service – Workload Security Agent Daemon Service
Loaded: loaded (/usr/lib/systemd/system/cloudsecure-agent.service;
enabled; vendor preset: disabled)
Active: activating (auto-restart) (Result: exit-code) since Tue 2021-08-03
21:12:26 PDT; 2s ago
Process: 25889 ExecStart=/bin/bash
/opt/netapp/cloudsecure/agent/bin/cloudsecure-agent (code=exited
status=126)
Main PID: 25889 (code=exited, status=126),

Aug 03 21:12:26 demo systemd[1]: cloudsecure-agent.service: main process
exited, code=exited, status=126/n/a
Aug 03 21:12:26 demo systemd[1]: Unit cloudsecure-agent.service entered
failed state.
Aug 03 21:12:26 demo systemd[1]: cloudsecure-agent.service failed.

|This can be failing because _cssys_ user may not have permission to
install.

If /opt/netapp is an NFS mount and if _cssys_ user does not have access to
this folder, installation will fail. _cssys_ is a local user created by
the Workload Security installer that may not have permission to access the
mounted share.

You can check this by attempting to access
/opt/netapp/cloudsecure/agent/bin/cloudsecure-agent using _cssys_ user.
If it returns “Permission denied”, installation permission is not present.

Instead of a mounted folder, install on a directory local to the machine.

|Agent was initially connected via a proxy server and the proxy was set
during Agent installation. Now the proxy server has changed. How can the
Agent’s proxy configuration be changed?
|You can edit the agent.properties to add the proxy details. Follow these
steps:

1.  Change to the folder containing the properties file:

cd /opt/netapp/cloudsecure/conf

2.  Using your favorite text editor, open the _agent.properties_ file for
editing.
```

```
3.  Add or modify the following lines:

AGENT_PROXY_HOST=scspa1950329001.vm.netapp.com
AGENT_PROXY_PORT=80
AGENT_PROXY_USER=pxuser
AGENT_PROXY_PASSWORD=pass1234

4.  Save the file.

5.  Restart the agent:

sudo systemctl restart cloudsecure-agent.service




|===

//image:CloudSecureAgentInstallationCommand.png[]






[[ID5f837baf01267791533025dfc8510af7]]
= Deleting a Workload Security Agent
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
When you delete a Workload Security Agent, all the data collectors
associated with the Agent must be deleted first.

== Deleting an Agent

[IMPORTANT]

Deleting an Agent deletes all of the Data Collectors associated with the
Agent. If you plan to configure the data collectors with a different agent
you should create a backup of the Data Collector configurations before you
```

```
delete the Agent.

.Before you begin
. Make sure all the data collectors associated with the agent are deleted
from the Workload Security portal.
+
Note: Ignore this step if all the associated collectors are in STOPPED
state.


.Steps to delete an Agent:

. SSH into the agent VM and execute the following command. When prompted,
enter "y" to continue.

 sudo /opt/netapp/cloudsecure/agent/install/cloudsecure-agent-uninstall.sh
 Uninstall CloudSecure Agent? [y|N]:

. Click *Workload Security > Collectors > Agents*
+
The system displays the list of configured Agents.

. Click the options menu for the Agent you are deleting.

. Click *Delete*.
+
The system displays the *Delete Agent* page.

. Click *Delete* to confirm the deletion.





[[IDb5c235ff634549f83549d1c9e930c0d5]]
= Configuring an Active Directory (AD) User Directory Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Workload Security can be configured to collect user attributes from Active
Directory servers.
```

```
.Before you begin

* You must be a Cloud Insights Administrator or Account Owner to perform
this task.
* You must have the IP address of the server hosting the Active Directory
server.
* An Agent must be configured before you configure a User Directory
connector.

.Steps to Configure a User Directory Collector

. In the Workload Security menu, click:
*Collectors > User Directory Collectors > + User Directory Collector* and
select *Active Directory*
+
The system displays the Add User Directory screen.

Configure the User Directory Collector by entering the required data in
the following tables:

[cols=2*, cols"30,70"]
[Options=header]
|===
|Name|Description
|Name |Unique name for the user directory. For example _GlobalADCollector_
|Agent|Select a configured agent from the list
|Server IP/Domain Name|IP address or Fully-Qualified Domain Name (FQDN) of
server hosting the active directory
|Forest Name|Forest level of the directory structure.
Forest name allows both of the following formats:

_x.y.z_ => direct domain name as you have it on your SVM. [Example:
hq.companyname.com]

_DC=x,DC=y,DC=z_ => Relative distinguished names [Example: DC=hq,DC=
companyname,DC=com]

Or you can specify as the following:

_OU=engineering,DC=hq,DC= companyname,DC=com_ [to filter by specific OU
engineering]

_CN=username,OU=engineering,DC=companyname, DC=netapp, DC=com_ [to get
only specific user with <username> from OU <engineering>]

_CN=Acrobat Users,CN=Users,DC=hq,DC=companyname,DC=com,O=
companyname,L=Boston,S=MA,C=US_ [to get all Acrobat Users within the Users
in that organization]

Trusted Active Directory domains are also supported.

|Bind DN|User permitted to search the directory. For example:
_username@companyname.com_ or _username@domainname.com_
In addition, Domain Read Only permission is required.
User must be a member of the Security group _Read-only Domain
Controllers_.
|BIND password|Directory server password (i.e. password for username used
in Bind DN)
|Protocol|ldap, ldaps, ldap-start-tls
|Ports|Select port
|===

////
Add to table once link is provided:
For more details about forest names, please refer to this
xref:{relative_path}////

Enter the following Directory Server required attributes if the default
attribute names have been modified in Active Directory. Most often these
attributes names are _not_ modified in Active Directory, in which case you
can simply proceed with the default attribute name.

[cols=2*, cols"50,50"]
[Options=header]
|===
|Attributes |Attribute name in Directory Server
|Display Name|name
|SID|objectsid
|User Name|sAMAccountName
|===

Click Include Optional Attributes to add any of the following attributes:

[cols=2*, cols"50,50"]
[Options=header]
|===
|Attributes |Attribute Name in Directory Server
|Email Address|mail
|Telephone Number|telephonenumber
|Role|title
|Country|co
|State|state
```

```
|Department|department
|Photo|thumbnailphoto
|ManagerDN|manager
|Groups|memberOf
|===


//Removed based on review comments
//Enter the following user search parameters in the Advanced Configuration
attributes table:

//[cols=2*, cols"50,50"]
//[Options=header]
//|===
//|*Base DN*|*Query*
//|Attributes //|(&(objectCategory=person)(objectClass=user))
//|Email Address|mail
//|Phone|telephoneNumber
//|Country|Country
//|State|state
//|Department|department
//|Photo|thumbnailPhoto
//
//|===

== Testing Your User Directory Collector Configuration

You can validate LDAP User Permissions and Attribute Definitions using the
following procedures:

* Use the following command to validate Workload Security LDAP user
permission:
+
`ldapsearch -o ldif-wrap=no -LLL -x -b "dc=netapp,dc=com" -h 10.235.40.29
-p 389 -D \Administrator@netapp.com -W`

* Use AD Explorer to navigate an AD database, view object properties and
attributes, view permissions, view an object's schema, execute
sophisticated searches that you can save and re-execute.

** Install link:https://docs.microsoft.com/en-
us/sysinternals/downloads/adexplorer[AD Explorer] on any windows machine
which can connect to the AD Server.

** Connect to the AD server using the username/password of the AD
directory server.
```

```
image:cs_ADExample.png[AD Connection]


== Troubleshooting User Directory Collector Configuration Errors

The following table describes known problems and resolutions that can
occur during collector configuration:

[cols=2*,  cols"50,50"]
[options="header"]
|===
|Problem: | Resolution:
|Adding a User Directory connector results in the ‘Error’ state. Error
says, “Invalid credentials provided for LDAP server”.
|Incorrect username or password provided. Edit and provide the correct
user name and password.

|Adding a User Directory connector results in the ‘Error’ state. Error
says, “Failed to get the object corresponding to
DN=DC=hq,DC=domainname,DC=com provided as forest name.”
|Incorrect forest name provided. Edit and provide the correct forest name.

|The optional attributes of domain user are not appearing in the Workload
Security User Profile page.
|This is likely due to a mismatch between the names of optional attributes
added in CloudSecure and the actual attribute names in Active Directory.
Edit and provide the correct optional attribute name(s).

|Data collector in error state with "Failed to retrieve LDAP users. Reason
for failure: Cannot connect on the server, the connection is null"
|Restart the collector by clicking on the _Restart_ button.

|Adding a User Directory connector results in the ‘Error’ state.
|Ensure you have provided valid values for the required fields (Server,
forest-name, bind-DN, bind-Password).
Ensure bind-DN input is always provided as
‘Administrator@<domain_forest_name>’ or as a user account with domain
admin privileges.

|Adding a User Directory connector results in the ‘RETRYING’ state. Shows
error “Unable to define state of the collector,reason Tcp command
[Connect(localhost:35012,None,List(),Some(,seconds),true)] failed because
of java.net.ConnectionException:Connection refused.”
|Incorrect IP or FQDN provided for the AD Server. Edit and provide the
correct IP address or FQDN.

|Adding a User Directory connector results in the ‘Error’ state. Error
```

```
says, “Failed to establish LDAP connection”.
|Incorrect IP or FQDN provided for the AD Server. Edit and provide the
correct IP address or FQDN.

|Adding a User Directory connector results in the ‘Error’ state. Error
says, “Failed to load the settings. Reason: Datasource configuration has
an error. Specific reason: /connector/conf/application.conf: 70:
ldap.ldap-port has type STRING rather than NUMBER”
|Incorrect value for Port provided. Try using the default port values or
the correct port number for the AD server.

|I started with the mandatory attributes, and it worked. After adding the
optional ones, the optional attributes data is not getting fetched from
AD.
|This is likely due to a mismatch between the optional attributes added in
CloudSecure and the actual attribute names in Active Directory. Edit and
provide the correct mandatory or optional attribute name.

|After restarting the collector, when will the AD sync happen?
|AD sync will happen immediately after the collector restarts. It will
take approximately 15 minutes to fetch user data of approximately 300K
users, and is refreshed every 12 hours automatically.

|User Data is synced from AD to CloudSecure. When will the data be
deleted?
|User data is retained for 13months in case of no refresh. If the tenant
is deleted then the data will be deleted.

|User Directory connector results in the ‘Error’ state. "Connector is in
error state. Service name: usersLdap. Reason for failure: Failed to
retrieve LDAP users. Reason for failure: 80090308: LdapErr: DSID-0C090453,
comment: AcceptSecurityContext error, data 52e, v3839"
|Incorrect forest name provided. See above on how to provide the correct
forest name.

|Telephone number is not getting populated in the user profile page.
|This is most likely due to an attribute mapping problem with the Active
Directory.

1. Edit the particular Active Directory collector which is fetching the
user’s information from Active Directory.
2. Notice under optional attributes, there is a field name “Telephone
Number” mapped to Active Directory attribute ‘telephonenumber’.
4. Now, please use the Active Directory Explorer tool as described above
to browse the Active Directory and see the correct attribute name.
3. Make sure that in Active Directory there is an attribute named
```

```
‘telephonenumber’ which has indeed the telephone number of the user.
5. Let us say in Active Directory it has been modified to ‘phonenumber’.
6. Then Edit the CloudSecure User Directory collector. In optional
attribute section, replace ‘telephonenumber’ with ‘phonenumber’.
7. Save the Active Directory collector, the collector will restart and get
the telephone number of the user and display the same in the user profile
page.

|If encryption certificate (SSL) is enabled on the Active Directory (AD)
Server, the Workload Security User Directory Collector can not connect to
the AD Server.
|Disable AD Server encryption before Configuring a User Directory
Collector.
Once the user detail is fetched it will be there for 13 months.
If the AD server gets disconnected after fetching the user details, the
newly added users in AD won’t get fetched. To fetch again, the user
directory collector needs to be connected to AD.

|Data from Active Directory is present in CloudInsights Security.
Want to delete all the user information from CloudInsights.
|It is not possible to ONLY delete Active Directory user information from
CloudInsights Security. In order to delete the user, the complete tenant
needs to be deleted.

|===




[[ID263a58ff7727aa1194c02e437f331456]]
= Configuring an LDAP Directory Server Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You configure Workload Security to collect user attributes from LDAP
Directory servers.

.Before you begin

* You must be a Cloud Insights Administrator or Account Owner to perform
this task.
```

```
* You must have the IP address of the server hosting the LDAP Directory
server.
* An Agent must be configured before you configure an LDAP Directory
connector.

.Steps to Configure a User Directory Collector

. In the Workload Security menu, click:
*Collectors > User Directory Collectors > + User Directory Collector* and
select *LDAP Directory Server*
+
The system displays the Add User Directory screen.

Configure the User Directory Collector by entering the required data in
the following tables:

[cols=2*, cols"30,70"]
[Options=header]
|===
|Name|Description
|Name |Unique name for the user directory. For example
_GlobalLDAPCollector_
|Agent|Select a configured agent from the list
|Server IP/Domain Name|IP address or Fully-Qualified Domain Name (FQDN) of
server hosting the LDAP Directory Server
|Search Base|Search Base of the LDAP server
Search Base allows both of the following formats:

_x.y.z_ => direct domain name as you have it on your SVM. [Example:
hq.companyname.com]

_DC=x,DC=y,DC=z_ => Relative distinguished names [Example: DC=hq,DC=
companyname,DC=com]

Or you can specify as the following:

_OU=engineering,DC=hq,DC= companyname,DC=com_ [to filter by specific OU
engineering]

_CN=username,OU=engineering,DC=companyname, DC=netapp, DC=com_ [to get
only specific user with <username> from OU <engineering>]

_CN=Acrobat Users,CN=Users,DC=hq,DC=companyname,DC=com,O=
companyname,L=Boston,S=MA,C=US_ [to get all Acrobat Users within the Users
in that organization]
```

```
|Bind DN|User permitted to search the directory. For example:
uid=ldapuser,cn=users,cn=accounts,dc=domain,dc=companyname,dc=com
uid=john,cn=users,cn=accounts,dc=dorp,dc=company,dc=com for a user
john@dorp.company.com.

dorp.company.com
|--accounts
        |--users
              |--john
              |--anna

|BIND password|Directory server password (i.e. password for username used
in Bind DN)
|Protocol|ldap, ldaps, ldap-start-tls
|Ports|Select port
|===

////
Add to table once link is provided:
For more details about forest names, please refer to this
xref:{relative_path}////

Enter the following Directory Server required attributes if the default
attribute names have been modified in LDAP Directory Server. Most often
these attributes names are _not_ modified in LDAP Directory Server, in
which case you can simply proceed with the default attribute name.

[cols=2*, cols"50,50"]
[Options=header]
|===
|Attributes |Attribute name in Directory Server
|Display Name|name
|UNIXID|uidnumber
|User Name|uid
|===

Click Include Optional Attributes to add any of the following attributes:

[cols=2*, cols"50,50"]
[Options=header]
|===
|Attributes |Attribute Name in Directory Server
|Email Address|mail
|Telephone Number|telephonenumber
|Role|title
```

```
|Country|co
|State|state
|Department|departmentnumber
|Photo|photo
|ManagerDN|manager
|Groups|memberOf
|===


//Removed based on review comments
//Enter the following user search parameters in the Advanced Configuration
attributes table:

//[cols=2*, cols"50,50"]
//[Options=header]
//|===
//|*Base DN*|*Query*
//|Attributes //|(&(objectCategory=person)(objectClass=user))
//|Email Address|mail
//|Phone|telephoneNumber
//|Country|Country
//|State|state
//|Department|department
//|Photo|thumbnailPhoto
//
//|===

== Testing Your User Directory Collector Configuration

You can validate LDAP User Permissions and Attribute Definitions using the
following procedures:

* Use the following command to validate Workload Security LDAP user
permission:
+
 ldapsearch -D "uid=john ,cn=users,cn=accounts,dc=dorp,dc=company,dc=com"
-W -x -LLL -o ldif-wrap=no -b "cn=accounts,dc=dorp,dc=company,dc=com" -H
ldap://vmwipaapp08.dorp.company.com

* Use LDAP Explorer to navigate an LDAP database, view object properties
and attributes, view permissions, view an object's schema, execute
sophisticated searches that you can save and re-execute.

** Install LDAP Explorer (http://ldaptool.sourceforge.net/) or Java LDAP
Explorer (http://jxplorer.org/) on any windows machine which can connect
to the LDAP Server.
```

```
** Connect to the LDAP server using the username/password of the LDAP
directory server.

image:CloudSecure_LDAPDialog.png[LDAP Connection]



== Troubleshooting LDAP Directory Collector Configuration Errors

The following table describes known problems and resolutions that can
occur during collector configuration:

[cols=2*,  cols"50,50"]
[options="header"]
|===
|Problem: | Resolution:
|Adding an LDAP Directory connector results in the ‘Error’ state. Error
says, “Invalid credentials provided for LDAP server”.
|Incorrect Bind DN or Bind Password or Search Base provided. Edit and
provide the correct information.

|Adding an LDAP Directory connector results in the ‘Error’ state. Error
says, “Failed to get the object corresponding to
DN=DC=hq,DC=domainname,DC=com provided as forest name.”
|Incorrect Search Base provided. Edit and provide the correct forest name.

|The optional attributes of domain user are not appearing in the Workload
Security User Profile page.
|This is likely due to a mismatch between the names of optional attributes
added in CloudSecure and the actual attribute names in Active Directory.
Fields are case sensitive. Edit and provide the correct optional attribute
name(s).

|Data collector in error state with "Failed to retrieve LDAP users. Reason
for failure: Cannot connect on the server, the connection is null"
|Restart the collector by clicking on the _Restart_ button.

|Adding an LDAP Directory connector results in the ‘Error’ state.
|Ensure you have provided valid values for the required fields (Server,
forest-name, bind-DN, bind-Password).
Ensure bind-DN input is always provided as
uid=ldapuser,cn=users,cn=accounts,dc=domain,dc=companyname,dc=com.

|Adding an LDAP Directory connector results in the ‘RETRYING’ state. Shows
error “Failed to determine the health of the collector hence retrying
again”
|Ensure correct Server IP and Search Base is provided
```

```
////
|While adding LDAP directory the following error is shown:
“Failed to determine the health of the collector within 2 retries, try
restarting the collector again(Error Code: AGENT008)”
|Ensure correct Server IP and Search Base is provided

|Adding an LDAP Directory connector results in the ‘RETRYING’ state. Shows
error “Unable to define state of the collector,reason Tcp command
[Connect(localhost:35012,None,List(),Some(,seconds),true)] failed because
of java.net.ConnectionException:Connection refused.”
|Incorrect IP or FQDN provided for the AD Server. Edit and provide the
correct IP address or FQDN.
////

|Adding an LDAP Directory connector results in the ‘Error’ state. Error
says, “Failed to establish LDAP connection”.
|Incorrect IP or FQDN provided for the LDAP Server. Edit and provide the
correct IP address or FQDN.
Or
Incorrect value for Port provided. Try using the default port values or
the correct port number for the LDAP server.

|Adding an LDAP Directory connector results in the ‘Error’ state. Error
says, “Failed to load the settings. Reason: Datasource configuration has
an error. Specific reason: /connector/conf/application.conf: 70:
ldap.ldap-port has type STRING rather than NUMBER”
|Incorrect value for Port provided. Try using the default port values or
the correct port number for the AD server.

|I started with the mandatory attributes, and it worked. After adding the
optional ones, the optional attributes data is not getting fetched from
AD.
|This is likely due to a mismatch between the optional attributes added in
CloudSecure and the actual attribute names in Active Directory. Edit and
provide the correct mandatory or optional attribute name.

|After restarting the collector, when will the LDAP sync happen?
|LDAP sync will happen immediately after the collector restarts. It will
take approximately 15 minutes to fetch user data of approximately 300K
users, and is refreshed every 12 hours automatically.

|User Data is synced from LDAP to CloudSecure. When will the data be
deleted?
|User data is retained for 13months in case of no refresh. If the tenant
is deleted then the data will be deleted.
```

```
|LDAP Directory connector results in the ‘Error’ state. "Connector is in
error state. Service name: usersLdap. Reason for failure: Failed to
retrieve LDAP users. Reason for failure: 80090308: LdapErr: DSID-0C090453,
comment: AcceptSecurityContext error, data 52e, v3839"
|Incorrect forest name provided. See above on how to provide the correct
forest name.

|Telephone number is not getting populated in the user profile page.
|This is most likely due to an attribute mapping problem with the Active
Directory.

1. Edit the particular Active Directory collector which is fetching the
user’s information from Active Directory.
2. Notice under optional attributes, there is a field name “Telephone
Number” mapped to Active Directory attribute ‘telephonenumber’.
4. Now, please use the Active Directory Explorer tool as described above
to browse the LDAP Directory server and see the correct attribute name.
3. Make sure that in LDAP Directory there is an attribute named
‘telephonenumber’ which has indeed the telephone number of the user.
5. Let us say in LDAP Directory it has been modified to ‘phonenumber’.
6. Then Edit the CloudSecure User Directory collector. In optional
attribute section, replace ‘telephonenumber’ with ‘phonenumber’.
7. Save the Active Directory collector, the collector will restart and get
the telephone number of the user and display the same in the user profile
page.

|If encryption certificate (SSL) is enabled on the Active Directory (AD)
Server, the Workload Security User Directory Collector can not connect to
the AD Server.
|Disable AD Server encryption before Configuring a User Directory
Collector.
Once the user detail is fetched it will be there for 13 months.
If the AD server gets disconnected after fetching the user details, the
newly added users in AD won’t get fetched. To fetch again the user
directory collector needs to be connected to AD.



|===





[[ID8aff8313ebb28727869d3d7d9122ac36]]
= Configuring the ONTAP SVM Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Workload Security uses data collectors to collect file and user access
data from devices.

== Before you begin

* This data collector is supported with the following:
** Data ONTAP 9.2 and later versions. For best performance, use a Data
ONTAP version greater than 9.13.1.
** SMB protocol version 3.1 and earlier.
//Note that Workload Security does not work with SMB configurations that
use Flexcache. In systems using Flexcache, starting with ONTAP 9.7,
Fpolicy is supported only in an NFS environment.
**  NFS protocol version 4.0 and earlier
** Flexgroup is supported from ONTAP 9.4 and later versions
** ONTAP Select is supported

* Only data type SVMs are supported. SVMs with infinite volumes are not
supported.

* SVM has several sub-types. Of these, only _default_, _sync_source_, and
_sync_destination_ are supported.

* An Agent xref:{relative_path}task_cs_add_agent.html[must be configured]
before you can configure data collectors.

* Make sure that you have a properly configured User Directory Connector,
otherwise events will show encoded user names and not the actual name of
the user (as stored in Active Directory) in the “Activity Forensics” page.

* For optimal performance, you should configure the FPolicy server to be
on the same subnet as the storage system.

//* You need the SVM management IP address or the cluster IP, and username
/ password for login.

* You must add an SVM using one of the following two methods:
** By Using Cluster IP, SVM name, and Cluster Management Username and
Password. *_This is the recommended method._*
*** SVM name must be exactly as is shown in ONTAP and is case-sensitive.
** By Using SVM Vserver Management IP, Username, and Password
** If you are not able or not willing to use the full Administrator
```

```
Cluster/SVM Management Username and Password, you can create a custom user
with lesser privileges as mentioned in the xref:{relative_path}#a-note-
about-permissions[“A note about permissions”] section below. This custom
user can be created for either SVM or Cluster access.
*** o   You can also use an AD user with a role that has at least the
permissions of csrole as mentioned in “A note about permissions” section
below. Also refer to the link:https://docs.netapp.com/ontap-
9/index.jsp?topic=%2Fcom.netapp.doc.pow-adm-auth-rbac%2FGUID-0DB65B04-
71DB-43F4-9A0F-850C93C4896C.html[ONTAP documentation].

* Ensure the correct applications are set for the SVM by executing the
following command:

 clustershell::> security login show -vserver <vservername> -user-or-group
-name <username>

Example output:
 image:cs_svm_sample_output.png[SVM Command Output Example]

////
security login show -vserver svmname
    Vserver: svmname
    Authentication Acct Is-Nsswitch
    User/Group Name Application Method Role Name Locked Group
    vsadmin http password vsadmin yes no
    vsadmin ontapi password vsadmin yes no
    vsadmin ssh password vsadmin yes no
    3 entries were displayed.
////

* Ensure that the SVM has a CIFS server configured:
 clustershell::> `vserver cifs show`
+
The system returns the Vserver name, CIFS server name and additional
fields.

* Set a password for the SVM vsadmin user. If using custom user or cluster
admin user, skip this step.
 clustershell::> `security login password -username vsadmin -vserver
svmname`

* Unlock the SVM vsadmin user for external access. If using custom user or
cluster admin user, skip this step.
 clustershell::> `security login unlock -username vsadmin -vserver
svmname`
```

```
* Ensure the firewall-policy of the data LIF is set to ‘mgmt’ (not
‘data’). Skip this step if using a dedicated management lif to add the
SVM.
 clustershell::> `network interface modify -lif <SVM_data_LIF_name>
-firewall-policy mgmt`

* When a firewall is enabled, you must have an exception defined to allow
TCP traffic for the port using the Data ONTAP Data Collector.
+
See xref:{relative_path}concept_cs_agent_requirements.html[Agent
requirements] for configuration information. This applies to on-premise
Agents and Agents installed in the Cloud.

* When an Agent is installed in an AWS EC2 instance to monitor a Cloud
ONTAP SVM, the Agent and Storage must be in the same VPC. If they are in
separate VPCs, there must be a valid route between the VPC’s.


== Prerequisites for User Access Blocking

Keep the following in mind for
xref:{relative_path}/cloudinsights/cs_restrict_user_access.html[User
Access Blocking]:

Cluster level credentials are needed for this feature to work.

If you are using cluster administration credentials, no new permissions
are needed.

If you are using a custom user (for example, _csuser_) with permissions
given to the user, then follow the steps below to give permissions to
Workload Security to block user.

For csuser with cluster credentials, do the following from the ONTAP
command line:

 security login role create -role csrole -cmddirname "vserver export-
policy rule" -access all
 security login role create -role csrole -cmddirname set -access all
 security login role create -role csrole -cmddirname "vserver cifs
session" -access all
 security login role create -role csrole -cmddirname "vserver services
access-check authentication translate" -access all
 security login role create -role csrole -cmddirname "vserver name-
mapping" -access all
```

```
== A Note About Permissions

=== Permissions when adding via *Cluster Management IP*:

If you cannot use the Cluster management administrator user to allow
Workload Security to access the ONTAP SVM data collector, you can create a
new user named “csuser” with the roles as shown in the commands below. Use
the username “csuser” and password for “csuser” when configuring the
Workload Security data collector to use Cluster Management IP.

To create the new user, log in to ONTAP with the Cluster management
Administrator username/password, and execute the following commands on the
ONTAP server:

 security login role create -role csrole -cmddirname DEFAULT -access
readonly

 security login role create -role csrole -cmddirname "vserver fpolicy"
-access all
 security login role create -role csrole -cmddirname "volume snapshot"
-access all -query "-snapshot cloudsecure_*"
 security login role create -role csrole -cmddirname "event catalog"
-access all
 security login role create -role csrole -cmddirname "event filter"
-access all
 security login role create -role csrole -cmddirname "event notification
destination" -access all
 security login role create -role csrole -cmddirname "event notification"
-access all
 security login role create -role csrole -cmddirname "security
certificate" -access all

 security login create -user-or-group-name csuser -application ontapi
-authmethod password -role csrole
 security login create -user-or-group-name csuser -application ssh
-authmethod password -role csrole


Permissions for ONTAP ARP Integration:

 security login rest-role create -role arwrole -api /api/storage/volumes
-access readonly -vserver <cluster_name>
 security login rest-role create -api /api/security/anti-ransomware
-access readonly  -role arwrole -vserver <cluster_name>
 security login create -user-or-group-name csuser -application http
-authmethod password -role arwrole
```

```
Permissions for ONTAP Access Denied:

 security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <cluster_name>
 security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole

Note: If one rest-role is already added--either _arwrole_ or
_csrestrole_--there is no need to add a second rest-role. You can simply
add the API permissions as in the example below.

Example: _csrestrole_ is already present, so we only have to enable anti-
ransomware protection and give API permissions to the existing
_csrestrole_:

 security login rest-role create -role csrestrole -api
/api/storage/volumes -access readonly -vserver <cluster_name>
 security login rest-role create -api /api/security/anti-ransomware
-access readonly  -role arwrole -vserver <cluster_name>


=== Permissions when adding via *Vserver Management IP*:

If you cannot use the Cluster management administrator user to allow
Workload Security to access the ONTAP SVM data collector, you can create a
new user named “csuser” with the roles as shown in the commands below. Use
the username “csuser” and password for “csuser” when configuring the
Workload Security data collector to use Vserver Management IP.

//If you cannot use the "vsadmin" user, since “vsadmin” has all the
privileges, create a new user named “csuser” with the following roles as
is shown in the command below. Use the username “csuser” and password for
“csuser” for adding the Vserver via Vserver Mgmt IP in the ONTAP
DataSource Addition UI.

To create the new user, log in to ONTAP with the Cluster management
Administrator username/password, and execute the following commands on the
ONTAP server. For ease, copy these commands to a text editor and replace
the <vservername> with your Vserver name before and executing these
commands on ONTAP:

 security login role create -vserver <vservername> -role csrole
-cmddirname DEFAULT -access none

 security login role create -vserver <vservername> -role csrole
-cmddirname "network interface" -access readonly
```

```
 security login role create -vserver <vservername> -role csrole
-cmddirname version -access readonly
 security login role create -vserver <vservername> -role csrole
-cmddirname volume -access readonly
 security login role create -vserver <vservername> -role csrole
-cmddirname vserver -access readonly

 security login role create -vserver <vservername> -role csrole
-cmddirname "vserver fpolicy" -access all
 security login role create -vserver <vservername> -role csrole
-cmddirname "volume snapshot" -access all

 security login create -user-or-group-name csuser -application ontapi
-authmethod password -role csrole -vserver <vservername>


Permissions for ONTAP Access Denied:

 security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <svm_name>
 security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole -vserver <svm_name>


=== Permissions for ONTAP Autonomous Ransomware Protection

If you are using cluster administration credentials, no new permissions
are needed.

If you are using a custom user (for example, _csuser_) with permissions
given to the user, then follow the steps below to give permissions to
Workload Security to collect ARP related information from ONTAP.

For _csuser_ with cluster credentials, do the following from the ONTAP
command line:

 security login rest-role create -role arwrole -api /api/storage/volumes
-access readonly -vserver <cluster_name>
 security login rest-role create -api /api/security/anti-ransomware
-access readonly  -role arwrole -vserver <cluster_name>
 security login create -user-or-group-name csuser -application http
-authmethod password -role arwrole

For more information, read about
xref:{relative_path}concept_cs_integration_with_ontap_arp.html[Integration
with ONTAP Autonomous Ransomware Protection]
```

```
=== Permissions for ONTAP Access Denied

If the Data Collector is added using cluster administration credentials,
no new permissions are needed.

If the Collector is added using a custom user (for example, _csuser_) with
permissions given to the user, follow the steps below to give Workload
Security the necessary permission to register for Access Denied events
with ONTAP.

For csuser with _cluster_ credentials, execute the following commands from
the ONTAP command line. Note that _csrestrole_ is custom role and _csuser_
is ontap custom user.
```

```
security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <cluster_name>
security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole
```

```
For csuser with _SVM_ credentials, execute the following commands from the
ONTAP command line:
```

```
security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <svm_name>
security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole -vserver <svm_name>
```

```
For more information, read about
xref:{relative_path}concept_ws_integration_with_ontap_access_denied.html[I
ntegration with ONTAP Access Denied]





== Configure the data collector

.Steps for Configuration

. Log in as Administrator or Account Owner to your Cloud Insights
environment.
```

```
. Click *Workload Security > Collectors > +Data Collectors*
+
The system displays the available Data Collectors.

. Hover over the *NetApp SVM tile and click *+Monitor*.
+
The system displays the ONTAP SVM configuration page. Enter the required
data for each field.

[caption=]
.Configuration
[cols=2*, cols"50,50"]
[Options=header]
|===
|Field|Description
|Name |Unique name for the Data Collector
|Agent|Select a configured agent from the list.
|Connect via Management IP for:|Select either Cluster IP or SVM Management
IP
|Cluster / SVM Management IP Address|The IP address for the cluster or the
SVM, depending on your selection above.
|SVM Name|The Name of the SVM (this field is required when connecting via
Cluster IP)
|Username|User name to access the SVM/Cluster
When adding via Cluster IP the options are:
1.  Cluster-admin
2.  ‘csuser’
3.  AD-user having similar role as csuser.
When adding via SVM IP the options are:
4.  vsadmin
5.  ‘csuser’
6.  AD-username having similar role as csuser.

|Password|Password for the above user name
|Filter Shares/Volumes|Choose whether to include or exclude Shares /
Volumes from event collection
|Enter complete share names to exclude/include|Comma-separated list of
shares to exclude or include (as appropriate) from event collection
|Enter complete volume names to exclude/include|Comma-separated list of
volumes to exclude or include (as appropriate) from event collection
|Monitor Folder Access|When checked, enables events for folder access
monitoring. Note that folder create/rename and delete will be monitored
even without this option selected. Enabling this will increase the number
of events monitored.
|Set ONTAP Send Buffer size|Sets the ONTAP Fpolicy send buffer size. If an
```

```
ONTAP version prior to 9.8p7 is used and performance issue is seen, then
the ONTAP send buffer size can be altered to get improved ONTAP
performance. Contact NetApp Support if you do not see this option and wish
to explore it.

|===


.After you finish

//* Click *Test Configuration* to check the status of the collector you
configured.

* In the Installed Data Collectors page, use the options menu on the right
of each collector to edit the data collector. You can restart the data
collector or edit data collector configuration attributes.





== Recommended Configuration for Metro Cluster

The following is recommended for Metro Cluster:

1.  Connect two data collectors, one to the source SVM and another to the
destination SVM.
2.  The data collectors should be connected by _Cluster IP_.
3.  At any moment of time, one data collector should be in running,
another will be in error.
+
The current ‘running’ SVM’s data collector will show as _Running_. The
current ‘stopped’ SVM’s
data collector will show as _Error_.

4.  Whenever there is a switchover, the state of the data collector will
change from ‘running’ to ‘error’ and vice versa.
5.  It will take up to two minutes for the data collector to move from
Error state to Running state.


== Service Policy

If using service policy from ONTAP version 9.9.1, in order to connect to
the Data Source Collector, the _data-fpolicy-client_ service is required
along with the data service _data-nfs_, and/or _data-cifs_.
```

```
Example:

 Testcluster-1::*> net int service-policy create -policy only_data_fpolicy
-allowed-addresses 0.0.0.0/0 -vserver aniket_svm
 -services data-cifs,data-nfs,data,-core,data-fpolicy-client
 (network interface service-policy create)

In versions of ONTAP prior to 9.9.1, _data-fpolicy-client_ need not be
set.



== Play-Pause Data  Collector

2 new operations are now shown on kebab menu of collector (PAUSE and
RESUME).

If the Data Collector is in _Running_ state, you can Pause collection.
Open the "three dots" menu for the collector and select PAUSE. While the
collector is paused, no data is gathered from ONTAP, and no data is sent
from the collector to ONTAP. This means no Fpolicy events will flow from
ONTAP to the data collector, and from there to Cloud Insights.

Note that if any new volumes, etc. are created on ONTAP while the
collector is Paused, Workload Security won’t gather the data and those
volumes, etc. will not be reflected in dashboards or tables.

Keep the following in mind:

* Snapshot purge won’t happen as per the settings configured on a paused
collector.
* EMS events (like ONTAP ARP) won’t be processed on a paused collector.
This means if ONTAP identifies a ransomware attack, Cloud Insights
Workload Security won’t be able to acquire that event.
* Health notifications emails will NOT be sent for a paused collector.
* Manual or Automatic actions (such as Snapshot or User Blocking) will not
be supported on a paused collector.
* On agent or collector upgrades, agent VM restarts/reboots, or agent
service restart, a paused collector will remain in _Paused_ state.
* If the data collector is in _Error_ state, the collector cannot be
changed to _Paused_ state. The Pause button will be enabled only if the
state of the collector is _Running_.
* If the agent is disconnected, the collector cannot be changed to
_Paused_ state. The collector will go into _Stopped_ state and the Pause
button will be disabled.
```

```
== Troubleshooting

Known problems and their resolutions are described in the following table.

In the case of an error, click on _more detail_ in the _Status_ column for
detail about the error.

image:CS_Data_Collector_Error.png[]

[cols=2*, options="header", cols"30,70"]

|===
|Problem: | Resolution:

|Data Collector runs for some time and stops after a random time, failing
with: "Error message: Connector is in error state. Service name: audit.
Reason for failure: External fpolicy server overloaded."
|The event rate from ONTAP was much higher than what the Agent box can
handle. Hence the connection got terminated.

Check the peak traffic in CloudSecure when the disconnection happened.
This you can check from the *CloudSecure > Activity Forensics > All
Activity* page.

If the peak aggregated traffic is higher than what the Agent Box can
handle, then please refer to the Event Rate Checker page on how to size
for Collector deployment in an Agent Box.

If the Agent was installed in the Agent box prior to 4 March 2021, run the
following commands in the Agent box:

 echo 'net.core.rmem_max=8388608' >> /etc/sysctl.conf
 echo 'net.ipv4.tcp_rmem = 4096 2097152 8388608' >> /etc/sysctl.conf
 sysctl -p

Restart the collector from the UI after resizing.


|Collector reports Error Message: “No local IP address found on the
connector that can reach the data interfaces of the SVM”.
|This is most likely due to a networking issue on the ONTAP side. Please
follow these steps:

1. Ensure that there are no firewalls on the SVM data lif or the
management lif which are blocking the connection from the SVM.

2. When adding an SVM via a cluster management IP, please ensure that the
```

```
data lif and management lif of the SVM are pingable from the Agent VM. In
case of issues, check the gateway, netmask and routes for the lif.

You can also try logging in to the cluster via ssh using the cluster
management IP, and ping the Agent IP. Make sure that the agent IP is
pingable:

_network ping -vserver <vserver name> -destination <Agent IP> -lif <Lif
Name> -show-detail_

If not pingable, make sure the network settings in ONTAP are correct, so
that the Agent machine is pingable.

3. If you have tried connecting via Cluster IP and it is not working, try
connecting directly via SVM IP. Please see above for the steps to connect
via SVM IP.

4. While adding the collector via SVM IP and vsadmin credentials, check if
the SVM Lif has Data plus Mgmt role enabled. In this case ping to the SVM
Lif will work, however SSH to the SVM Lif will not work.
If yes, create an SVM Mgmt Only Lif and try connecting via this SVM
management only Lif.

5. If it is still not working, create a new SVM Lif and try connecting
through that Lif. Make sure that the subnet mask is correctly set.

6. Advanced Debugging:
a)  Start a packet trace in ONTAP.
b)  Try to connect a data collector to the SVM from CloudSecure UI.
c)  Wait till the error appears. Stop the packet trace in ONTAP.
d)  Open the packet trace from ONTAP. It is available at this location

 _\https://<cluster_mgmt_ip>/spi/<clustername>/etc/log/packet_traces/_

e)  Make sure there is a SYN from ONTAP to the Agent box.
f)  If there is no SYN from ONTAP then it is an issue with firewall in
ONTAP.
g)  Open the firewall in ONTAP, so that ONTAP is able to connect the agent
box.

7. If it is still not working, please consult the networking team to make
sure that no external firewall is blocking the connection from ONTAP to
the Agent box.

8. Verify that port 7 is open.

9. If none of the above solves the issue, open a case with
```

```
link:http://docs.netapp.com/us-
en/cloudinsights/concept_requesting_support.html[Netapp Support] for
further assistance.



|Message: "Failed to determine ONTAP type for [hostname: <IP Address>.
Reason: Connection error to Storage System <IP Address>: Host is
unreachable (Host unreachable)"
|1. Verify that the correct SVM IP Management address or Cluster
Management IP has been provided.
2. SSH to the SVM or the Cluster to which you are intending to connect.
Once you are connected ensure that the SVM or the Cluster name is correct.

|Error Message: "Connector is in error state. Service.name: audit. Reason
for failure: External fpolicy server terminated."
|1. It is most likely that a firewall is blocking the necessary ports in
the agent machine. Verify the port range 35000-55000/tcp is opened for the
agent machine to connect from the SVM. Also ensure that there are no
firewalls enabled from the ONTAP side blocking communication to the agent
machine.

2. Type the following command in the Agent box and ensure that the port
range is open.

_sudo iptables-save \| grep 3500*_

Sample output should look like:

_-A IN_public_allow -p tcp -m tcp --dport 35000 -m conntrack -ctstate NEW
-j ACCEPT_

3. Login to SVM, enter the following commands and check that no firewall
is set to block the communication with ONTAP.

_system services firewall show_
_system services firewall policy show_

link:https://docs.netapp.com/ontap-
9/index.jsp?topic=%2Fcom.netapp.doc.dot-cm-nmg%2FGUID-969851BB-4302-4645-
8DAC-1B059D81C5B2.html[Check firewall commands] on the ONTAP side.

4. SSH to the SVM/Cluster which you want to monitor. Ping the Agent box
from the SVM data lif (with CIFS, NFS protocols support) and ensure that
ping is working:

 _network ping -vserver <vserver name> -destination <Agent IP> -lif <Lif
```

```
Name> -show-detail_

If not pingable, make sure the network settings in ONTAP are correct, so
that the Agent machine is pingable.

5.If a single SVM is added twice added to a tenant via 2 data collectors,
then this error will be shown. Delete one of the data collectors thru the
UI. Then restart the other data collector thru the UI. Then the data
collector will show “RUNNING” status and will start receiving events from
SVM.

Basically, in a tenant, 1 SVM should be added only once, via 1 data
collector. 1 SVM should not added twice via 2 data collectors.

6. In instances where the same SVM was added in two different Workload
Security environments (tenants), the last one will always succeed. The
second collector will configure fpolicy with its own IP address and kick
out the first one. So the collector in the first one will stop receiving
events and its "audit" service will enter into error state.
To prevent this, configure each SVM on a single environment.


7. This error may also occur if service policies are not configured
correctly. With ONTAP 9.8 or later, in order to connect to the Data Source
Collector, the data-fpolicy-client service is required along with the data
service data-nfs, and/or data-cifs. Additionally, the data-fpolicy-client
service must be associated with the data lif(s) for the monitored SVM.

|No events seen in activity page.
|1. Check if ONTAP collector is in “RUNNING” state. If yes, then ensure
that some cifs events are being generated on the cifs client VMs by
opening some files.

2. If no activities are seen, please login to the SVM and enter the
following command.
_<SVM>event log show -source fpolicy_
Please ensure that there are no errors related to fpolicy.

3. If no activities are seen, please login to the SVM. Enter the following
command
_<SVM>fpolicy show_
Check if the fpolicy policy named with prefix “cloudsecure_” has been set
and status is “on”. If not set, then most likely the Agent is unable to
execute the commands in the SVM. Please ensure all the prerequisites as
described in the beginning of the page have been followed.

|SVM Data Collector is in error state and Errror message is “Agent failed
```

```
to connect to the collector”
|1. Most likely the Agent is overloaded and is unable to connect to the
Data Source collectors.
2. Check how many Data Source collectors are connected to the Agent.
3. Also check the data flow rate in the “All Activity” page in the UI.
4. If the number of activities per second is significantly high, install
another Agent and move some of the Data Source Collectors to the new
Agent.

|SVM Data Collector shows error message as "fpolicy.server.connectError:
Node failed to establish a connection with the FPolicy server
"12.195.15.146" ( reason: "Select Timed out")"
|Firewall is enabled in SVM/Cluster. So fpolicy engine is unable to
connect to fpolicy server.
CLIs in ONTAP which can be used to get more information are:

event log show -source fpolicy which shows the error
event log show -source fpolicy -fields event,action,description which
shows more details.

link:https://docs.netapp.com/ontap-
9/index.jsp?topic=%2Fcom.netapp.doc.dot-cm-nmg%2FGUID-969851BB-4302-4645-
8DAC-1B059D81C5B2.html[Check firewall commands] on the ONTAP side.

|Error Message: “Connector is in error state. Service name:audit. Reason
for failure: No valid data interface (role: data,data protocols: NFS or
CIFS or both, status: up) found on the SVM.”
|Ensure there is an operational interface (having role as data and data
protocol as CIFS/NFS.


|The data collector goes into Error state and then goes into RUNNING state
after some time, then back to Error again. This cycle repeats.
|This typically happens in the following scenario:
1.  There are multiple data collectors added.
2.  The data collectors which show this kind of behavior will have 1 SVM
added to these data collectors. Meaning 2 or more data collectors are
connected to 1 SVM.
3.  Ensure 1 data collector connects to only 1 SVM.
4.  Delete the other data collectors which are connected to the same SVM.

|Connector is in error state. Service name: audit. Reason for failure:
Failed to configure (policy on SVM svmname. Reason: Invalid value
specified for 'shares-to-include' element within 'fpolicy.policy.scope-
modify: "Federal'
|The share names need to be given without any quotes. Edit the ONTAP SVM
```

```
DSC configuration to correct the share names.

_Include and exclude shares_ is not intended for a long list of share
names. Use filtering by volume instead if you have a large number of
shares to include or exclude.

|There are existing fpolicies in the Cluster which are unused. What should
be done with those prior to installation of Workload Security?
|It is recommended to delete all existing unused fpolicy settings even if
they are in disconnected state. Workload Security will create fpolicy with
the prefix "cloudsecure_". All other unused fpolicy configurations can be
deleted.

CLI command to show fpolicy list:

_fpolicy show_

Steps to delete fpolicy configurations:

_fpolicy disable -vserver <svmname> -policy-name <policy_name>_
_fpolicy policy scope delete -vserver <svmname> -policy-name
<policy_name>_
_fpolicy policy delete -vserver <svmname> -policy-name <policy_name>_
_fpolicy policy event delete -vserver <svmname> -event-name <event_list>_
_fpolicy policy external-engine delete -vserver <svmname> -engine-name
<engine_name>_

|After enabling Workload Security, ONTAP performance is impacted: Latency
becomes sporadically high, IOPs become sporadically low.
|While using ONTAP with Workload Security sometimes latency issues can be
seen in ONTAP. There are a number of possible reasons for this as noted in
the following: link:https://mysupport.netapp.com/site/bugs-
online/product/ONTAP/BURT/1372994[1372994],
https://mysupport.netapp.com/site/bugs-
online/product/ONTAP/BURT/1415152[1415152],
https://mysupport.netapp.com/site/bugs-
online/product/ONTAP/BURT/1438207[1438207],
https://mysupport.netapp.com/site/bugs-
online/product/ONTAP/BURT/1479704[1479704],
https://mysupport.netapp.com/site/bugs-
online/product/ONTAP/BURT/1354659[1354659]. All of these issues are fixed
in ONTAP 9.13.1 and later; it is strongly recommended to use one of these
later versions.

|Data collector is in error, shows this error message.
“Error: Connector is in error state. Service name: audit. Reason for
```

```
failure: Failed to configure policy on SVM svm_test. Reason: Missing value
for zapi field: events. “
|Start with a new SVM with only NFS service configured.
Add an ONTAP SVM data collector in Workload Security. CIFS is configured
as an allowed protocol for the SVM while adding the ONTAP SVM Data
Collector in Workload Security.
Wait until the Data collector in Workload Security shows an error.
Since the CIFS server is NOT configured on the SVM, this error as shown in
the left is shown by Workload Security.
Edit the ONTAP SVM data collector and un-check CIFs as allowed protocol.
Save the data collector. It will start running with only NFS protocol
enabled.

|Data Collector shows the error message:
“Error: Failed to determine the health of the collector within 2 retries,
try restarting the collector again (Error Code: AGENT008)”.
|1. On the Data Collectors page, scroll to the right of the data collector
giving the error and click on the 3 dots menu. Select _Edit_.
Enter the password of the data collector again.
Save the data collector by pressing on the _Save_ button.
Data Collector will restart and the error should be resolved.

2. The Agent machine may not enough CPU or RAM headroom, that is why the
DSCs are failing.
Please check the number of Data Collectors which are added to the Agent in
the machine.
If it is more than 20, please increase the CPU and RAM capacity of the
Agent machine.
Once the CPU and RAM is increased, the DSCs will get into Initializing and
then to Running state automatically.
Look into the sizing guide on link:https://docs.netapp.com/us-
en/cloudinsights/concept_cs_event_rate_checker.html[this page].

|===

If you are still experiencing problems, reach out to the support links
mentioned in the *Help > Support* page.




[[ID7a8d1548286601e3093c9c9eded74cf6]]
= Configuring the Cloud Volumes ONTAP and Amazon FSx for NetApp ONTAP
collector
:toc: macro
:hardbreaks:
:toclevels: 1
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Workload Security uses data collectors to collect file and user access
data from devices.


== Cloud Volumes ONTAP Storage Configuration

See the OnCommand Cloud Volumes ONTAP Documentation to configure a single-
node / HA AWS instance to host the Workload Security Agent:
https://docs.netapp.com/us-en/cloud-manager-cloud-volumes-ontap/index.html

After the configuration is complete, follow the steps to setup your SVM:
https://docs.netapp.com/us-en/cloudinsights/task_add_collector_svm.html

== Supported Platforms

*   Cloud Volumes ONTAP, supported in all the available cloud service
providers wherever available. For example: Amazon, Azure, Google Cloud.
*   ONTAP Amazon FSx


== Agent Machine Configuration

The agent machine must be configured in the respective subnets of the
cloud Service providers. Read more about network access in the [Agent
Requirements].

Below are the steps for Agent installation in AWS. Equivalent steps, as
applicable to the cloud service provider, can be followed in Azure or
Google Cloud for the installation.

In AWS, use the following steps to configure the machine to be used as a
Workload Security Agent:


Use the following steps to configure the machine to be used as a Workload
Security Agent:

.Steps

. Log in to the AWS console and navigate to EC2-Instances page and select
_Launch instance_.
```

```
. Select a RHEL or CentOS AMI with the appropriate version as mentioned in
this page:
https://docs.netapp.com/us-
en/cloudinsights/concept_cs_agent_requirements.html

. Select the VPC and Subnet that the Cloud ONTAP instance resides in.

. Select _t2.xlarge_ (4 vcpus and 16 GB RAM) as allocated resources.

.. Create the EC2 instance.

. Install the required Linux packages using the YUM package manager:

.. Install _wget_ and _unzip_ native Linux packages.

////
.. Install _selinux_ (dependency package for the docker-ce):
+
 wget http://mirror.centos.org/centos/7/extras/x86_64/Packages/container-
selinux-2.68-1.el7.noarch.rpm
 yum install -y container-selinux-2.68-1.el7.noarch.rpm

. Install the docker-ce (not the native docker) package. You must use a
version higher than 17.03:
https://download.docker.com/linux/centos/7/x86_64/stable/Packages/

. SSH to the Redhat EC2 VM:
+
 ssh -i "your_new_pem.pem" <ec2_hostname_or_IP>
 sudo su -

. Perform a docker login after installing the required AWS CLI package:
+
 curl "https://s3.amazonaws.com/aws-cli/awscli-bundle.zip" -o "awscli-
bundle.zip"
 unzip awscli-bundle.zip
 sudo ./awscli-bundle/install -i /usr/local/aws -b /usr/local/bin/aws
 /usr/local/bin/aws --version
 aws configure --profile collector_readonly
 aws ecr get-login --no-include-email --region us-east-1 --profile
collector_readonly
 docker login -u AWS -p <token_generated_above>  <ECR_hostname>

. Use the following command to verify the steps completed successfully and
the _cs-ontap-dsc_ image can be successfully pulled:
+
 docker pull 376015418222.dkr.ecr.us-east-1.amazonaws.com/cs-ontap-
dsc:1.25.0
////


== Install the Workload Security Agent

. Log in as Administrator or Account Owner to your Cloud Insights
environment.

. Navigate to Workload Security *Collectors* and click the *Agents* tab.

. Click *+Agent* and specify RHEL as the target platform.

. Copy the Agent Installation command.

. Paste the Agent Installation command into the RHEL EC2 instance you are
logged in to.
This installs the Workload Security agent, providing all of the
xref:{relative_path}concept_cs_agent_requirements.html[Agent
Prerequisites] are met.

For detailed steps please refer to this xref:{relative_path}
https://docs.netapp.com/us-en/cloudinsights/task_cs_add_agent.html#steps-
to-install-agent

////
== Add a NetApp ONTAP data collector

. Click *Observability > Collectors > Data Collectors > +Data Collector*
and specify the NetApp ONTAP Cloud Volumes data collector. Enter the
required information in the fields.

[caption=]
.Configuration
[cols=2*, cols"50,50"]
[Options=header]
|===
|Field|Description
|Name |Unique name for the Data Collector
|Agent|Select a configured agent from the list or click *Add Agent* to
configure an Agent. See
xref:{relative_path}concept_cs_agent_requirements.html[Agent requirements]
and xref:{relative_path}task_cs_add_agent.html[Agent Installation] for
configuration information.
|SVM Management IP Address|Management IP Address
|Username|User name to access the SVM
```

```
|Password|SVM Password
|Enter complete share names to exclude|Comma-separated list of shares to
exclude from event collection
|Enter complete volume names to exclude|Comma-separated list of volumes to
exclude from event collection
|===

.. Click *Add Collector*

. Verify the Agent Server is running using the
`docker ps` command and a `docker logs <docker_image_id>` file.
+
All of the data collector's service status should be in the 'running'
state.

// .. Identify an NFS client (in the same VPC subnet as the Agent and
Cloud ONTAP)

//.. Install the nfs-utils package in this VPC Subnet:

//+

//‘yum install -y nfs-utils’

//.. NFS mount the volume / qtree container that was created in the SVM.
////



== Troubleshooting

Known problems and their resolutions are described in the following table.

|===
|Problem    |Resolution
|“Workload Security: Failed to determine ONTAP type for Amazon FxSN data
collector” error is shown by the Data Collector.
Customer is unable to add new Amazon FSxN data collector into Workload
Security.  Connection to FSxN cluster on port 443 from the agent is timing
out. Firewall and AWS security groups have the required rules enabled to
allow communication. An agent is already deployed and is in the same AWS
account as well. This same agent is used to connect and monitor the
remaining NetApp devices (and all of them are working).
|Solve this issue by adding fsxadmin LIF network segment to agent's
security rule.
Allowed all ports if you are not sure about the ports.
|===
[[IDc848d791112b9127eadbfa0939f1099d]]
= User Management
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Workload Security user accounts are managed through Cloud Insights.

Cloud Insights provides four user account levels: Account Owner,
Administrator, User, and Guest. Each account is assigned specific
permission levels. A User account that has Administrator privileges can
create or modify users, and assign each user one of the following Workload
Security roles:

|===
|Role   |Workload Security  Access
|Administrator
|Can perform all Workload Security functions, including those for Alerts,
Forensics, data collectors, automated response policies, and APIs for
Workload Security.
An Administrator can also invite other users but can only assign Workload
Security roles.
|User
|Can view and manage Alerts and view Forensics. User role can change alert
status, add a note, take snapshots manually, and restrict user access.
|Guest
|Can view Alerts and Forensics. Guest role cannot change alert status, add
a note, take snapshots manually, or restrict user access.

|===
.Steps

. Log into Workload Security
. In the menu, click *Admin > User Management*
+
You will be forwarded to Cloud Insights’s User Management page.

. Select the desired role for each user.

While adding a new user, simply select the desired role (usually User or
Guest).

More information on User accounts and roles can be found in the Cloud
Insights link:https://docs.netapp.com/us-
en/cloudinsights/concept_user_roles.html[User Role] documentation.



[[ID0acdeeac44f83b6c74cfa9027f41b028]]
= SVM Event Rate Checker (Agent Sizing Guide)
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]

The Event Rate Checker is used to check the NFS/SMB combined event rate in
the SVM before installing an ONTAP SVM data collector, to see how many
SVMs one Agent machine will be able to monitor. Use the Event Rate Checker
as a sizing guide to help plan your security environment.

An Agent can support up to a maximum of 50 data collectors.

== Requirements:

* Cluster IP
* Cluster admin username and password

NOTE: When running this script no ONTAP SVM Data Collector should be
running for the SVM for which event rate is being determined.

Steps:
```

```
. Install the Agent by following the instructions in CloudSecure.
. Once the agent is installed, run the _server_data_rate_checker.sh_
script as a sudo user:
+
 /opt/netapp/cloudsecure/agent/install/svm_event_rate_checker.sh

. This script requires _sshpass_ to be installed in the linux machine.
There are two ways to install it:

.. Run the following command:
+
 linux_prompt> yum install sshpass

.. If that does not work, then download _sshpass_ to the linux machine
from the web and run the following command:
+
 linux_prompt> rpm -i sshpass


.   Provide the correct values when prompted. See below for an example.

.   The script will take approximately 5 minutes to run.

.   After the run is complete, the script will print the event rate from
the SVM. You can check Event rate per SVM in the console output:
+
 “Svm svm_rate is generating 100 events/sec”.

//This will show the rate of generation of Events for a SVM.

Each Ontap SVM Data Collector can be associated with a single SVM, which
means each data collector will be able to receive the number of events
which a single SVM generates.

Keep the following in mind:

A) Use this table as a general sizing guide. You can increase the number
of cores and/or memory to increase the number of data collectors
supported, up to a maximum of 50 data collectors:

|===

|Agent Machine Configuration |Number of SVM Data Collectors |Max event
Rate which the Agent Machine can handle

|4 core, 16GB   |10 data collectors |20K events/sec
|4 core, 32GB   |20 data collectors |20K events/sec
```

```
|===

B) To calculate your total events, add the Events generated for all SVMs
for that agent.

C) If the script is not run during peak hours or if peak traffic is
difficult to predict, then keep an event rate buffer of 30%.

B + C Should be less than A, otherwise the Agent machine will fail to
monitor.

In other words, the number of data collectors which can be added to a
single agent machine should comply to the formula below:

 Sum of all Event rate of all Data Source Collectors + Buffer Event rate
of 30% < 20000 events/second

See the xref:{relative_path}concept_cs_agent_requirements.html[Agent
Requirements] page for additional pre-requisites and requirements.

== Example

Let us say we have three SVMS generating event rates of 100, 200, and 300
events per second, respectively.

We apply the formula:

 (100+200+300) + [(100+200+300)*30%] = 600+180 = 780events/sec
780 events/second is < 20000 events/second, so the 3 SVMs can be monitored
via one agent box.

Console output is available in the Agent machine in the file name
__fpolicy_stat_<SVM Name>.log__ in the present working directory.

The script may give erroneous results in the following cases:

* Incorrect credentials, IP, or SVM name are provided.
* An already-existing fpolicy with same name, sequence number, etc. will
give error.
* The script is stopped abruptly while running.


An example script run is shown below:

 [root@ci-cs-data agent]#
/opt/netapp/cloudsecure/agent/install/svm_event_rate_checker.sh
```

```
 Enter the cluster ip: 10.192.139.166
 Enter the username to SSH: admin
 Enter the password:
 Getting event rate for NFS and SMB events.
 Available SVMs in the Cluster
 -----------------------------
 QA_SVM
 Stage_SVM
 Qa-fas8020
 Qa-fas8020-01
 Qa-fas8020-02
 audit_svm
 svm_rate
 vs_new
 vs_new2

 -----------------------------
 Enter [1/5] SVM name to check (press enter to skip): svm_rate
 Enter [2/5] SVM name to check (press enter to skip): audit_svm
 Enter [3/5] SVM name to check (press enter to skip):
 Enter [4/5] SVM name to check (press enter to skip):
 Enter [5/5] SVM name to check (press enter to skip):
 Running check for svm svm_rate...
 Running check for svm audit_svm...
 Waiting 5 minutes for stat collection
 Stopping sample svm_rate_sample
 Stopping sample audit_svm_sample
 fpolicy stats of svm svm_rate is saved in fpolicy_stat_svm_rate.log
 Svm svm_rate is generating 100 SMB events/sec and 100 NFS events/sec
 Overall svm svm_rate is generating 200 events/sec
 fpolicy stats of svm audit_svm is saved in fpolicy_stat_audit_svm.log
 Svm audit_svm is generating 200 SMB events/sec and 100 NFS events/sec
 Overall svm audit_svm is generating 300 events/sec

 [root@ci-cs-data agent]#


== Troubleshooting

|===

|Question|Answer

|If I run this script on an SVM that is already configured for Workload
Security, does it just use the existing fpolicy config on the SVM or does
```

```
it setup a temporary one and run the process?
|The Event Rate Checker can run fine even for an SVM already configured
for Workload Security. There should be no impact.

|Can I increase the number of SVMs on which the script can be run?
|Yes. Simply edit the script and change the max number of SVMs from 5 to
any desirable number.

|If I increase the number of SVMs, will it increase the time of running of
the script?
|No. The script will run for a max of 5 minutes, even if the number of
SVMs is increased.

|Can I increase the number of SVMs on which the script can be run?
|Yes. You need to edit the script and change the max number of SVMs from 5
to any desirable number.

|If I increase the number of SVMs, will it increase the time of running of
the script?
|No. The script will run for a max of 5mins, even if the number of SVMs
are increased.

|What happens if I run the Event Rate Checker with an existing agent?
|Running the Event Rate Checker against an already-existing agent may
cause an increase in latency on the SVM. This increase will be temporary
in nature while the Event rate Checker is running.

|===



:leveloffset: -1



[[IDecc629975b176d4b874a1ad1505c92d7]]
= Alerts
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media

[.lead]
The Workload Security Alerts page shows a timeline of recent attacks
and/or warnings and allows you to view details for each issue.

NOTE: Workload Security is not available in Cloud Insights Federal
```

```
Edition.

image:CloudSecureAlertsListPage.png[Alerts list]

////
The Alerts page shows all alerts generated by Workload Security.

Use this page to identify recent alerts and the users generating those
alerts.

You can also access all alerts that have been raised with the ability to
drill down into individual alerts.
////

////
== History

History shows the number of alerts that have been raised over the last
seven days. Hovering over the severity of the alerts displays the number,
severity, and occurrence date for each alert type.

== Notable Users

* Shows a list of the users that have generated the highest number of
alerts.

* Shows the type of alerts generated.

* Shows the total number of alerts generated for each user.
////

== Alert

The Alert list displays a graph showing the total number of Potential
Attacks and/or Warnings that have been raised in the selected time range,
followed by a list of the attacks and/or warnings that occurred in that
time range. You can change the time range by adjusting the start time and
end time sliders in the graph.

The following is displayed for each alert:

*Potential Attacks:*

* The _Potential Attack_ type (for example, Ransomware or Sabotage)

* The date and time the potential attack was _Detected_
* The _Status_ of the alert:

** *New*: This is the default for new alerts.
** *In Progress*: The alert is under investigation by a team member or
members.
** *Resolved*: The alert has been marked as resolved by a team member.
** *Dismissed*: The alert has been dismissed as false positive or expected
behavior.
+
An administrator can change the status of the alert and add a note to
assist with investigation.
+
image:CloudSecureChangeAlertStatus.png[Change Alert Status]

* The _User_ whose behavior triggered the alert

* _Evidence_ of the attack (for example, a large number of files was
encrypted)

* The _Action Taken_ (for example, a snapshot was taken)


*Warnings:*

* The _Abnormal Behavior_ that triggered the warning

* The date and time the behavior was _Detected_

* The _Status_ of the alert (New, In progress, etc.)

* The _User_ whose behavior triggered the alert

* A description of the _Change_ (for example, an abnormal increase in file
access)

* The _Action Taken_



== Filter Options

You can filter Alerts by the following:

* The _Status_ of the alert
* Specific text in the _Note_
* The type of _Attacks/Warnings_
* The _User_ whose actions triggered the alert/warning
```

```
== The Alert Details page

You can click an alert link on the Alerts list page to open a detail page
for the alert. Alert details may vary according to the type of attack or
alert. For example, a Ransomware Attack detail page may show the following
information:

=== Summary section:

* Attack type (Ransomware, Sabotage) and Alert ID (assigned by Workload
Security)
* Date and Time the attack was detected
* Action Taken (for example, an automatic snapshot was taken. Time of
snapshot is shown immediately below the summary section))
* Status (New, In Progress, etc.)

=== Attack Results section:

* Counts of Affected Volumes and Files
* An accompanying summary of the detection
* A graph showing file activity during the attack

=== Related Users section:

This section shows details about the user involved in the potential
attack, including a graph of Top Activity for the user.

Alerts page (this example shows a potential ransomware attack):
image:RansomwareAlertExample.png[Ransomware Alert Example]

Detail page (this example shows a potential ransomware attack):
image:RansomwareDetailPageExample.png[Ransomware Detail Page Example]



== _Take a Snapshot_ Action

Workload Security protects your data by automatically taking a snapshot
when malicious activity is detected, ensuring that your data is safely
backed up.

You can define
xref:{relative_path}cs_automated_response_policies.html[automated response
policies] that take a snapshot when ransomware attack or other abnormal
user activity is detected.
```

```
You can also take a snapshot manually from the alert page.

Automatic Snapshot taken:
image:AlertActionsAutomaticExample.png[Alert Action Screen,1000]

Manual Snapshot:
image:AlertActionsExample.png[Alert Action Screen,1000]


== Alert Notifications

Email notifications of alerts are sent to an alert recipient list for
every action on the alert. To configure alert recipients, click on *Admin
> Notifications* and enter an email addresses for each recipient.

== Retention Policy
Alerts and Warnings are retained for 13 months. Alerts and Warnings older
than 13 months will be deleted.
If the Workload Security environment is deleted, all data associated with
the environment is also deleted.

== Troubleshooting

|===
|Problem:|Try This:

|There is a situation where, ONTAP takes hourly snapshots per day. Will
Workload Security (WS) snapshots affect it? Will WS snapshot take the
hourly snapshot place? Will the default hourly snapshot get stopped?
|Workload Security snapshots will not affect the hourly snapshots. WS
snapshots will not take the hourly snapshot space and that should continue
as before. The default hourly snapshot will not get stopped.

|What will happen if the maximum snapshot count is reached in ONTAP?
|If the maximum Snapshot count is reached, subsequent Snapshot taking will
fail and Workload Security will show an error message noting that Snapshot
is full.
User needs to define Snapshot policies to delete the oldest snapshots,
otherwise snapshots will not be taken.
In ONTAP 9.3 and earlier, a volume can contain up to 255 Snapshot copies.
In ONTAP 9.4 and later, a volume can contain up to 1023 Snapshot copies.

See the ONTAP Documentation for information on
link:https://docs.netapp.com/ontap-
9/index.jsp?topic=%2Fcom.netapp.doc.dot-cm-cmpr-
960%2Fvolume__snapshot__autodelete__modify.html[setting Snapshot deletion
policy].
```

```
|Workload Security is unable to take snapshots at all.
|Make sure that the role being used to create snapshots has
xref:{relative_path} https://docs.netapp.com/us-
en/cloudinsights/task_add_collector_svm.html#a-note-about-
permissions[proper rights assigned].
Make sure _csrole_ is created with proper access rights for taking
snapshots:

 security login role create -vserver <vservername> -role csrole
-cmddirname "volume snapshot" -access all

|Snapshots are failing for older alerts on SVMs which were removed from
Workload Security and subsequently added back again. For new alerts which
occur after SVM is added again, snapshots are taken.
|This is a rare scenario. In the event you experience this, log in to
ONTAP and take the snapshots manually for the older alerts.

|In the _Alert Details_ page, the message “Last attempt failed” error is
seen below the _Take Snapshot_ button.
Hovering over the error displays “Invoke API command has timed out for the
data collector with id”.
|This can happen when a data collector is added to Workload Security via
SVM Management IP, if the LIF of the SVM is in _disabled_ state in ONTAP.
Enable the particular LIF in ONTAP and trigger _Take Snapshot manually_
from Workload Security. The Snapshot action will then succeed.

|===





= Forensics

:leveloffset: +1



[[ID71413cd0f902458b4a03f0e3742bab78]]
= Forensics - All Activity
:toc: macro
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[.lead]
The All Activity page helps you understand the actions performed on
entities in the Workload Security environment.


== Examining All Activity Data

Click *Forensics > Activity Forensics* and click the *All Activity* tab to
access the All Activity page.
This page provides an overview of activities in your environment,
highlighting the following information:

* A graph showing _Activity History_ (accessed per minute/per 5
minutes/per 10 minutes based on selected global time range)
+
You can zoom the graph by dragging out a rectangle in the graph. The
entire page will be loaded to display the zoomed time range. When zoomed
in, a button is displayed that lets the user zoom out.

* A chart of _Activity Types_. To obtain activity history data by activity
type, click on corresponding x-axis label link.
* A chart of Activity on _Entity Types_. To obtain activity history data
by entity type, click on corresponding x-axis label link.
* A list of the _All Activity_ data

The _*All Activity*_ table shows the following information. Note that not
all of these columns are displayed by default. You can select columns to
display by clicking on the "gear" icon  image:GearIcon.png[gear icon].

* The *time* an entity was accessed including the year, month, day, and
time of the last access.

* The *user* that accessed the entity with a link to the
xref:{relative_path}forensic_user_overview.html[User information].

//Above should be new user profile?

* The *activity* the user performed. Supported types are:

**  *Change Group Ownership* - Group Ownership is of file or folder is
changed. For more details about group ownership please see
link:https://docs.microsoft.com/en-us/previous-versions/orphan-
topics/ws.11/dn789205(v=ws.11)?redirectedfrom=MSDN[this link.]

**  *Change Owner* - Ownership of file or folder is changed to another
user.
```

```
**  *Change Permission* - File or folder permission is changed.

**  *Create* - Create file or folder.

**  *Delete* - Delete file or folder. If a folder is deleted, _delete_
events are obtained for all the files in that folder and subfolders.

**  *Read* - File is read.

**  *Read Metadata* - Only on enabling folder monitoring option. Will be
generated on opening a folder on Windows or Running “ls” inside a folder
in Linux.

**  *Rename* - Rename file or folder.

**  *Write* - Data is written to a file.

**  *Write Metadata* - File metadata is written, for example, permission
changed.

**  *Other Change* - Any other event which are not described above. All
unmapped events are mapped to “Other Change” activity type. Applicable to
files and folders.

* The *Path* to the entity with a link to the
xref:{relative_path}forensic_entity_detail.html[Entity Detail Data]

* The *Entity Type*, including entity (i.e. file) extension (.doc, .docx,
.tmp, etc.)

* The *Device* where the entities reside

* The *Protocol* used to fetch events.

* The *Original Path* used for rename events when the original file was
renamed. This column is not visible in the table by default. Use the
column selector to add this column to the table.

* The *Volume* where the entities reside. This column is not visible in
the table by default. Use the column selector to add this column to the
table.


//* The *Source IP* address from which the activity was performed.
```

```
== Filtering Forensic Activity History Data

There are two methods you can use to filter data.

.   Hover over the field in the table and click the filter icon that
appears. The value is added to the appropriate filters in the top _Filter
By_ list.

.   Filter data by typing in the _Filter By_ field:
+
Select the appropriate filter from the top ‘Filter By’ widget by clicking
the *[+]* button:
+
image:Forensic_Activity_Filter.png[Entity Filer, width=500]
+
Enter the search text
+
Press Enter or click outside of the filter box to apply the filter.


You can filter Forensic Activity data by the following fields:

* The *Activity* type.

////
** Change Group Ownership
**  Change Owner
**  Change Permission
**  Copy
**  Create
**  Delete
**  Move
**  Read
**  Read Metadata
**  Rename
**  Write
**  Write Metadata
**  Other Change
////

* *Source IP* from which the entity was accessed. You must provide a valid
source IP address in double quotes, for example “10.1.1.1.”.  Incomplete
IPs such as “10.1.1.*”, “10.1.*.*”, etc. will not work.

* *Protocol* to fetch protocol-specific activities.

//* *Noise Reduction* to filter activities on temporary files which are
```

```
generated as part of the normal operating process. If noise reduction is
enabled, temporary files of extension .tmp, .ldb, .laccdb, .$db etc. are
filtered.

* *Username* of the user performing the activity. You need to provide the
exact Username to filter. Search with partial username, or partial
username prefixed or suffixed with ‘*’ will not work.


* *Noise Reduction* to filter files which are created in the last 2 hours
by the user. It is also used to filter temporary files (for example, .tmp
files) accessed by the user.


The following fields are subject to special filtering rules:

* *Entity Type*, using entity (file) extension
* *Path* of the entity
* *User* performing the activity
* *Device* (SVM) where entities reside
* *Volume* where entities reside
* The *Original Path* used for rename events when the original file was
renamed.

The preceding fields are subject to the following when filtering:

* Exact value should be within quotes: Example: "searchtext"
* Wildcard strings must contain no quotes: Example: searchtext,
\*searchtext*, will filter for any strings containing ‘searchtext’.
* String with a prefix, Example: searchtext* , will search any strings
which start with ‘searchtext’.

== Sorting Forensic Activity History Data

You can sort activity history data by _Time, User,  Source IP, Activity,
Path_ and _Entity Type_. By default, the table is sorted by descending
_Time_ order, meaning the latest data will be displayed first. Sorting is
disabled for _Device_ and _Protocol_ fields.


== Exporting All Activity

You can export the activity history to a .CSV file by clicking the
_Export_ button above the Activity History table. Note that only the top
100,000 records are exported. Depending on the amount of data, it may take
from a few seconds to several minutes for the export to finish.
```

```
== Column Selection for All Activity

The _All activity_ table shows select columns by default. To add, remove,
or change the columns, click the gear icon on the right of the table and
select from the list of available columns.

image:CloudSecure_ActivitySelection.png[Activity Selector, width=30%]

== Activity History Retention

Activity history is retained for 13 months for active Workload Security
environments.



== Applicability of Filters in Forensics Page

|===

|Filter |What it does   |Example    |Applicable in Which Filters?   |Not
applicable for which filters   |Result

|*  (Asterisk)  |enables you to search for everything   |Auto*03172022
|User, PATH, Entity Type, Device Type, Volume, Original Path
||returns all resources that start with “Auto" and end with “03172022”
|? (question mark)  |enables you to search for a specific number of
characters  |AutoSabotageUser1_03172022?    |User, Entity Type, Device,
Volume   |  |returns AutoSabotageUser1_03172022A,
AutoSabotageUser1_03172022AB, AutoSabotageUser1_031720225, and so on

|OR |enables you to specify multiple entities
|AutoSabotageUser1_03172022 OR AutoRansomUser4_03162022
    |User, Domain, Username, PATH, Entity Type, Device, Original Path
||returns any of AutoSabotageUser1_03172022 OR AutoRansomUser4_03162022

|NOT    |allows you to exclude text from the search results |NOT
AutoRansomUser4_03162022
    |User, Domain, Username, PATH, Entity Type, Original PATH, Volume
|Device |returns everything that does not start
with"AutoRansomUser4_03162022”
|None   |searches for NULL values in all fields |None   |Domain |
|returns results where the target field is empty

|===

== Path / Original path Search
```

```
Search results with and  without / will be different

|===

|/AutoDir1/AutoFile |Works
|AutoDir1/AutoFile  |Doesn’t work
|/AutoDir1/AutoFile (Dir1)  |Dir1 Partial substring doesn’t work
|"/AutoDir1/AutoFile03242022"   |Exact search works
|Auto*03242022  |Doesn’t work
|AutoSabotageUser1_03172022?    |Doesn’t work
|/AutoDir1/AutoFile03242022 OR /AutoDir1/AutoFile03242022   |Works
|NOT /AutoDir1/AutoFile03242022 |Works
|NOT /AutoDir1  |Works
|NOT /AutoFile03242022  |Doesn’t work
|*  |Shows all the entries

|===





== Troubleshooting

|===
|Problem|Try This
|In the “All Activities” table, under the ‘User’ column, the user name is
shown as:
“ldap:HQ.COMPANYNAME.COM:S-1-5-21-3577637-1906459482-1437260136-1831817”
or
"ldap:default:80038003”

|Possible reasons could be:
1. No User Directory Collectors have been configured yet. To add one, go
to *Workload Security > Collectors > User Directory Collectors* and click
on *+User Directory Collector*. Choose _Active Directory_ or _LDAP
Directory Server_.
2. A User Directory Collector has been configured, however it has stopped
or is in error state. Please go to *Collectors > User Directory
Collectors* and check the status. Refer to the
link:http://docs.netapp.com/us-
en/cloudinsights/task_config_user_dir_connect.html#troubleshooting-user-
directory-collector-configuration-errors[User Directory Collector
troubleshooting] section of the documentation for troubleshooting tips.
After configuring properly, the name will get automatically resolved
within 24 hours.
If it still does not get resolved, check if you have added the correct
```

```
User Data Collector. Make sure that the user is indeed part of the added
Active Directory/LDAP Directory Server.

|Some NFS events are not seen in UI.
|Check the following:
1.  A user directory collector for AD server with POSIX attributes set
should be running with the unixid attribute enabled from UI.
2.  Any user doing NFS access should be seen when searched in the user
page from UI
3.  Raw events (Events for whom the user is not yet discovered) are not
supported for NFS
4.  Anonymous access to the NFS export will not be monitored.
5.  Make sure NFS version used in lesser than NFS4.1.


|After typing some letters containing a wildcard character like asterisk
(*) in the filters on the Forensics _All Activity_ or  _Entities_ pages,
the pages load very slowly.
|An asterisk (\*) in the search string searches for everything. However,
leading wildcard strings like  _*<searchTerm>_ or _*<searchTerm>*_ will
result in a slow query.
To get better performance, use prefix strings instead, in the format
_<searchTerm>*_ (in other words, append the asterisk (*) _after_ a search
term).
Example: use the string _testvolume*_, rather than _*testvolume_ or
_*test*volume_.

Use a prefix-based search to see all activities underneath a given folder
recursively (Hierarchical search). e.g.   _/path1/path2/path3_ or
_“/path1/path2/path3”_ will list all the activities recursively under
_/path1/path2/path3_.
Alternatively use the "Add To Filter" option under the All Activity tab.

|I am encountering a "Request failed with status code 500/503" error when
using a Path filter.
|Try using a smaller date range for filtering records.

|===










[[ID4c29e0ffac528ad2d9e73065921c3667]]
= Forensic Entities Page
```

```
:toc: macro
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[Lead]
The Forensics Entities page provides detailed information about entity
activity in your environment.


== Examining Entity Information

Click *Forensics > Activity Forensics* and click the _Entities_ tab to
access the Entities page.

This page provides an overview of entity activity in your environment,
highlighting the following information:
* A graph showing _Unique Entities_ accessed per minute
* A chart of _Entity Types Accessed_
* A breakdown of the _Common Paths_
* A list of the _Top 50 Entities_ out of the total number of entities

image:CS-Entities-Page.png[Entities Page]

Clicking on an entity in the list opens an overview page for the entity,
showing a profile of the entity with details like name, type, device name,
most accessed location IP, and path, as well as the entity behavior such
as the user, IP, and time the entity was last accessed.

image:CS-entity-detail-page.png[Entity Overview Page]







[[ID7a15117d7c1691539dfc241d15546d0e]]
= Forensic User Overview
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[lead]
Information for each user is provided in the User Overview. Use these
views to understand user characteristics, associated entities, and recent
activities.

== User Profile

User Profile information includes contact information and location of the
user. The profile provides the following information:

* Name of the user
* Email address of the user
* User's Manager
* Phone contact for the user
* Location of the user


== User Behavior

The user behavior information identifies recent activities and operations
performed by the user. This information includes:

* Recent activity
** Last access location
** Activity graph
** Alerts

//** Entities accessed

* Operations for the last seven days
** Number of operations

//** Number of read operations
//** Number of times meta data was accessed

== Refresh Interval
The User list is refreshed every 12 hours.

== Retention Policy
If not refreshed again, the User list is retained for 13 months. After 13
months, the data will be deleted.
If your Workload Security environment is deleted, all data associated with
the environment is deleted.
```

```
:leveloffset: -1


[[ID0f827154d0e47b78b03f3d989303fa61]]
= Automated Response Policies
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media

[.lead]
Response Policies trigger actions such as taking a snapshot or restricting
user access in the event of an attack or abnormal user behavior.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

You can set policies on specific devices or all devices. To set a response
policy, select *Admin > Automated Response Policies* and click the
appropriate *+Policy* button. You can create policies for Attacks or for
Warnings.

image:Automated_Response_Screenshot.png[Create Attack Policy]

You must save the policy with a unique name.

To disable an automated response action (for example, Take Snapshot),
simply un-check the action and save the policy.

When an alert is triggered against the specified devices (or all devices,
if selected), the automated response policy takes a snapshot of your data.
You can see snapshot status on the
xref:{relative_path}cs_alert_data.html#the-alert-details-page[Alert detail
page].

See the xref:{relative_path}cs_restrict_user_access.html[Restrict User
Access] page for more details on restricting user access by IP.

You can modify or pause an Automated Response Policy by choosing the
option in the policy's drop-down menu.

Workload Security will automatically delete snapshots once per day based
on the Snapshot Purge settings.

//image:AutomatedResponsePolicyList.png[Automated Response Policy Pause]
//image:CloudSecure_AutomatedResponsePolicies_WithSnapshotPurge.png[Automa
ted Response Policy Settings]
image:CloudSecure_SnapshotPurgeSettings.png[Snapshot Purge Settings]






[[ID7058ce0c7d60255fac67b1b363b4d767]]
= Allowed File Types Policies

:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media

[.lead]
If a ransomware attack is detected for a known file extension, and alerts
are being generated on the Alerts screen, then that file extension can be
added to an _allowed file types_ list to prevent unnecessary alerting.

Navigate to *Workload Security > Policies* and go to the _Allowed File
Type Policies_ tab.

image:WS_Allowed_File_Type_Policies.png[Allowed File Types Policies]

Once added to the _allowed file types_ list, no ransomware attack alert
will be generated for that allowed file type. Note that the _Allowed File
Types_ policy is only applicable for ransomware detection.

For example, if a file named _test.txt_ is renamed to _test.txt.abc_ and
Workload Security is detecting a ransomware attack because of the _.abc_
extension, the _.abc_ extension can be added to the _allowed file types_
list. After being added to the list, ransomware attacks will no longer be
generated against files with the _.abc_ extension.

Allowed File Types can be exact matches (e.g., ".abc") or expressions
(e.g., ".*type", ".type*", or "*type*"). Expressions of types “.a*c”,
“.p*f” are not supported.



[[IDc7756021f9616e005480f10f5a67d12a]]
= Integration with ONTAP Autonomous Ransomware Protection
:toc: macro
:hardbreaks:
```

```
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The ONTAP Autonomous Ransomware Protection (ARP) feature uses workload
analysis in NAS (NFS and SMB) environments to proactively detect and warn
about abnormal in-file activity that might indicate a ransomware attack.

Additional details and license requirements about ARP can be found
link:https://docs.netapp.com/us-en/ontap/anti-ransomware/index.html[here].

Workload Security integrates with ONTAP to receive ARP events and provide
an additional analytics and automatic responses layer.

Workload Security receives the ARP events from ONTAP and takes the
following actions:

. Correlates volume encryption events with user activity to identify who
is causing the damage.
. Implements automatic response policies (if defined)
. Provides forensics capabilities:
** Allow customers to conduct data breach investigations.
** Identify what files were affected, helping to recover faster and
conduct data breach investigations.

== Prerequisites

. Minimum ONTAP version: 9.11.1
. ARP enabled volumes. Details on enabling ARP can be found
link:https://docs.netapp.com/us-en/ontap/anti-ransomware/enable-
task.html[here].  ARP must be enabled via OnCommand System Manager.
Workload Security cannot enable ARP.
. Workload Security collector should be added via cluster IP.
. Cluster level credentials are needed for this feature to work. In other
words, cluster level credentials must be used when adding the SVM.

== User permissions required

If you are using cluster administration credentials, no new permissions
are needed.

If you are using a custom user (for example, _csuser_) with permissions
given to the user, then follow the steps below to give permissions to
Workload Security to collect ARP related information from ONTAP.
```

```
For _csuser_ with cluster credentials, do the following from the ONTAP
command line:

 security login rest-role create -role arwrole -api /api/storage/volumes
-access readonly -vserver <cluster_name>
 security login rest-role create -api /api/security/anti-ransomware
-access readonly  -role arwrole -vserver <cluster_name>
 security login create -user-or-group-name csuser -application http
-authmethod password -role arwrole

Read more about configuring other
xref:{relative_path}task_add_collector_svm.html[ONTAP permissions].


== Sample Alert

A sample alert generated due to ARP event is shown below:

//image:CS_ONTAP_ARP_EXAMPLE.png[ONTAP ARP Example Screen]
image:CS_Ransomware_Example_1.png[Ransomware Alert top section]
image:CS_Ransomware_Example_2.png[Ransomware Alert top section]
image:CS_Ransomware_Example_3.png[Ransomware Alert top section]



A high confidence banner indicates the attack has shown ransomware
behavior along with file encryption activities.
The encrypted files graph indicates the timestamp at which the volume
encryption activity was detected by the ARP solution.

== Limitations

In the case where an SVM is not monitored by Workload Security, but there
are ARP events generated by ONTAP, the events will still be received and
displayed by Workload Security. However, Forensic information related to
the alert, as well as user mapping, will not be captured or shown.

== Troubleshooting

Known problems and their resolutions are described in the following table.

[cols=2*, options="header", cols"30,70"]

|===
|Problem: | Resolution:
|Email alerts are received 24 hrs after an attack is detected. In the UI,
the alerts are shown 24 hrs before that when the emails are received by
Cloud Insights Workload Security.
|When ONTAP sends the _Ransomware Detected_ Event to Cloud Insights
Workload Security (i.e. Workload Security), the email is sent. The Event
contains a list of attacks and its timestamps. The Workload Security UI
displays the alert timestamp of the first file attacked. ONTAP sends the
_Ransomware Detected_ Event to Cloud Insights when a certain number of
files are encoded.
Therefore, there may be a difference between the time the alert is
displayed in the UI and the time the email is sent.



|===





[[IDf8cef30d801f8ba172c92daa7a719c97]]
= Integration with ONTAP Access Denied
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The ONTAP Access Denied feature uses workload analysis in NAS environments
(NFS and SMB) to proactively detect and warn about failed file operations
(i.e., a user trying to perform an operation for which they do not have
permission). These failed file operation notifications--especially in
cases of security-related failures--will further help in blocking insider
attacks at early stages.

Cloud Insights Workload Security integrates with ONTAP to receive Access
Denied events and provide an additional analytic and automatic response
layer.

Prerequisites

* Minimum ONTAP version: 9.13.0.
* A Workload Security administrator must enable the Access Denied feature
while adding a new collector or editing existing collector, by selecting
```

```
the _Monitor Access Denied Events_ checkbox under Advanced Configuration.

image:WS_Access_Denied_Enable_in_Collector.png[Enable Access Denied in the
ONTAP collector Advanced Configuration]


== User permissions required

If the Data Collector is added using cluster administration credentials,
no new permissions are needed.

If the Collector is added using a custom user (for example, _csuser_) with
permissions given to the user, follow the steps below to give Workload
Security the necessary permission to register for Access Denied events
with ONTAP.

For csuser with _cluster_ credentials, execute the following commands from
the ONTAP command line. Note that _csrestrole_ is custom role and _csuser_
is ontap custom user.
```

```
security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <cluster_name>
security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole
```

```
For csuser with _SVM_ credentials, execute the following commands from the
ONTAP command line:
```

```
security login rest-role create -role csrestrole -api
/api/protocols/fpolicy -access all -vserver <svm_name>
security login create -user-or-group-name csuser -application http
-authmethod password -role csrestrole -vserver <svm_name>
```

```
Read more about configuring other
xref:{relative_path}task_add_collector_svm.html[ONTAP permissions].



== Access Denied events

Once events have been acquired from the ONTAP system, the Workload
Security Forensics page will show Access Denied events. In addition to the
```

```
information displayed, you can view the missing user permissions for a
particular operation by adding the _Desired Activity_ column to the table
from the gear icon.

image:WS_Access_Denied_Example_Event_1.png[Example Access Denied Event]










[[IDebac69ac74b78527be3bc7fc4f9b5829]]
= Blocking User Access
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media

[.lead]
Once an attack is detected, Workload Security can stop the attack by
blocking user access to the file system. Access can be blocked
automatically, using Automated Response Policies or manually from the
alert or user details pages.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

When blocking user access, you should define a blocking time period. After
the selected time period ends, user access is automatically restored.
Access blocking is supported for both SMB and NFS protocols.

User is directly blocked for SMB and IP address of the host machines
causing the attack will be blocked for NFS. Those machine IP addresses
will be blocked from accessing any of the Storage Virtual Machines (SVMs)
monitored by Workload Security.

For example, let’s say Workload Security manages 10 SVMs and the Automatic
Response Policy is configured for four of those SVMs. If the attack
originates in one of the four SVMs, the user’s access will be blocked in
all 10 SVMs. A Snapshot is still taken on the originating SVM.

If there are four SVMs with one SVM configured for SMB, one configured for
```

```
NFS, and the remaining two configured for both NFS and SMB, all the SVMs
will be blocked if the attack originates in any of the four SVMs.

== Prerequisites for User Access Blocking

Cluster level credentials are needed for this feature to work.

If you are using cluster administration credentials, no new permissions
are needed.

If you are using a custom user (for example, _csuser_) with permissions
given to the user, then follow the steps below to give permissions to
Workload Security to block user.

For csuser with cluster credentials, do the following from the ONTAP
command line:

 security login role create -role csrole -cmddirname "vserver export-
policy rule" -access all
 security login role create -role csrole -cmddirname set -access all
 security login role create -role csrole -cmddirname "vserver cifs
session" -access all
 security login role create -role csrole -cmddirname "vserver services
access-check authentication translate" -access all
 security login role create -role csrole -cmddirname "vserver name-
mapping" -access all

Be sure to review the Permissions section of the
xref:{relative_path}/cloudinsights/task_add_collector_svm.html[Configuring
the ONTAP SVM Data Collector] page as well.

== How to enable the feature?

* In Workload Security, navigate to *Workload Security > Policies >
Automated Response Policies*.  Choose *+Attack Policy*.
* Select (check) _Block User File Access_.

== How to set up Automatic user access blocking?

* Create a new Attack Policy or edit an existing Attack policy.
* Select the SVMs on which the attack policy should be monitored.
* Click on the checkbox “Block User File Access”. The feature will be
enabled when this is selected.
* Under “Time Period” select the time until which the blocking should be
applied.
* To test automatic user blocking,, you can simulate an attack via a
xref:{relative_path}concept_cs_attack_simulator.html[simulated script].
```

```
== How to know if there are blocked users in the system?

* In the alert lists page, a banner on the top of screen will be displayed
in case any user is blocked.
* Clicking on the banner will take you to the “Users” page, where the list
of blocked users can be seen.
* In the “Users” page, there in a column named “User/IP Access”. In that
column, the current state of user blocking will be displayed.

== Restrict and manage user access manually

* You can go to the alert details or user details screen and then manually
block or restore a user from those screens.

== User Access Limitation History

In the alert details and user details page, in the user panel, you can
view an audit of the user’s access limitation history: Time, Action
(Block, Unblock), duration, action taken by, manual/automatic, and
affected IPs for NFS.

== How to disable the feature?

At any time, you can disable the feature. If there are restricted users in
the system, you must restore their access first.

* In Workload Security, navigate to *Workload Security > Policies >
Automated Response Policies*.  Choose *+Attack Policy*.
* De-select (uncheck) _Block User File Access_.

The feature will be hidden from all pages.


== Manually Restore IPs for NFS

Use the following steps to manually restore any IPs from ONTAP if your
Workload Security trial expires, or if the agent/collector is down.

. List all export policies on an SVM.

 contrail-qa-fas8020::> export-policy rule show -vserver <svm name>
              Policy          Rule    Access   Client                RO
 Vserver      Name            Index   Protocol Match                 Rule
 ------------ --------------- ------  -------- ---------------------
---------
 svm0        default         1       nfs3,    cloudsecure_rule,     never
```

```
                                     nfs4,    10.11.12.13
                                     cifs
 svm1        default         4       cifs,    0.0.0.0/0             any
                                     nfs
 svm2        test            1       nfs3,    cloudsecure_rule,     never
                                     nfs4,    10.11.12.13
                                     cifs
 svm3        test            3       cifs,    0.0.0.0/0             any
                                     nfs,
                                     flexcache
 4 entries were displayed.



. Delete the rules across all policies on the SVM which have
“cloudsecure_rule” as Client Match by specifying its respective RuleIndex.
Workload Security rule will usually be at 1.

 contrail-qa-fas8020::*> export-policy rule delete -vserver <svm name>
-policyname * -ruleindex 1





.   Ensure Workload Security rule is deleted (optional step to confirm).

 contrail-qa-fas8020::*> export-policy rule show -vserver <svm name>
              Policy          Rule    Access   Client                RO
 Vserver      Name            Index   Protocol Match                 Rule
 ------------ --------------- ------  -------- ---------------------
---------
 svm0         default          4       cifs,    0.0.0.0/0             any
                                     nfs
 svm2         test             3       cifs,    0.0.0.0/0             any
                                     nfs,
                                     flexcache
 2 entries were displayed.



== Manually Restore Users for SMB

Use the following steps to manually restore any users from ONTAP if your
Workload Security trial expires, or if the agent/collector is down.

You can get the list of users blocked in Workload Security from the users
list page.
```

```
1.  Login to the ONTAP cluster (where you want to unblock users) with
cluster _admin_ credentials. (For Amazon FSx, login with FSx credentials).

2.  Run the following command to list all users blocked by Workload
Security for SMB in all SVMs:

 vserver name-mapping show -direction win-unix -replacement " "

 Vserver:   <vservername>
 Direction: win-unix
 Position Hostname         IP Address/Mask
 -------- ---------------- ----------------
 1       -                -                   Pattern: CSLAB\\US040
                                          Replacement:
 2       -                -                   Pattern: CSLAB\\US030
                                          Replacement:
 2 entries were displayed.

In the above output, 2 users were blocked (US030, US040) with domain
CSLAB.

3.  Once we identify the position from the above output, run the following
command to unblock the user:

 vserver name-mapping delete -direction win-unix -position <position>

4.  Confirm the users are unblocked by running the command:

 vserver name-mapping show -direction win-unix -replacement " "

No entries should be displayed for the users previously blocked.




== Troubleshooting

|===
|Problem|Try This

|Some of the users are not getting restricted, though there is an attack.
|1. Make sure that the Data Collector and Agent for the SVMs are in
_Running_ state. Workload Security won’t be able to send commands if the
Data Collector and Agent are stopped.

2. This is because the user may have accessed the storage from a machine
```

```
with a new IP which has not been used before.
Restricting happens via IP address of the host through which the user is
accessing the storage. Check in the UI (Alert Details > Access Limitation
History for This User > Affected IPs) for the list of IP addresses which
are restricted. If the user is accessing storage from a host which has an
IP different from the restricted IPs, then the user will still be able to
access the storage through the non-restricted IP. If the user is trying to
access from the hosts whose IPs are restricted, then the storage won’t be
accessible.

|Manually clicking on Restrict Access gives “IP addresses of this user
have already been restricted”.
|The IP to be restricted is already being restricted from another user.

|Policy could not be modified. Reason: not authorized for that command.
|Check if using csuser, permissions are given to the user as mentioned
above.

|User (IP Address) blocking for NFS works, but for SMB / CIFS, I see an
error message: “SID to DomainName transformation failed. Reason timeout:
socket is not established”
|This can happen is _csuser_ does not have permission to perform ssh.
(Ensure connection at cluster level, then ensure user can perform ssh).
_csuser_ role requires these permissions.

 https://docs.netapp.com/us-
en/cloudinsights/cs_restrict_user_access.html#prerequisites-for-user-
access-blocking

For _csuser_ with cluster credentials, do the following from the ONTAP
command line:

 security login role create -role csrole -cmddirname "vserver export-
policy rule" -access all
 security login role create -role csrole -cmddirname set -access all
 security login role create -role csrole -cmddirname "vserver cifs
session" -access all
 security login role create -role csrole -cmddirname "vserver services
access-check authentication translate" -access all
 security login role create -role csrole -cmddirname "vserver name-
mapping" -access all

If _csuser_ is not used and if admin user at cluster level is used, make
sure that the admin user has ssh permission to ONTAP.
```

```
|
|

|===





[[ID707da7a26baf174db4885e609a9d402e]]
= Workload Security: Simulating an Attack
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
You can use the instructions on this page to simulate an attack for
testing or demonstrating Workload Security using the included Ransomware
Simulation script.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

== Things to note before you begin

* The ransomware simulation script works on Linux only.
* The script is provided with the Workload Security agent installation
files. It is available on any machine that has a Workload Security agent
installed.
* You can run the script on the Workload Security agent machine itself;
there is no need to prepare another Linux machine. However, if you prefer
to run the script on another system, simply copy the script and run it
there.

== Have at least 1,000 sample files

This script should run on an SVM with a folder that has files to encrypt.
We recommend having at least 1,000 files within that folder and any sub-
folders. The files must not be empty.
Do not create the files and encrypt them using the same user. Workload
Security considers this a low-risk activity and will therefore not
generate an alert (i.e. the same user modifies files he/she/they just
created).
```

```
See below for instructions to xref:{relative_path}#create-files-
programmatically[programmatically create non-empty files].

== Guidelines before you run the simulator:

. Make sure encrypted files are not empty.
. Make sure you encrypt > 50 files. A small number of files will be
ignored.
. Do not run an attack with the same user multiple times. After a few
times, Workload Security will learn this user behavior and assume it is
the user's normal behavior.
. Do not encrypt files the same user has just created. Changing a file
that was just created by a user is not considered a risky activity.
Instead, use files created by another user OR wait for a few hours between
creating the files and encrypting them.


== Prepare the system

First, mount the target volume to machine. You can mount either an NFS
mount or CIFs export.

To mount NFS export in Linux:

 mount -t nfs -o vers=4.0 10.193.177.158:/svmvol1 /mntpt
 mount -t nfs -o vers=4.0 Vserver data IP>:/nfsvol /destinationlinuxfolder

Do not mount NFS version 4.1; it is not supported by Fpolicy.

To mount CIFs in Linux:

 mount -t cifs //10.193.77.91/sharedfolderincluster
/root/destinationfolder/ -o username=raisa


Next, set up a Data Collector:

. Configure the Workload Security agent if not already done.
. Configure SVM data collector if not already done.

== Run the Ransomware Simulator script

. Log in (ssh) to the Workload Security agent machine.
. Navigate to: _/opt/netapp/cloudsecure/agent/install_
. Call the simulator script without parameters to see usage:
 # pwd
 /opt/netapp/cloudsecure/agent/install
 # ./ransomware_simulator.sh
 Error: Invalid directory  provided.
 Usage: ./ransomware_simulator.sh [-e] [-d] [-i <input_directory>]
        -e to encrypt files (default)
        -d to restore files
        -i <input_directory> - Files under the directory to be encrypted

 Encrypt command example: ./ransomware_simulator.sh -e -i
/mnt/audit/reports/
 Decrypt command example: ./ransomware_simulator.sh -d -i
/mnt/audit/reports/


== Encrypt your test files

To encrypt the files, run the following command:

 # ./ransomware_simulator.sh -e -i /root/for/
 Encryption key is saved in /opt/netapp/cloudsecure/cloudsecure-agent-
1.251.0/install/encryption-key,
 which can be used for restoring the files.
 Encrypted /root/for/File000.txt
 Encrypted /root/for/File001.txt
 Encrypted /root/for/File002.txt
 ...


== Restore files

To decrypt, run the following command:

 [root@scspa2527575001 install]# ./ransomware_simulator.sh -d -i
/root/for/
 File /root/for/File000.txt is restored.
 File /root/for/File001.txt is restored.
 File /root/for/File002.txt is restored.
 ...


== Run the script multiple times

After generating a ransomware attack for a user, switch to another user in
order to generate an additional attack.
Workload Security learns user behavior and will not alert on repeated
ransomware attacks within a short duration for the same user.
```

```
== Create files programmatically

Before creating the files, you must first stop or pause the data collector
processing.
Perform the steps below before you add the data collector to the Agent. If
you have already added the data collector, just edit the data collector,
enter an invalid password, and save it. This will temporarily put the data
collector in error state. NOTE: Be sure you note the original password!

NOTE: The recommended option is to
xref:{relative_path}task_add_collector_svm.html#play-pause-data-
collector[pause the collector] before creating your files.]

Before running the simulation, you must first add files to be encrypted.
You can either manually copy the files to be encrypted into the target
folder, or use a script (see the example below) to programmatically create
the files. Whichever method you use, copy at least 1,000 files.

If you choose to programmatically create the files, do the following:

. Log into the Agent box.
. Mount an NFS export from the SVM of the filer to the Agent machine. Cd
to that folder.
. In that folder create a file named createfiles.sh
. Copy the following lines to that file.

 for i in {000..1000}
 do
    echo hello > "File${i}.txt"
 done
 echo 3 > /proc/sys/vm/drop_caches ; sync

. Save the file.

. Ensure execute permission on the file:

 chmod 777 ./createfiles.sh

. Execute the script:

 ./createfiles.sh
+
1000 files will be created in the current folder.

. Re-enable the data collector
```

```
+
If you disabled the data collector in step 1, edit the data collector,
enter the correct password, and save. Make sure that the data collector is
back in running state.

. If you paused the collector before following these steps, be sure to
xref:{relative_path}task_add_collector_svm.html#play-pause-data-
collector[resume the collector].







[[IDe2ca62e81e2006ec9e7b65ea578ad8ed]]
= Configuring Email Notifications for Alerts, Warnings, and Agent/Data
Source Collector health
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
To configure Workload Security alert recipients, click on *Admin >
Notifications* and enter an email addresses in the appropriate section(s)
for each recipient.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

== Potential Attack Alerts and Warnings

To send _Potential Attack_ alert notifications, enter the recipients'
email addresses in the _Send Potential Attack Alerts_ section.
Email notifications are sent to the alert recipient list for every action
on the alert.

To send _Warning_ notifications, enter the recipients' email addresses in
the _Send Warning Alerts_ section.

== Agent and Data Collector Health monitoring

You can monitor the health of Agents and Data Sources through
```

```
notifications.

In order to receive notifications in the event that an Agent or Data
Source collector is not functioning, enter the email addresses of the
recipients in the _Data Collection Health Alerts_ section.

Keep the following in mind:

* Health alerts will be sent only after the agent/collector stops
reporting for at least one hour.
* Only one email notification is sent to the intended recipients in a
given 24 hour period, even If the Agent or Data collector is disconnected
for a longer duration.
* In case of an Agent failure, one alert will be sent (not one per
collector). The email will include a list of all impacted SVMs.
* Active directory collection failure is reported as a warning; it does
not impact Ransomware detection.
* The Getting Started setup list now includes a new _Configure email
notifications_ phase.

== Receiving Agent And Data Collector Upgrade Notifications

* Enter the email ID(s) in the “Data Collection Health Alerts”.
* The “Enable upgrade notifications” check box becomes enabled.
* Agent and Data Collector upgrade email notifications are sent to the
email IDs one day in advance of the planned upgrade.

== Troubleshooting

|===
|*Problem:* | *Try this:*

|Email IDs are present in the “Data Collector Health Alerts”, however I am
not receiving notifications.
|Notification emails are sent from the NetApp Cloud Insights domain, i.e
from _accounts@service.cloudinsights.netapp.com_. Some companies block
incoming emails if they are from an external domain. Ensure that external
notifications from NetApp Cloud Insights domains are whitelisted.
|===




[[ID60bf036011375aee49006d9fcfd603be]]
= Workload Security API
:hardbreaks:
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Workload Security API enables NetApp customers and independent
software vendors (ISVs) to integrate Workload Security with other
applications, such as CMDB’s or other ticketing systems.

NOTE: Workload Security is not available in Cloud Insights Federal
Edition.

Requirements for API Access:

*   An API Access Token model is used to grant access.
*   API Token management is performed by Workload Security users with the
Administrator role.


== API Documentation (Swagger)
The latest API information is found by logging in to Workload Security and
navigating to *Admin > API Access*. Click the *API Documentation* link.
The API Documentation is Swagger-based, which provides a brief description
and usage information for the API and allows you to try it out in your
environment.

== API Access Tokens
Before using the Workload Security API, you must create one or more *API
Access Tokens*. Access tokens grant read permissions. You can also set the
expiration for each access token.

To create an Access Token:

* Click *Admin > API Access*
*   Click *+API Access Token*
*   Enter *Token Name*
*   Specify *Token Expiration*

NOTE: Your token will only be available for copying to the clipboard and
saving during the creation process. Tokens can not be retrieved after they
are created, so it is highly recommended to copy the token and save it in
a secure location. You will be prompted to click the Copy API Access Token
button before you can close the token creation screen.

You can disable, enable, and revoke tokens. Tokens that are disabled can
be enabled.
```

```
Tokens grant general purpose access to APIs from a customer perspective,
managing access to APIs in the scope of their own environment.

The application receives an Access Token after a user successfully
authenticates and authorizes access, then passes the Access Token as a
credential when it calls the target API. The passed token informs the API
that the bearer of the token has been authorized to access the API and
perform specific actions based on the scope that was granted during
authorization.

The HTTP header where the Access Token is passed is *X-CloudInsights-
ApiKey:*

For example, use the following to retrieve storages assets:

 curl https://<tenant_host_name>/rest/v1/cloudsecure/activities -H 'X-
CloudInsights-ApiKey: <API_Access_Token>'

Where _<API_Access_Token>_ is the token you saved during API access key
creation.

Detailed information can be found in the _API Documentation_ link under
*Admin > API Access*.




:leveloffset: -1


[[ID5aef73fba8fa9bd6dd27216fd763b4a7]]
= Active IQ
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
NetApp link:https://www.netapp.com/us/products/data-infrastructure-
management/active-iq.aspx[Active IQ] provides a series of visualizations,
analytics, and other support-related services to NetApp customers for
their hardware / software systems. The data reported by Active IQ can
enhance troubleshooting of system problems and also provide insight into
```

```
optimization and predictive analysis related to your devices.

NOTE: ActiveIQ is not available in Cloud Insights Federal Edition.

Cloud Insights collects the *Risks* for any NetApp Clustered Data ONTAP
storage system that is monitored and reported by Active IQ. Risks reported
for the storage systems are collected automatically by Cloud Insights as
part of its data collection from those devices. You must add the
appropriate data collector to Cloud Insights to collect Active IQ risk
information.

Cloud Insights will not show risk data for ONTAP systems that are not
monitored and reported by Active IQ.

The risks reported are shown in Cloud Insights on the _storage_ and
_storage node_ asset landing pages, in the "Risks" table. The table shows
Risk Detail, Category of risk, and Potential Impact of the risk, and also
provides a link to the Active IQ page summarizing all risks for the
storage node (NetApp Support account sign-in required).


image:AIQ_Risks_Table_Example.png[Active IQ Risks Table]


A count of reported risks is also shown in the landing page's Summary
widget, with a link to the appropriate Active IQ page. On a _storage_
landing page, the count is a sum of risks from all underlying storage
nodes.

image:AIQ_Summary_Example.png[Storage Page Summary]

== Opening the Active IQ page

When clicking on the link to an Active IQ page, if you are not currently
signed in to your Active IQ account, you must perform the following steps
to view the Active IQ page for the storage node.

. In the Cloud Insights Summary widget or Risks table, click the "Active
IQ' link.
. Sign in to your NetApp Support account. You are taken directly to the
storage node page in Active IQ.

== Querying for Risks

In Cloud Insights, you can add the *monitoring.count* column to a storage
or storage node query. If the returned result includes Active IQ-Monitored
storage systems, the monitoring.count column will display the number of
```

```
risks for the storage system or node.

== Dashboards

You can build widgets (e.g. pie chart, table widget, bar, column, scatter
plot, and single value widgets) in order to visualize object risks for
storage and storage nodes for NetApp Clustered Data ONTAP systems
monitored by Active IQ. "Object Risks" can be selected as a column or
metric in these widgets where Storage or Storage Node is the object of
focus.

//Additionally, you can filter on "Object Risks" in widgets or queries.

image:ObjectRiskWidgets.png[Object Risks in Widgets]










= Troubleshooting

:leveloffset: +1


[[ID543ac597a1eeec30e38b297f8ecbd1bc]]
= Troubleshooting General Cloud Insights Problems
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Here you will find suggestions for troubleshooting Cloud insights.

See also
xref:{relative_path}task_troubleshooting_linux_acquisition_unit_problems.h
tml[Troubleshooting Linux Acquisition Unit Problems] and
xref:{relative_path}task_troubleshooting_windows_acquisition_unit_problems
.html[Troubleshooting Windows Acquisition Unit Problems].
```

```
== Login issues

|===
|*Problem:* | *Try this:*

|Cloud Insights logs out every 5 minutes
|Enable third-party acceptance for the necessary NetApp and auth0 cookies.

Example:
In Chrome, enter "chrome://settings/cookies" in the browser URL.

Select the "Allow all cookies" option.
*OR*
Select "Block third-party cookies" and add exceptions for [*.]auth0.com
and [*.]netapp.com.

Note: Make sure to select the "Including third-party cookies on this site"
option when creating an exception.

|I have a Cloud Central account but am unable to login to Cloud Central.
|Open a ticket from https://mysupport.netapp.com/site/help. Select
category “cloud.netapp.com > Account/Login issues” or “cloud.netapp.com >
Federation issues”.  This is specifically for Cloud Central issues or
questions.
For all other Cloud Insights technical support issues, contact
xref:{relative_path}concept_requesting_support.html[NetApp support].

|I got invited to Cloud Insights but I get a "not authorized" message.
|Verify that you have signed up for a Cloud Central account, or that your
organization uses SSO login with Cloud Central.

Verify your Cloud Central profile email address matches email address
shown in your Cloud Insights welcome email. If the email does not match,
request a new invitation with the correct email address.

|I logged out from Cloud Central or Cloud Secure and was automatically
logged out from Cloud Insights. |Single Sign-On (SSO) across NetApp Cloud
logs out all Cloud Insights, Cloud Secure, and Reporting sessions. If you
have access to multiple Cloud Insights accounts, logging out from any one
logs out all active sessions. Log back in to access your account.

|I was automatically logged out after several days.
|NetApp Cloud accounts require reauthentication every few days (current
Cloud Central setting is 7 days). Log back in to access your account.

|I receive an error message “no longer authorized to login”.
```

```
|Contact your account administrator to verify access to Cloud Insights.
Verify your Cloud Central profile email address matches email address
shown in your Cloud Insights welcome email

|Other login errors
|Try incognito mode in Chrome, or clear browser history, cookies, and
cache.
Try with a different browser profile (i.e. Chrome - add Person).

|===



== Other Issues

|===

|*Question:* | *Answer:*

|My Qtree hard quotas are showing correctly in queries, but my soft quotas
are showing as the total capacity of the volume. Is that correct?
|Only hard quotas--either manually set or set through Trident--will show
as the set quotas; if no hard quotas are specified, the Qtree capacity
will be the internal volume capacity.

|I have both a soft and a hard quota manually set in the same Qtree, but
the total capacity showing is the hard quota; is that correct?
|Yes, if a hard quota is specified, that will be shown as the total
capacity.

|When entering a Cognos report schedule time, sometimes I end up with an
extra "m" in the schedule time. For example, if I enter the time as "02:15
PM", it may add an extra character: "02:15 PMM" (or PMm). When I click
outside, it changes it to "2:15 AM".

I am able to save the report, but when I re-open the saved report, the
schedule time appears as AM (i.e. morning), regardless of whether I
entered AM or PM in the schedule time.
|Re-enter the schedule time, being careful not to enter the full "AM" or
"PM" characters; it is enough to type "A" for "AM or "P" for "PM". If you
are not shown the extra character, the schedule time will be set
correctly.

|===


== Resources
```

```
Additional troubleshooting tips may be found in the
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights[NetApp Knowledgebase] (support sign-in required).

Additional support information may be found from the Cloud Insights
xref:{relative_path}concept_requesting_support.html[Support] page.

If you have an active Cloud Insights subscription you can use these
support options:

link:https://www.netapp.com/us/contact-us/support.aspx[Phone]
link:https://mysupport.netapp.com/site/cases/mine/create?serialNumber=9500
1014387268156333[Support Ticket]

For more information, see the https://docs.netapp.com/us-
en/cloudinsights/concept_requesting_support.html[Cloud Insights Support
Documentation].





[[IDfdf11c7d87710a5e7a48c4a549f17c21]]
= Troubleshooting Acquisition Unit Problems on Linux
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Here you will find suggestions for troubleshooting problems with
Acquisition Units on a Linux server.

|===
|*Problem:* | *Try this:*
|AU status on the *Observability > Collectors* page in the *Acquisition
Units* tab displays "Certificate Expired” or “Certificate Revoked” .
|Click on the menu to the right of the AU and select *Restore Connection*.
Follow the instructions to restore your Acquisition Unit:

1. Stop the Acquisition Unit (AU) service. You can click the _Copy Stop
Command_ button to quickly copy the command to the clipboard, then paste
this command into a command prompt on the acquisition unit machine.
```

```
2. Create a file named "token" in the
_/var/lib/netapp/cloudinsights/acq/conf_ folder on the AU.

3. Click the _Copy Token_ button, and paste this token into the file you
created.

4. Restart the AU service. Click the _Copy Restart Command_ button, and
paste the command into a command prompt on the AU.

|Permission denied when starting the Acquisition Unit Server Service|When
the AU is installed on SELINUX, SE should be set to _permissive_ mode.
_Enforcing_ mode is not supported. After setting SELINUX to permissive
mode, restart the AU service.
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights/Permission_denied_when_starting_the_Cloud_Insight_Acquisition_Un
it_Server_Service[Learn more].

|Server Requirements not met | Ensure that your Acquisition Unit server or
VM meets
xref:{relative_path}concept_acquisition_unit_requirements.html[requirement
s]

|Network Requirements not met |Ensure that your Acquisition Unit server/VM
can access your Cloud Insights environment (<environment-
name>.c01.cloudinsights.netapp.com) through SSL connection over port 443.
Try the following commands:

 _ping <environment-name>.c01.cloudinsights.netapp.com_
_traceroute <environment-name>.c01.cloudinsights.netapp.com_
_curl \https://<environment-name>.c01.cloudinsights.netapp.com_
_wget \https://<environment-name>.c01.cloudinsights.netapp.com_

|Proxy Server not configured properly | Verify your proxy settings, and
uninstall/re-install the Acquisition Unit software if necessary to enter
the correct proxy settings.

1. Try "curl".  Refer to "man curl" information/documentation regarding
proxies: --preproxy, --proxy-* (that's a wildcard "*" because curl
supports many proxy settings).
2. Try "wget".  Check documentation for proxy options.

|Acquisition unit installation failed in Cloud insights with credential
errors while starting acquisition service (and visible in the
acq.log).|This can be caused by the inclusion of special characters in the
proxy credentials. Uninstall the AU (_sudo cloudinsights-uninstall.sh_)
```

```
and reinstall without using special characters.

|Linux: missing library / file not found| Ensure that your Linux
Acquisition Unit server/VM has all necessary libraries. For example, you
must have the _unzip_ library installed on the server. To install the
_unzip_ library, run the command _*sudo yum install unzip*_ before running
the Acquisition Unit install script

|Permission issues| Be sure you are logged in as a user with _sudo_
permissions

|Acquisition Not Running:
| Gather the acq.log from /opt/netapp/cloudinsights/acq/logs (Linux)
Restart the Acquisition Service: sudo cloudinsights-service.sh restart
acquisition

|Data Collection Issues:
|Send an Error Report from the Data Collector landing page by clicking the
"Send Error Report" button

|Status: Heartbeat Failed
|The Acquisition Unit (AU) sends a heartbeat to Cloud Insights every 60
seconds to renew its lease. If the heartbeat call fails due to network
issue or unresponsive Cloud Insights, the AU's lease time isn't updated.
When the AU's lease time expires, Cloud Insights shows a status of
"Heartbeat Failed".

Troubleshoot steps:

Check the network connection between the Acquisition Unit sever and
CloudInsights.
Check whether the Acquisition Unit service is running. If the service is
not running, start the service.
Check the Acquisition Unit log (/var/log/netapp/cloudinsights/acq/acq.log)
to see whether there are any errors.

|I'm seeing a "Heartbeat Error: message
|This error can occur if there is a network interruption that causes
communication between the Acquisition Unit and the Cloud Insights
environment to be interrupted for more than one minute. Verify the
connection between the AU and Cloud Insights is stable and active.



|===

////
Moving Data Collectors to Different Acquisition Units:
```

```
•   What is the proper process for a customer to do this?  They have to
retype their passwords or go into the security admin tool to transfer the
keys?
////

== Considerations about Proxies and Firewalls

If your organization requires proxy usage for internet access, you may
need to understand your organization’s proxy behavior and seek certain
exceptions for Cloud Insights to work. Keep the following in mind:

* First, does your organization block access by default, and only allow
access to specific web sites/domains by exception? If so, you will need to
get the following domain added to the exception list:
+
 *.cloudinsights.netapp.com
+
Your Cloud Insights Acquisition Unit, as well as your interactions in a
web browser with Cloud Insights, will all go to hosts with that domain
name.

* Second, some proxies attempt to perform TLS/SSL inspection by
impersonating Cloud Insights web sites with digital certificates not
generated from NetApp. The Cloud Insights Acquisition Unit’s security
model is fundamentally incompatible with these technologies. You would
also need the above domain name excepted from this functionality in order
for the Cloud Insights Acquisition Unit to successfully login to Cloud
Insights and facilitate data discovery.


In case where the proxy is set up for traffic inspection, the Cloud
Insights environment must be added to an exception list in the proxy
configuration. The format and setup of this exception list varies
according to your proxy environment and tools, but in general you must add
the URLs of the Cloud Insights servers to this exception list in order to
allow the AU to properly communicate with those servers.

The simplest way to do this is to add the Cloud Insights domain itself to
the exception list:

 *.cloudinsights.netapp.com

In the case where the proxy is not set up for traffic inspection, an
exception list may or may not be required. If you are unsure whether you
need to add Cloud Insights to an exception list, or if you experience
difficulties installing or running Cloud Insights due to proxy and/or
firewall configuration, talk to your proxy administration team to set up
```

```
the proxy's handling of SSL interception.

=== Viewing Proxy endpoints

You can view your proxy endpoints by clicking the *Proxy Settings* link
when choosing a data collector during onboarding, or the link under _Proxy
Settings_ on the *Help > Support* page. A table like the following is
displayed. If you have Workload Security in your environment, the
configured endpoint URLs will also be displayed in this list.

image:ProxyEndpoints_NewTable.png[Proxy Endpoints Table]


== Resources

Additional troubleshooting tips may be found in the
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights[NetApp Knowledgebase] (support sign-in required).

Additional support information may be found from the Cloud Insights
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID075995600dd2e8a0033f536133202f10]]
= Troubleshooting Acquisition Unit Problems on Windows
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Here you will find suggestions for troubleshooting problems with
Acquisition Units on a Windows server.

|===
|*Problem:* | *Try this:*
|AU status on the *Observability > Collectors* page in the *Acquisition
Units* tab displays "Certificate Expired” or “Certificate Revoked” .
|Click on the menu to the right of the AU and select *Restore Connection*.
Follow the instructions to restore your Acquisition Unit:

1. Stop the Acquisition Unit (AU) service. You can click the _Copy Stop
Command_ button to quickly copy the command to the clipboard, then paste
```

```
this command into a command prompt on the acquisition unit machine.

2. Create a file named "token" in the _c:\Program Files\Cloud
Insights\Acquisition Unit\conf\_ folder on the AU.

3. Click the _Copy Token_ button, and paste this token into the file you
created.

4. Restart the AU service. Click the _Copy Restart Command_ button, and
paste the command into a command prompt on the AU.

|Server Requirements not met | Ensure that your Acquisition Unit server or
VM meets
xref:{relative_path}concept_acquisition_unit_requirements.html[requirement
s]

|Network Requirements not met |Ensure that your Acquisition Unit server/VM
can access your Cloud Insights environment (<environment-
name>.c01.cloudinsights.netapp.com) through SSL connection over port 443.
Try the following commands:

 _ping <environment-name>.c01.cloudinsights.netapp.com_
_traceroute <environment-name>.c01.cloudinsights.netapp.com_
_curl \https://<environment-name>.c01.cloudinsights.netapp.com_
_wget \https://<environment-name>.c01.cloudinsights.netapp.com_

|Proxy Server not configured properly | Verify your proxy settings, and
uninstall/re-install the Acquisition Unit software if necessary to enter
the correct proxy settings.

1. Try "curl".  Refer to "man curl" information/documentation regarding
proxies: --preproxy, --proxy-* (that's a wildcard "*" because curl
supports many proxy settings).
2. Try "wget".  Check documentation for proxy options.


|Acquisition unit installation failed in Cloud insights with credential
errors while starting acquisition service (and visible in the
acq.log).|This can be caused by the inclusion of special characters in the
proxy credentials. Uninstall the AU (_sudo cloudinsights-uninstall.sh_)
and reinstall without using special characters.

|Permission issues| Be sure you are logged in as a user with administrator
permissions

|Acquisition Not Running
|You can find information in the acq.log in the _<install directory>\Cloud
```

```
Insights\Acquisition Unit\log_ folder.
Restart the Acquisition via Windows Services

|Data Collection Issues
|Send an Error Report from the Data Collector landing page by clicking the
"Send Error Report" button

|Status: Heartbeat Failed
|The Acquisition Unit (AU) sends a heartbeat to Cloud Insights every 60
seconds to renew its lease. If the heartbeat call fails due to network
issue or unresponsive Cloud Insights, the AU's lease time isn't updated.
When the AU's lease time expires, Cloud Insights shows a status of
"Heartbeat Failed".

Troubleshoot steps:

* Check the network connection between the Acquisition Unit sever and
CloudInsights.
* Check whether the Acquisition Unit service is running. If the service is
not running, start the service.
* Check the Acquisition Unit log (<Install dir>:\Program Files\Cloud
Insights\Acquisition Unit\log\acq.log) to see whether there are any
errors.

|I'm seeing a "Heartbeat Error: message
|This error can occur if there is a network interruption that causes
communication between the Acquisition Unit and the Cloud Insights
environment to be interrupted for more than one minute. Verify the
connection between the AU and Cloud Insights is stable and active.

|===



== Considerations about Proxies and Firewalls

If your organization requires proxy usage for internet access, you may
need to understand your organization’s proxy behavior and seek certain
exceptions for Cloud Insights to work. Keep the following in mind:

* First, does your organization block access by default, and only allow
access to specific web sites/domains by exception? If so, you will need to
add the following domain to your exception list:
+
 *.cloudinsights.netapp.com
+
Your Cloud Insights Acquisition Unit, as well as your interactions in a
web browser with Cloud Insights, will all go to hosts with that domain
```

```
name.

* Second, some proxies attempt to perform TLS/SSL inspection by
impersonating Cloud Insights web sites with digital certificates not
generated from NetApp. The Cloud Insights Acquisition Unit’s security
model is fundamentally incompatible with these technologies. You would
also need the above domain name excepted from this functionality in order
for the Cloud Insights Acquisition Unit to successfully login to Cloud
Insights and facilitate data discovery.

=== Viewing Proxy endpoints

You can view your proxy endpoints by clicking the *Proxy Settings* link
when choosing a data collector during onboarding, or the link under _Proxy
Settings_ on the *Help > Support* page. A table like the following is
displayed. If you have Workload Security in your environment, the
configured endpoint URLs will also be displayed in this list.

image:ProxyEndpoints_NewTable.png[Proxy Endpoints Table]

== Resources

Additional troubleshooting tips may be found in the
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights[NetApp Knowledgebase] (support sign-in required).

Additional support information may be found from the Cloud Insights
xref:{relative_path}concept_requesting_support.html[Support] page.




[[IDfe412a5bb3a89a23a12c6d07cdfd1a28]]
= Researching a failed data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
If a data collector has failure message and a High or Medium Impact, you
need to research this problem using the data collector summary page with
its linked information.
```

```
Use the following steps to determine the cause of failed data collectors.
Data collector failure messages are displayed on the *Admin* menu and on
the *Installed Data Collectors* page.

.Steps

. Click *Admin* > *Data Collectors* > *Installed Data Collectors*.
. Click the linked Name of the failing data collector to open the Summary
page.
. On the Summary page, check the Comments area to read any notes that
might have been left by another engineer who might also be investigating
this failure.
. Note any performance messages.
//. If there is a patch being applied to this data collector, click link
to check the patch page to see if that has caused the problem.
. Move your mouse pointer over the segments of the Event Timeline graph to
display additional information.
. Select an error message for a Device and displayed below the Event
Timeline and click the Error details icon that displays to the right of
the message.
+
The Error details include the text of the error message, most likely
causes, information in use, and suggestions of what can be tried to
correct the problem.

. In the Devices Reported By This Data Collector area, you might filter
the list to display only devices of interest, and you can click the linked
*Name* of a device to display the asset page for that device.
. When you return to the data collector summary page, check the *Show
Recent Changes* area at the bottom of the page to see if recent changes
could have caused the problem.



:leveloffset: -1



[[ID04af7f0af35c7de9051bea59999ac866]]
= Cloud Insights Data Collector Support Matrix
:toc: macro
:toc-title: Cloud Insights Data Collectors
:hardbreaks:
:toclevels: 1
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
[.lead]

The Data Collector Support Matrix provides reference for Data Collectors
supported by Cloud Insights, including vendor and model information.

[#top]

toc::[]

== HP Enterprise 3PAR / Alletra 9000 / Primera StoreServ Storage
:description: Support Matrix Asciidoc for HP Enterprise 3PAR / Alletra
9000 / Primera StoreServ Storage

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|HPE Alletra 9080
HPE_3PAR 20450
HPE_3PAR 20800
HPE_3PAR 20850
HPE_3PAR 20850_R2
HPE_3PAR 7200c
HPE_3PAR 7400
HPE_3PAR 7440c
HPE_3PAR 7450c
HPE_3PAR 8200
HPE_3PAR 8400
HPE_3PAR 8440
HPE_3PAR 8450
HPE_3PAR 9450
HPE_3PAR A630
HPE_3PAR A650
HPE_3PAR A670
HP_3PAR 20800
HP_3PAR 7200
HP_3PAR 7200c
HP_3PAR 7400
HP_3PAR 7400c
HP_3PAR 7450c
HP_3PAR 8200
HP_3PAR 8400
InServ F400
InServ T400
InServ T800
InServ V400
|3.1.1 (MU1)
3.1.2 (MU3)
3.1.3 (MU1)
3.1.3 (MU2)
3.1.3 (MU3)
3.2.1 (MU3)
3.2.1 (MU5)
3.2.2
3.2.2 (MU2)
3.2.2 (MU4)
3.2.2 (MU6)
3.3.1 (MU1)
3.3.1 (MU2)
3.3.1 (MU5)
3.3.2
3.3.2 (MU1)
4.4.1 Release Type: Standard Support Release
4.5.11 Release Type: Extended Support Release
4.5.3 Release Type: Extended Support Release
4.5.7 Release Type: Extended Support Release
9.5.8 Release Type: Extended Support Release

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.117+|foundation .3+|Device Group|Name|Implemented|SSH|
|Storage Management Id|Implemented|SSH|
|Type|Gap|SSH|
.14+|Disk|Capacity (GB)|Implemented|SSH|use capacity
|Disk Id|Implemented|SSH|Uniquely identifies this disk in the array
|Location|Gap|SSH|Where this disk is physically located in the array
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Role|Implemented|SSH|
|Role Enum|Implemented|SSH|enum for disk role
|Serial Number|Implemented|SSH|
|Status|Implemented|SSH|
|Status Enum|Implemented|SSH|enum for disk status
|Type|Gap|SSH|
|Type Enum|Implemented|SSH|enum for disk type
```

```
|Vendor|Implemented|SSH|
|Vendor Id|Implemented|SSH|
.4+|ISCSI Network Portal|IP|Implemented|SSH|
|Listening Port|Implemented|SSH|
|Nic|Implemented|SSH|
|OID|Implemented|SSH|
.3+|ISCSI Network Portal Group|OID|Implemented|SSH|
|Portal Group Name|Implemented|SSH|
|Portal Group Tag|Implemented|SSH|
.3+|ISCSI Node|Node Name|Implemented|SSH|
|OID|Implemented|SSH|
|Type|Gap|SSH|
.8+|ISCSI Session|OID|Implemented|SSH|
|Initiator OID|Implemented|SSH|
|Portal Group OID|Implemented|SSH|
|Target Session Id|Implemented|SSH|
|Number Of Connections|Implemented|SSH|
|Max Connections|Implemented|SSH|
|Initiator Ips|Implemented|SSH|
|Security|Implemented|SSH|
.5+|Info|Api Name|Implemented|SSH|
|Api Version|Implemented|SSH|
|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
.12+|Storage|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.8+|Storage Node|Memory Size|Gap|SSH|device memory in MB
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Processors Count|Implemented|SSH|device CPU
|State|Implemented|SSH|free text describing the device state
```

```
|UUID|Implemented|SSH|
|Up Time|Implemented|SSH|time in milliseconds
|Version|Implemented|SSH|software version
.24+|Storage Pool|Auto Tiering|Implemented|SSH|indicates if this
storagepool is participating in auto tiering with other pools
|Compression Enabled|Implemented|SSH|Is compression enabled on the storage
pool
|Compression Savings|Implemented|SSH|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|SSH|capacity allocated for data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Other Allocated Capacity|Gap|SSH|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|SSH|Any capacity other than data and
snapshot
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Redundancy|Implemented|SSH|Redundancy level
|Snapshot Allocated Capacity|Gap|SSH|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Vendor Tier|Implemented|SSH|Vendor Specific Tier Name
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.7+|Storage Synchronization|Mode|Implemented|SSH|
|Mode Enum|Implemented|SSH|
|Source Volume|Implemented|SSH|
|State|Implemented|SSH|free text describing the device state
|State Enum|Implemented|SSH|
|Target Volume|Implemented|SSH|
|Technology|Implemented|SSH|technology which causes storage efficiency
changed
.12+|Volume|AutoTier Policy Identifier|Implemented|SSH|Dynamic Tier Policy
```

```
identifier
|Auto Tiering|Implemented|SSH|indicates if this storagepool is
participating in auto tiering with other pools
|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|SSH|Redundancy level
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Type|Gap|SSH|
|UUID|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.4+|Volume Map|LUN|Implemented|SSH|Name of the backend lun
|Protocol Controller|Implemented|SSH|
|Storage Port|Implemented|SSH|
|Type|Gap|SSH|
.4+|Volume Mask|Initiator|Implemented|SSH|
|Protocol Controller|Implemented|SSH|
|Storage Port|Implemented|SSH|
|Type|Gap|SSH|
.2+|Volume Ref|Name|Implemented|SSH|
|Storage Ip|Implemented|SSH|
.4+|WWN Alias|Host Aliases|Implemented|SSH|
|Object Type|Implemented|SSH|
|Source|Implemented|SSH|
|WWN|Implemented|SSH|
.74+|performance .6+|Disk|IOps Read|Implemented|SMI-S|Number of read IOps
on the disk
|IOPs Total|Implemented|SMI-S|
|IOPs Write|Implemented|SMI-S|
|Throughput Read|Implemented|SMI-S|
|Throughput Total|Implemented|SMI-S|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|SMI-S|
.19+|Storage|Cache Hit Ratio Read|Implemented|SMI-S|
|Cache Hit Ratio Total|Implemented|SMI-S|
|Cache Hit Ratio Write|Implemented|SMI-S|
|Failed Raw Capacity|Implemented|SMI-S|
|Raw Capacity|Implemented|SMI-S|
|Spare Raw Capacity|Implemented|SMI-S|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|SMI-S|
|IOPs other|Implemented|SMI-S|
|IOps Read|Implemented|SMI-S|Number of read IOps on the disk
```

```
|IOPs Total|Implemented|SMI-S|
|IOPs Write|Implemented|SMI-S|
|Latency Read|Implemented|SMI-S|
|Latency Total|Implemented|SMI-S|
|Latency Write|Implemented|SMI-S|
|Partial Blocked Ratio|Implemented|SMI-S|
|Throughput Read|Implemented|SMI-S|
|Throughput Total|Implemented|SMI-S|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|SMI-S|
|Write Pending|Implemented|SMI-S|total write pending
.11+|Storage Node|Cache Hit Ratio Total|Implemented|SMI-S|
|IOps Read|Implemented|SMI-S|Number of read IOps on the disk
|IOPs Total|Implemented|SMI-S|
|IOPs Write|Implemented|SMI-S|
|Latency Read|Implemented|SMI-S|
|Latency Total|Implemented|SMI-S|
|Latency Write|Implemented|SMI-S|
|Throughput Read|Implemented|SMI-S|
|Throughput Total|Implemented|SMI-S|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|SMI-S|
|Utilization Total|Implemented|SMI-S|
.19+|StoragePool Disk|Capacity Provisioned|Implemented|SMI-S|
|Raw Capacity|Implemented|SMI-S|
|Total Capacity|Implemented|SMI-S|
|Used Capacity|Implemented|SMI-S|
|Over Commit Capacity Ratio|Implemented|SMI-S|Reported as a time series
|Capacity Used Ratio|Implemented|SMI-S|
|Total Data Capacity|Implemented|SMI-S|
|Data Used Capacity|Implemented|SMI-S|
|IOps Read|Implemented|SMI-S|Number of read IOps on the disk
|IOPs Total|Implemented|SMI-S|
|IOPs Write|Implemented|SMI-S|
|Other Total Capacity|Implemented|SMI-S|
|Other Used Capacity|Implemented|SMI-S|
|Snapshot Reserved Capacity|Implemented|SMI-S|
|Snapshot Used Capacity|Implemented|SMI-S|
|Snapshot Used Capacity Ratio|Implemented|SMI-S| Reported as a time series
|Throughput Read|Implemented|SMI-S|
|Throughput Total|Implemented|SMI-S|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|SMI-S|
.19+|Volume|Cache Hit Ratio Read|Implemented|SMI-S|
|Cache Hit Ratio Total|Implemented|SMI-S|
|Cache Hit Ratio Write|Implemented|SMI-S|
|Raw Capacity|Implemented|SMI-S|
|Total Capacity|Implemented|SMI-S|
|Used Capacity|Implemented|SMI-S|
|Capacity Used Ratio|Implemented|SMI-S|
|CapacityRatio Written|Implemented|SMI-S|
|IOps Read|Implemented|SMI-S|Number of read IOps on the disk
|IOPs Total|Implemented|SMI-S|
|IOPs Write|Implemented|SMI-S|
|Latency Read|Implemented|SMI-S|
|Latency Total|Implemented|SMI-S|
|Latency Write|Implemented|SMI-S|
|Partial Blocked Ratio|Implemented|SMI-S|
|Throughput Read|Implemented|SMI-S|
|Throughput Total|Implemented|SMI-S|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|SMI-S|
|Write Pending|Implemented|SMI-S|total write pending

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|3Par SMI-S
|SMI-S
|HTTP/HTTPS
|5988/5989
|
|true
|true
|true
|true

|3Par CLI
|SSH
|SSH
|22
|
|true
|false
|true
|true
```

```
|===

<<top,Back to Top>>

== Amazon AWS EC2
:description: Support Matrix Asciidoc for Amazon AWS EC2

Models and versions supported by this data collector:
|===
<.<|API versions

|2014-10-01

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.56+|foundation .7+|Data Store|Capacity|Implemented|HTTPS|Snapshot Used
capacity in MB
|MOID|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.6+|Server|Cluster|Implemented|HTTPS|Cluster name
|DataCenter Name|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
.8+|Virtual Disk|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DataStore OID|Implemented|HTTPS|
|Is Chargeable|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Is Snapshot|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.20+|VirtualMachine|Dns Name|Implemented|HTTPS|
|Guest State|Implemented|HTTPS|
|DataStore OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|OS|Implemented|HTTPS|
|Power State|Implemented|HTTPS|
|State Change Time|Implemented|HTTPS|
|Processors|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Instance Type|Implemented|HTTPS|
|Launch Time|Implemented|HTTPS|
|LifeCycle|Implemented|HTTPS|
|public Ips|Implemented|HTTPS|
|Security Groups|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.3+|VirtualMachine Disk|OID|Implemented|HTTPS|
|VirtualDisk OID|Implemented|HTTPS|
|VirtualMachine OID|Implemented|HTTPS|
.5+|Host|Host OS|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.30+|performance .3+|Data Store|Capacity Provisioned|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
.10+|Virtual Disk|Total Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.17+|vm|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Total CPU Utilization|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|diskIops.total|Implemented|HTTPS|
|Disk IOPs write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Disk Throughput Read|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|total disk throughput read
|Disk Throughput Write|Implemented|HTTPS|
|IP Throughput Read|Implemented|HTTPS|
|Throughput total|Implemented|HTTPS|IP throughput total
|ipThroughput.write|Implemented|HTTPS|
|Total Memory Utilization|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EC2 API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Amazon AWS S3
:description: Support Matrix Asciidoc for Amazon AWS S3

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions
```

```
|S3
|2010-08-01

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.40+|foundation .7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.10+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.10+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
```

```
.10+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.4+|performance .4+|Internal Volume|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Total Objects|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|S3 API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Microsoft Azure NetApp Files
:description: Support Matrix Asciidoc for Microsoft Azure NetApp Files
```

```
Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models

|2019-06-01
|Azure NetApp Files

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.69+|foundation .5+|File Share|Is InternalVolume|Implemented|HTTPS|whether
the file share represents an internal volume (netapp volume) or is it a
qtree/folder within the internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
.4+|Info|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.18+|Internal Volume|Data Allocated Capacity|Gap|HTTPS|capacity allocated
for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Last Snapshot Time|Implemented|HTTPS|time of last snapshot
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Snapshot Count|Implemented|HTTPS|Number of snapshots on the internal
volumes
|Snapshot Used Capacity|Implemented|HTTPS|
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
```

```
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
.6+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Security Style|Implemented|HTTPS|Security style of the directory: unix,
ntfs, or mixed
|Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
.6+|Quota|Hard Capacity Limit (MB)|Implemented|HTTPS|max amount of disk
space, allowed for the quota target (Hard limit)
|Internal Volume Id|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota Id|Implemented|HTTPS|unique id of the quota
|Type|Gap|HTTPS|
|Used Capacity|Implemented|HTTPS|
.3+|Share|IP Interfaces|Implemented|HTTPS|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
.11+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.14+|Storage Pool|Data Allocated Capacity|Gap|HTTPS|capacity allocated for
data
|Data Used Capacity|Implemented|HTTPS|
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
```

```
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.23+|performance .17+|Internal Volume|Latency Total|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|Latency Read|Implemented||
|IOPs other|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented||
|Latency Write|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Snapshot Used Capacity Ratio|Implemented|| Reported as a time series
|Capacity Used Ratio|Implemented||
|Total Data Capacity|Implemented||
|Data Used Capacity|Implemented||
|Snapshot Used Capacity|Implemented||
.6+|StoragePool Disk|IOps Read|Implemented||Number of read IOps on the
disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Azure Netapp Files REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Brocade Fibre Channel Switches
:description: Support Matrix Asciidoc for Brocade Fibre Channel Switches

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|178.0
183.0
Brocade 200E
Brocade 300E
Brocade 3900
Brocade 4024 Embedded
Brocade 48000
Brocade 5000
Brocade 5100
Brocade 5300
Brocade 5480 Embedded
Brocade 6505
Brocade 6510
Brocade 6520
Brocade 6548
Brocade 7800
Brocade 7840
Brocade DCX
Brocade DCX-4S Backbone
Brocade DCX8510-4
Brocade DCX8510-8
Brocade G610
Brocade G620
Brocade G630
Brocade G720
Brocade M5424 Embedded
Brocade X6-4
Brocade X6-8
Brocade X7-4
Brocade X7-8
|v5.3.2c
v6.2.1b
v6.2.2g
v6.3.2
v6.4.1a
v6.4.2
v6.4.2a
v7.0.0
v7.0.1b
v7.1.0c
v7.3.0c
v7.3.1d
v7.4.1d
v7.4.1f
v7.4.2a
v7.4.2c
v7.4.2d
v7.4.2g
v7.4.2g_cvr_824494_01
v7.4.2h
v7.4.2j1
v8.0.2a
v8.0.2c
v8.0.2d
v8.1.2g
v8.1.2j
v8.1.2k
v8.2.0
v8.2.0b
v8.2.1c
v8.2.1d
v8.2.2a
v8.2.2b
v8.2.2c
v8.2.2d
v8.2.2d4
v8.2.3
v8.2.3a
v8.2.3a1
```

```
v8.2.3b
v8.2.3c
v8.2.3c1
v9.0.0b
v9.0.1a
v9.0.1b4
v9.0.1c
v9.0.1d
v9.0.1e
v9.0.1e1
v9.1.0b
v9.1.1
v9.1.1_01
v9.1.1b

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.75+|foundation .4+|FC Name Server Entry|FC ID|Implemented|SSH|
|Nx Port WWN|Implemented|SSH|
|Physica lPort WWN|Implemented|SSH|
|Switch Port WWN|Implemented|SSH|
.4+|Fabric|Name|Implemented|Manual Entry|
|VSAN Enabled|Implemented|SSH|
|VSANId|Implemented|SSH|
|WWN|Implemented|SSH|
.2+|IVR Physical Fabric|IVR Chassis WWNs|Implemented|SSH|Comma seperated
list of IVR enabled chassis WWNs
|Lowest IVRChassis WWN|Implemented|SSH|identifier of the IVR fabric
.4+|Info|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
|Originator Key|Implemented|SSH|
.13+|Logical Switch|Chassis WWN|Implemented|SSH|
|Domain Id|Implemented|SSH|
|Firmware Version|Implemented|SSH|
|IP|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|Manual Entry|
|Serial Number|Implemented|SSH|
|Switch Role|Implemented|SSH|
|Switch State|Implemented|SSH|
|Switch Status|Implemented|SSH|
|Type|Gap|SSH|
|WWN|Implemented|SSH|
.16+|Port|Blade|Implemented|SSH|
|FC4 Protocol|Implemented|SSH|
|GBIC Type|Implemented|SSH|
|Generated|Implemented|SSH|
|Name|Implemented|Manual Entry|
|Node WWN|Implemented|SSH|Mandatory to report with PortId if WWN is not present
|Port ID|Implemented|SSH|
|Port Number|Implemented|SSH|
|Port Speed|Implemented|SSH|
|Port State|Implemented|SSH|
|Port Status|Implemented|SSH|
|Port Type|Implemented|SSH|
|Raw Port Status|Implemented|SSH|
|Raw Speed GigaBits|Implemented|SSH|
|Unknown Connectivity|Implemented|SSH|
|WWN|Implemented|SSH|
.14+|Switch|Domain Id|Implemented|SSH|
|Firmware Version|Implemented|SSH|
|IP|Implemented|SSH|
|Manage URL|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|Manual Entry|
|Serial Number|Implemented|SSH|
|Switch Role|Implemented|SSH|
|Switch State|Implemented|SSH|
|Switch Status|Implemented|SSH|
|Type|Gap|SSH|
|VSAN Enabled|Implemented|SSH|
|WWN|Implemented|SSH|
.7+|Unknown|Driver|Implemented|SSH|
|Firmware|Implemented|SSH|
|Generated|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|Manual Entry|
|WWN|Implemented|SSH|
.4+|WWN Alias|Host Aliases|Implemented|SSH|
|Object Type|Implemented|SSH|
|Source|Implemented|SSH|
|WWN|Implemented|SSH|
.1+|Zone|Zone Name|Implemented|SSH|
.2+|Zone Member|Type|Gap|SSH|
|WWN|Implemented|SSH|
.4+|Zoning Capabilities|Active Configuration|Implemented|SSH|
|Configuration Name|Implemented|SSH|
|Default Zoning Behavior|Implemented|SSH|
|WWN|Implemented|SSH|
.28+|performance .28+|port|BB Credit|Implemented|SNMP|
|bbCreditZero.total|Implemented|SNMP|
|BB Credit|Implemented|SNMP|
|bbCreditZeroMs|Implemented|SNMP|
|portErrors.class3Discard|Implemented|SNMP|
|portErrors.crc|Implemented|SNMP|
|Port Error|Implemented|SNMP|
|portErrors.encOut|Implemented|SNMP|
|Port Error|Implemented|SNMP|Port errors due to long frame
|Port Error|Implemented|SNMP|Port errors due to short frame
|portErrors.linkFailure|Implemented|SNMP|Port Errors link failure
|portErrors.linkResetRx|Implemented|SNMP|
|Port Error|Implemented|SNMP|Port Error due to link reset
|Port Error|Implemented|SNMP|Port errors signal loss
|Port Error|Implemented|SNMP|Port error sync loss
|Port Error|Implemented|SNMP|port errors timeout discard
|Port Error|Implemented|SNMP|Total port errors
|Traffic Frame Rate|Implemented|SNMP|
|Total Traffic Frame Rate|Implemented|SNMP|
|Traffic Frame Rate|Implemented|SNMP|
|Average Frame Size|Implemented|SNMP|Average Frame size of traffic
|TX Frames|Implemented|SNMP|traffic average frame size
|Traffic Rate|Implemented|SNMP|
|Total Traffic Rate|Implemented|SNMP|
|Traffic Rate|Implemented|SNMP|
|Traffic Utilization|Implemented|SNMP|
|Traffic Utilization|Implemented|SNMP|Total traffic utilization
|Traffic Utilization|Implemented|SNMP|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Brocade SNMP
|SNMP
```

```
|SNMPv1, SNMPv2, SNMPv3
|161
|
|true
|true
|true
|true

|Brocade SSH
|SSH
|SSH
|22
|
|false
|false
|true
|true

|Data source wizard configuration
|Manual Entry
|
|
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Brocade Network Advisor HTTP
:description: Support Matrix Asciidoc for Brocade Network Advisor HTTP

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|14.4.1
14.4.3
14.4.4
14.4.5
|Brocade 5300
Brocade 6510
Brocade 6520
Brocade 6548
Brocade DCX 8510-8
Brocade G620
DS-6620B
EMC Connectrix ED-DCX8510-8B
|v7.2.1a
v7.3.1a
v7.4.1b
v7.4.2d
v8.2.3b
v8.2.3c
v9.0.1a
v9.0.1b
v9.0.1e1

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.58+|foundation .4+|FC Name Server Entry|FC ID|Implemented|HTTP/S|
|Nx Port WWN|Implemented|HTTP/S|
|Physica lPort WWN|Implemented|HTTP/S|
|Switch Port WWN|Implemented|HTTP/S|
.4+|Fabric|Name|Implemented|HTTP/S|
|VSAN Enabled|Implemented|HTTP/S|
|VSANId|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.7+|Info|Api Description|Implemented|HTTP/S|
|Api Name|Implemented|HTTP/S|
|Api Version|Implemented|HTTP/S|
|DataSource Name|Implemented|HTTP/S|Info
|Date|Implemented|HTTP/S|
|Originator ID|Implemented|HTTP/S|
|Originator Key|Implemented|HTTP/S|
.15+|Port|Blade|Implemented|HTTP/S|
|FC4 Protocol|Implemented|HTTP/S|
|GBIC Type|Implemented|HTTP/S|
|Generated|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Port ID|Implemented|HTTP/S|
|Port Number|Implemented|HTTP/S|
|Port Speed|Implemented|HTTP/S|
|Port State|Implemented|HTTP/S|
|Port Status|Implemented|HTTP/S|
|Port Type|Implemented|HTTP/S|
|Raw Port Status|Implemented|HTTP/S|
|Raw Speed GigaBits|Implemented|HTTP/S|
|Unknown Connectivity|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.13+|Switch|Domain Id|Implemented|HTTP/S|
|Firmware Version|Implemented|HTTP/S|
|IP|Implemented|HTTP/S|
|Manage URL|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Serial Number|Implemented|HTTP/S|
|Switch Role|Implemented|HTTP/S|
|Switch State|Implemented|HTTP/S|
|Switch Status|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
|WWN|Implemented|HTTP/S|
.5+|Unknown|Driver|Implemented|HTTP/S|
|Firmware|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Model|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.4+|WWN Alias|Host Aliases|Implemented|HTTP/S|
|Object Type|Implemented|HTTP/S|
|Source|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.1+|Zone|Zone Name|Implemented|HTTP/S|
.2+|Zone Member|Type|Gap|HTTP/S|
|WWN|Implemented|HTTP/S|
.3+|Zoning Capabilities|Active Configuration|Implemented|HTTP/S|
|Configuration Name|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.18+|performance .18+|port|bbCreditZero.total|Implemented|HTTP/S|
|BB Credit|Implemented|HTTP/S|
|bbCreditZeroMs|Implemented|HTTP/S|
|portErrors.class3Discard|Implemented|HTTP/S|
|portErrors.crc|Implemented|HTTP/S|
|Port Error|Implemented|HTTP/S|
|Port Error|Implemented|HTTP/S|Port errors due to short frame
|portErrors.linkFailure|Implemented|HTTP/S|Port Errors link failure
|Port Error|Implemented|HTTP/S|Port errors signal loss
|Port Error|Implemented|HTTP/S|Port error sync loss
|Port Error|Implemented|HTTP/S|port errors timeout discard
|Port Error|Implemented|HTTP/S|Total port errors
|Traffic Rate|Implemented|HTTP/S|
|Total Traffic Rate|Implemented|HTTP/S|
|Traffic Rate|Implemented|HTTP/S|
|Traffic Utilization|Implemented|HTTP/S|
|Traffic Utilization|Implemented|HTTP/S|Total traffic utilization
|Traffic Utilization|Implemented|HTTP/S|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Brocade Network Advisor REST API
|HTTP/HTTPS
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Brocade FOS REST
:description: Support Matrix Asciidoc for Brocade FOS REST

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|Brocade 6505
Brocade G720
Brocade X6-8
|v8.2.3c
v8.2.3c1
v9.0.1e1
v9.1.1b

|===
Products supported by this data collector:
```

```
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.72+|foundation .4+|FC Name Server Entry|FC ID|Implemented|HTTPS|
|Nx Port WWN|Implemented|HTTPS|
|Physica lPort WWN|Implemented|HTTPS|
|Switch Port WWN|Implemented|HTTPS|
.4+|Fabric|Name|Implemented|HTTPS|
|VSAN Enabled|Implemented|HTTPS|
|VSANId|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.12+|Logical Switch|WWN|Implemented|HTTPS|
|IP|Implemented|HTTPS|
|Firmware Version|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Switch Role|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Serial Number|Implemented|HTTPS|
|Switch State|Implemented|HTTPS|
|Domain Id|Implemented|HTTPS|
|Chassis WWN|Implemented|HTTPS|
.15+|Port|Blade|Implemented|HTTPS|
|Generated|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Node WWN|Implemented|HTTPS|Mandatory to report with PortId if WWN is not
present
|Port ID|Implemented|HTTPS|
|Port Number|Implemented|HTTPS|
|Port Speed|Implemented|HTTPS|
|Port State|Implemented|HTTPS|
|Port Status|Implemented|HTTPS|
|Port Type|Implemented|HTTPS|
|Raw Port Status|Implemented|HTTPS|
|Raw Speed GigaBits|Implemented|HTTPS|
|Unknown Connectivity|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
|Description|Implemented|HTTPS|
.14+|Switch|Domain Id|Implemented|HTTPS|
|Firmware Version|Implemented|HTTPS|
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Switch Role|Implemented|HTTPS|
|Switch State|Implemented|HTTPS|
|Switch Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
|VSAN Enabled|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.5+|Unknown|Driver|Implemented|HTTPS|
|Firmware|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.4+|WWN Alias|Host Aliases|Implemented|HTTPS|
|Object Type|Implemented|HTTPS|
|Source|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.1+|Zone|Zone Name|Implemented|HTTPS|
.2+|Zone Member|Type|Gap|HTTPS|
|WWN|Implemented|HTTPS|
.4+|Zoning Capabilities|Active Configuration|Implemented|HTTPS|
|Configuration Name|Implemented|HTTPS|
|Default Zoning Behavior|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.27+|performance .27+|port|BB Credit|Implemented|HTTPS|
|bbCreditZero.total|Implemented|HTTPS|
|BB Credit|Implemented|HTTPS|
|bbCreditZeroMs|Implemented|HTTPS|
|portErrors.class3Discard|Implemented|HTTPS|
|portErrors.crc|Implemented|HTTPS|
|Port Error|Implemented|HTTPS|
|portErrors.encOut|Implemented|HTTPS|
|Port Error|Implemented|HTTPS|Port errors due to long frame
|Port Error|Implemented|HTTPS|Port errors due to short frame
|portErrors.linkFailure|Implemented|HTTPS|Port Errors link failure
|portErrors.linkResetRx|Implemented|HTTPS|
|Port Error|Implemented|HTTPS|Port Error due to link reset
|Port Error|Implemented|HTTPS|Port errors signal loss
|Port Error|Implemented|HTTPS|Port error sync loss
```

```
|Port Error|Implemented|HTTPS|Total port errors
|Traffic Frame Rate|Implemented|HTTPS|
|Total Traffic Frame Rate|Implemented|HTTPS|
|Traffic Frame Rate|Implemented|HTTPS|
|Average Frame Size|Implemented|HTTPS|Average Frame size of traffic
|TX Frames|Implemented|HTTPS|traffic average frame size
|Traffic Rate|Implemented|HTTPS|
|Total Traffic Rate|Implemented|HTTPS|
|Traffic Rate|Implemented|HTTPS|
|Traffic Utilization|Implemented|HTTPS|
|Traffic Utilization|Implemented|HTTPS|Total traffic utilization
|Traffic Utilization|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Brocade FOS REST API
|HTTPS
|
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Cisco MDS & Nexus Fabric Switches
:description: Support Matrix Asciidoc for Cisco MDS & Nexus Fabric
Switches

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|8978-E04
CN1610
```

```
DS-C9124-2-K9
DS-C9124-K9
DS-C9132T-K9
DS-C9134-K9
DS-C9148-16P-K9
DS-C9148-32P-K9
DS-C9148-48P-K9
DS-C9148S-K9
DS-C9148T-K9
DS-C9222I-K9
DS-C9250I-K9
DS-C9396S-K9
DS-C9396T-K9
DS-C9506
DS-C9509
DS-C9513
DS-C9706
DS-C9710
DS-C9718
DS-HP-8GFC-K9
DS-HP-FC-K9
N5K-C5548UP
N5K-C5596UP
N5K-C56128P
N5K-C5696Q
UCS-FI-6248UP
UCS-FI-6296UP
UCS-FI-6332
UCS-FI-6332-16UP
UCS-FI-6454
|3.3(1c)
4.1(3a)
5.0(1a)
5.0(3)N2(3.11e)
5.0(3)N2(3.23o)
5.0(3)N2(4.01d)
5.0(3)N2(4.04e)
5.0(3)N2(4.13e)
5.0(3)N2(4.13i)
5.0(3)N2(4.21e)
5.0(3)N2(4.21j)
5.0(3)N2(4.21k)
5.0(3)N2(4.22c)
5.0(8)
5.2(2d)
5.2(3)N2(2.28g)
```

```
5.2(6a)
5.2(8)
5.2(8b)
5.2(8c)
5.2(8d)
5.2(8f)
5.2(8g)
5.2(8h)
5.2(8i)
6.2(1)
6.2(11)
6.2(11b)
6.2(11c)
6.2(11e)
6.2(13)
6.2(13a)
6.2(15)
6.2(17)
6.2(19)
6.2(21)
6.2(23)
6.2(25)
6.2(27)
6.2(29)
6.2(31)
6.2(33)
6.2(5)
6.2(5a)
6.2(7)
6.2(9)
6.2(9a)
6.2(9c)
7.3(0)D1(1)
7.3(0)DY(1)
7.3(1)DY(1)
7.3(1)N1(1)
7.3(13)N1(1)
7.3(6)N1(1)
7.3(8)N1(1)
8.1(1)
8.1(1a)
8.1(1b)
8.2(1)
8.2(2)
8.3(1)
8.3(2)
```

```
8.4(1)
8.4(1a)
8.4(2)
8.4(2a)
8.4(2b)
8.4(2c)
8.4(2d)
8.4(2e)
8.4(2f)
8.5(1)
9.2(1)
9.2(1a)
9.2(2)
9.3(2)
9.3(2a)
9.3(5)I42(2a)
9.3(5)I42(2c)

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.69+|foundation .4+|FC Name Server Entry|FC ID|Implemented|SNMP|
|Nx Port WWN|Implemented|SNMP|
|Physica lPort WWN|Implemented|SNMP|
|Switch Port WWN|Implemented|SNMP|
.4+|Fabric|Name|Implemented|SNMP|
|VSAN Enabled|Implemented|SNMP|
|VSANId|Implemented|SNMP|
|WWN|Implemented|SNMP|
.2+|IVR Physical Fabric|IVR Chassis WWNs|Implemented|SNMP|Comma seperated
list of IVR enabled chassis WWNs
|Lowest IVRChassis WWN|Implemented|SNMP|identifier of the IVR fabric
.4+|Info|DataSource Name|Implemented|SNMP|Info
|Date|Implemented|SNMP|
|Originator ID|Implemented|SNMP|
|Originator Key|Implemented|SNMP|
.9+|Logical Switch|Chassis WWN|Implemented|SNMP|
|Domain Id|Implemented|SNMP|
|DomainId Type|Implemented|SNMP|
|IP|Implemented|SNMP|
|Manufacturer|Implemented|SNMP|
|Priority|Implemented|SNMP|
|Switch Role|Implemented|SNMP|
|Type|Gap|SNMP|
|WWN|Implemented|SNMP|
.14+|Port|Blade|Implemented|SNMP|
|GBIC Type|Implemented|SNMP|
|Generated|Implemented|SNMP|
|Name|Implemented|SNMP|
|Port ID|Implemented|SNMP|
|Port Number|Implemented|SNMP|
|Port Speed|Implemented|SNMP|
|Port State|Implemented|SNMP|
|Port Status|Implemented|SNMP|
|Port Type|Implemented|SNMP|
|Raw Port Status|Implemented|SNMP|
|Raw Speed GigaBits|Implemented|SNMP|
|Unknown Connectivity|Implemented|SNMP|
|WWN|Implemented|SNMP|
.12+|Switch|Firmware Version|Implemented|SNMP|
|IP|Implemented|SNMP|
|Manage URL|Implemented|SNMP|
|Manufacturer|Implemented|SNMP|
|Model|Implemented|SNMP|
|Name|Implemented|SNMP|
|SANRoute Enabled|Implemented|SNMP|Indicates if this chassis is enabled
for SAN routing (IVR, etc...)
|Serial Number|Implemented|SNMP|
|Switch Status|Implemented|SNMP|
|Type|Gap|SNMP|
|VSAN Enabled|Implemented|SNMP|
|WWN|Implemented|SNMP|
.7+|Unknown|Driver|Implemented|SNMP|
|Firmware|Implemented|SNMP|
|Generated|Implemented|SNMP|
|Manufacturer|Implemented|SNMP|
|Model|Implemented|SNMP|
|Name|Implemented|SNMP|
|WWN|Implemented|SNMP|
.4+|WWN Alias|Host Aliases|Implemented|SNMP|
|Object Type|Implemented|SNMP|
|Source|Implemented|SNMP|
|WWN|Implemented|SNMP|
.2+|Zone|Zone Name|Implemented|SNMP|
|Zone Type|Implemented|SNMP|
.2+|Zone Member|Type|Gap|SNMP|
|WWN|Implemented|SNMP|
.5+|Zoning Capabilities|Active Configuration|Implemented|SNMP|
|Configuration Name|Implemented|SNMP|
|Default Zoning Behavior|Implemented|SNMP|
|Merge Control|Implemented|SNMP|
|WWN|Implemented|SNMP|
.26+|performance .26+|port|BB Credit|Implemented|SNMP|
|bbCreditZero.total|Implemented|SNMP|
|BB Credit|Implemented|SNMP|
|bbCreditZeroMs|Implemented|SNMP|
|portErrors.class3Discard|Implemented|SNMP|
|portErrors.crc|Implemented|SNMP|
|Port Error|Implemented|SNMP|Port errors due to long frame
|Port Error|Implemented|SNMP|Port errors due to short frame
|portErrors.linkFailure|Implemented|SNMP|Port Errors link failure
|portErrors.linkResetRx|Implemented|SNMP|
|Port Error|Implemented|SNMP|Port Error due to link reset
|Port Error|Implemented|SNMP|Port errors signal loss
|Port Error|Implemented|SNMP|Port error sync loss
|Port Error|Implemented|SNMP|port errors timeout discard
|Port Error|Implemented|SNMP|Total port errors
|Traffic Frame Rate|Implemented|SNMP|
|Total Traffic Frame Rate|Implemented|SNMP|
|Traffic Frame Rate|Implemented|SNMP|
|Average Frame Size|Implemented|SNMP|Average Frame size of traffic
|TX Frames|Implemented|SNMP|traffic average frame size
|Traffic Rate|Implemented|SNMP|
|Total Traffic Rate|Implemented|SNMP|
|Traffic Rate|Implemented|SNMP|
|Traffic Utilization|Implemented|SNMP|
|Traffic Utilization|Implemented|SNMP|Total traffic utilization
|Traffic Utilization|Implemented|SNMP|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Cisco SNMP
|SNMP
|SNMPv1 (Inventory only), SNMPv2, SNMPv3
|161
|
|true
|true
```

```
|true
|true

|===

<<top,Back to Top>>

== Cohesity
:description: Support Matrix Asciidoc for Cohesity

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|C2500
C2505
C4000 Compute Node
C4600
C5036
C5066
C6025
C6035
C6055
PXG1
UCS-C240M5H10
|6.5.1f_release-20210913_13f6a4bf
6.5.1f_u1_release-20211027_9e4e40cb
6.6.0d_u6_release-20221204_c03629f0
6.8.1_release-20220807_6c9115ef
6.8.1_u1_release-20221022_6f58ed2a
6.8.1_u2_release-20230412_5ced2ed3
6.8.1_u3_release-20230509_1e641b74
7.0_u1_release-20230222_8995f044

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.66+|foundation .3+|Disk|Capacity (GB)|Implemented||use capacity
|Disk Id|Implemented||Uniquely identifies this disk in the array
|Name|Implemented||
.5+|File Share|Is InternalVolume|Implemented||whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
```

```
|Is Shared|Implemented||whether this fileShare has any shares associated
with it
|Name|Implemented||
|Path|Implemented||path of the fileShare
|Qtree Id|Implemented||unique id of the qtree
.5+|Info|Api Name|Implemented||
|DataSource Name|Implemented||Info
|Date|Implemented||
|Originator ID|Implemented||
|Originator Key|Implemented||
.13+|Internal Volume|Compression Enabled|Implemented||Is compression
enabled on the storage pool
|Dedupe Enabled|Implemented||Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented||ratio of dedupe savings in percentage
|Internal Volume Id|Implemented||
|Name|Implemented||
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Total Used Capacity (MB)|Implemented||place holder for the used capacity
as read from the device
|Type|Gap||
.3+|QTree|Name|Implemented||
|Qtree Id|Implemented||unique id of the qtree
|Type|Gap||
.3+|Share|IP Interfaces|Implemented||comma separated list of IP addresses
on which this share is exposed
|Name|Implemented||
|Protocol|Implemented||enum for share protocol
.13+|Storage|Display IP|Implemented||
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et
al
|IP|Implemented||
|Manage URL|Implemented||
|Manufacturer|Implemented||
|Microcode Version|Implemented||
|Model|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Serial Number|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|Virtual|Implemented||Is this a storage virtualization device?
.5+|Storage Node|Model|Implemented||
|Name|Implemented||
|Serial Number|Implemented||
|UUID|Implemented||
|Version|Implemented||software version
.16+|Storage Pool|Compression Enabled|Implemented||Is compression enabled
on the storage pool
|Dedupe Enabled|Implemented||Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented||ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Status|Implemented||
|Storage Pool Id|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Type|Gap||
|Virtual|Implemented||Is this a storage virtualization device?
|Encrypted|Implemented||
.26+|performance .7+|Disk|IOps Read|Implemented||Number of read IOps on
the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.3+|Internal Volume|Total Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Used Capacity|Implemented||
.0+|Qtree.10+|Storage|Latency Total|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
```

```
|Latency Read|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented||
|Latency Write|Implemented||
|Utilization Total|Implemented||
.6+|StoragePool Disk|IOps Read|Implemented||Number of read IOps on the
disk
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Cohesity REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC Celerra (SSH)
:description: Support Matrix Asciidoc for EMC Celerra (SSH)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|NS-480FC
NSX
VG8
VNX5200
VNX5300
VNX5400
VNX5600
VNX7600
|5.5.38-1
6.0.65-2
7.1.76-4
7.1.79-8
7.1.83-2
8.1.21-266
8.1.21-303
8.1.9-155

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.85+|foundation .6+|File Share|Is InternalVolume|Implemented|SSH|whether
the file share represents an internal volume (netapp volume) or is it a
qtree/folder within the internal volume
|Is Shared|Implemented|SSH|whether this fileShare has any shares
associated with it
|Name|Implemented|SSH|
|Path|Implemented|SSH|path of the fileShare
|Qtree Id|Implemented|SSH|unique id of the qtree
|Status|Implemented|SSH|
.6+|Info|Api Name|Implemented|SSH|
|Api Version|Implemented|SSH|
|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
|Originator Key|Implemented|SSH|
.21+|Internal Volume|Data Allocated Capacity|Gap|SSH|capacity allocated
for data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects whose GUID
```

```
key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|Internal Volume Id|Implemented|SSH|
|Last Snapshot Time|Implemented|SSH|time of last snapshot
|Name|Implemented|SSH|
|Other Allocated Capacity|Gap|SSH|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|SSH|Any capacity other than data and
snapshot
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Snapshot Count|Implemented|SSH|Number of snapshots on the internal
volumes
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Total Used Capacity (MB)|Implemented|SSH|place holder for the used
capacity as read from the device
|Type|Gap|SSH|
|Virtual Storage|Implemented|SSH|Owning virtual storage (vfiler)
.8+|QTree|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects
whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|Name|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|SSH|Space in MB currently used
|Type|Gap|SSH|
.12+|Quota|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects
whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|Hard Capacity Limit (MB)|Implemented|SSH|max amount of disk space,
allowed for the quota target (Hard limit)
|Hard File Limit|Implemented|SSH|max number of files allowed for the quota
target
|Internal Volume Id|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
```

```
|Quota Id|Implemented|SSH|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|SSH|Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented|SSH|Max number of files allowed for the quota
target
|Type|Gap|SSH|
|Used Capacity|Implemented|SSH|
|Used Files|Implemented|SSH|Number of files currently used
.3+|Share|IP Interfaces|Implemented|SSH|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|SSH|
|Protocol|Implemented|SSH|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|SSH|
|Permission|Implemented|SSH|Permissions for this particular share
.12+|Storage|Cpu Count|Implemented|SSH|Cpu Count of the storage
|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.15+|Storage Pool|Data Allocated Capacity|Gap|SSH|capacity allocated for
data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Snapshot Allocated Capacity|Gap|SSH|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
```

```
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Celerra CLI
|SSH
|SSH
|
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== EMC CLARiiON (NaviCLI)
:description: Support Matrix Asciidoc for EMC CLARiiON (NaviCLI)

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|6.23
6.26
6.28
7.30
7.32
7.33
|AX4-5F8
CX3-20f
CX3-40f
CX4-480
VNX5100
```

```
VNX5200
VNX5300
VNX5400
VNX5500
VNX5600
VNX5700
VNX5800
VNX7600
VNX8000
|04.28.000.5.710
04.30.000.5.525
05.32.000.5.218
05.32.000.5.219
05.32.000.5.221
05.32.000.5.225
05.32.000.5.249
05.33.000.5.074
05.33.009.5.155
05.33.009.5.184
05.33.009.5.186
05.33.009.5.218
05.33.009.5.231
05.33.009.5.236
05.33.009.5.238
05.33.009.6.305
05.33.021.5.256
05.33.021.5.266
2.23.50.5.710
3.26.20.5.011
3.26.40.5.029

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.101+|foundation .14+|Disk|Capacity (GB)|Implemented|CLI|use capacity
|Disk Id|Implemented|CLI|Uniquely identifies this disk in the array
|Group|Implemented|CLI|
|Location|Gap|CLI|Where this disk is physically located in the array
|Model|Implemented|CLI|
|Name|Implemented|CLI|
|Role|Implemented|CLI|
|Role Enum|Implemented|CLI|enum for disk role
|Serial Number|Implemented|CLI|
|Status|Implemented|CLI|
|Status Enum|Implemented|CLI|enum for disk status
|Type|Gap|CLI|
|Type Enum|Implemented|CLI|enum for disk type
|Vendor|Implemented|CLI|
.7+|Info|Api Name|Implemented|CLI|
|Api Version|Implemented|CLI|
|Client Api Name|Implemented|CLI|
|Client Api Version|Implemented|CLI|
|DataSource Name|Implemented|CLI|Info
|Date|Implemented|CLI|
|Originator ID|Implemented|CLI|
.14+|Storage|Display IP|Implemented|CLI|
|Failed Raw Capacity|Implemented|CLI|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|CLI|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|CLI|
|Manage URL|Implemented|CLI|
|Manufacturer|Implemented|CLI|
|Microcode Version|Implemented|CLI|
|Model|Implemented|CLI|
|Name|Implemented|CLI|
|Total Raw Capacity|Implemented|CLI|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|CLI|
|Spare Raw Capacity|Implemented|CLI|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|CLI|Specified if the storage supports
active-active configurations
|Virtual|Implemented|CLI|Is this a storage virtualization device?
.4+|Storage Node|Name|Implemented|CLI|
|Serial Number|Implemented|CLI|
|UUID|Implemented|CLI|
|ManagementIp Addresses|Implemented|CLI|
.18+|Storage Pool|Dedupe Enabled|Implemented|CLI|Is dedupe enabled on the
storage pool
|Include In Dwh Capacity|Implemented|CLI|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|CLI|
|Other Allocated Capacity|Gap|CLI|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|CLI|Any capacity other than data and
snapshot
|Physical Disk  Capacity (MB)|Implemented|CLI|used as raw capacity for
storage pool
```

```
|Raid Group|Implemented|CLI|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|CLI|ratio to convert from usable capacity
to raw capacity
|Redundancy|Implemented|CLI|Redundancy level
|Snapshot Allocated Capacity|Gap|CLI|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|CLI|
|Status|Implemented|CLI|
|Storage Pool Id|Implemented|CLI|
|Thin Provisioning Supported|Implemented|CLI|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|CLI|
|Total Used Capacity|Implemented|CLI|Total capacity in MB
|Type|Gap|CLI|
|Virtual|Implemented|CLI|Is this a storage virtualization device?
.7+|Storage Synchronization|Mode|Implemented|CLI|
|Mode Enum|Implemented|CLI|
|Source Volume|Implemented|CLI|
|State|Implemented|CLI|free text describing the device state
|State Enum|Implemented|CLI|
|Target Volume|Implemented|CLI|
|Technology|Implemented|CLI|technology which causes storage efficiency
changed
.17+|Volume|AutoTier Policy Identifier|Implemented|CLI|Dynamic Tier Policy
identifier
|Auto Tiering|Implemented|CLI|indicates if this storagepool is
participating in auto tiering with other pools
|Capacity|Implemented|CLI|Snapshot Used capacity in MB
|DiskGroup|Implemented|CLI|Disk Group Type
|Disk Type|Not Available|CLI|
|Junction Path|Implemented|CLI|
|Meta|Implemented|CLI|Flag saying whether this volume is a meta volume
with memeber or not. Meta volumes will have DiskGroup empty!
|Name|Implemented|CLI|
|Total Raw Capacity|Implemented|CLI|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|CLI|Redundancy level
|Replica Source|Implemented|CLI|
|Replica Target|Implemented|CLI|
|Storage Pool Id|Implemented|CLI|
|Thin Provisioned|Implemented|CLI|
|Type|Gap|CLI|
|UUID|Implemented|CLI|
|Used Capacity|Implemented|CLI|
.4+|Volume Map|LUN|Implemented|CLI|Name of the backend lun
|Protocol Controller|Implemented|CLI|
|Storage Port|Implemented|CLI|
|Type|Gap|CLI|
.4+|Volume Mask|Initiator|Implemented|CLI|
|Protocol Controller|Implemented|CLI|
|Storage Port|Implemented|CLI|
|Type|Gap|CLI|
.7+|Volume Member|Capacity|Implemented|CLI|Snapshot Used capacity in MB
|Name|Implemented|CLI|
|Rank|Implemented|CLI|
|Total Raw Capacity|Implemented|CLI|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|CLI|Redundancy level
|Storage Pool Id|Implemented|CLI|
|Used Capacity|Implemented|CLI|
.5+|WWN Alias|Host Aliases|Implemented|CLI|
|IP|Implemented|CLI|
|Object Type|Implemented|CLI|
|Source|Implemented|CLI|
|WWN|Implemented|CLI|
.66+|performance .9+|Disk|IOps Read|Implemented|CLI|Number of read IOps on
the disk
|IOPs Total|Implemented|CLI|
|IOPs Write|Implemented|CLI|
|Throughput Read|Implemented|CLI|
|Throughput Total|Implemented|CLI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|CLI|
|Read Utilization|Implemented|CLI|
|Utilization Total|Implemented|CLI|
|Utilization Write|Implemented|CLI|
.16+|Storage|Cache Hit Ratio Read|Implemented|CLI|
|Cache Hit Ratio Total|Implemented|CLI|
|Cache Hit Ratio Write|Implemented|CLI|
|Failed Raw Capacity|Implemented|CLI|
|Raw Capacity|Implemented|CLI|
|Spare Raw Capacity|Implemented|CLI|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|CLI|
|IOPs other|Implemented|CLI|
|IOps Read|Implemented|CLI|Number of read IOps on the disk
|IOPs Total|Implemented|CLI|
|IOPs Write|Implemented|CLI|
|Latency Total|Implemented|CLI|
|Partial Blocked Ratio|Implemented|CLI|
|Throughput Read|Implemented|CLI|
|Throughput Total|Implemented|CLI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|CLI|
.4+|Storage Node|IOps Read|Implemented|CLI|Number of read IOps on the disk
|IOPs Total|Implemented|CLI|
|IOPs Write|Implemented|CLI|
|Utilization Total|Implemented|CLI|
.20+|StoragePool Disk|Capacity Provisioned|Implemented|CLI|
|Raw Capacity|Implemented|CLI|
|Total Capacity|Implemented|CLI|
|Used Capacity|Implemented|CLI|
|Over Commit Capacity Ratio|Implemented|CLI|Reported as a time series
|Capacity Used Ratio|Implemented|CLI|
|IOps Read|Implemented|CLI|Number of read IOps on the disk
|IOPs Total|Implemented|CLI|
|IOPs Write|Implemented|CLI|
|Other Total Capacity|Implemented|CLI|
|Other Used Capacity|Implemented|CLI|
|Snapshot Reserved Capacity|Implemented|CLI|
|Snapshot Used Capacity|Implemented|CLI|
|Snapshot Used Capacity Ratio|Implemented|CLI| Reported as a time series
|Throughput Read|Implemented|CLI|
|Throughput Total|Implemented|CLI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|CLI|
|Read Utilization|Implemented|CLI|
|Utilization Total|Implemented|CLI|
|Utilization Write|Implemented|CLI|
.17+|Volume|Cache Hit Ratio Read|Implemented|CLI|
|Cache Hit Ratio Total|Implemented|CLI|
|Cache Hit Ratio Write|Implemented|CLI|
|Raw Capacity|Implemented|CLI|
|Total Capacity|Implemented|CLI|
|Used Capacity|Implemented|CLI|
|Capacity Used Ratio|Implemented|CLI|
|IOps Read|Implemented|CLI|Number of read IOps on the disk
|IOPs Total|Implemented|CLI|
|IOPs Write|Implemented|CLI|
|Latency Read|Implemented|CLI|
|Latency Total|Implemented|CLI|
|Latency Write|Implemented|CLI|
|Partial Blocked Ratio|Implemented|CLI|
|Throughput Read|Implemented|CLI|
|Throughput Total|Implemented|CLI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|CLI|
|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Navi CLI
|CLI
|
|6389,2162,2163,443(HTTPS)/80(HTTP)
|
|true
|true
|true
|false

|===

<<top,Back to Top>>

== EMC Data Domain (SSH)
:description: Support Matrix Asciidoc for EMC Data Domain (SSH)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|DD VE
DD2200
DD2500
DD3300
DD4200
DD6300
DD6800
DD6900
DD7200
DD9300
DD9400
DD9500
DD9800
DD990
DD9900
|6.1.2.051-633576
```

```
6.1.2.20-606786
6.1.2.50-632120
6.2.0.30-629757
6.2.0.35-635767
6.2.1.30-663869
6.2.1.40-671977
6.2.1.60-686365
7.10.0.0-1017741
7.10.1.0-1042928
7.2.0.30-663847
7.2.0.50-671975
7.2.0.60-682124
7.2.0.70-686759
7.2.0.90-692270
7.6.0.20-689174
7.6.0.30-690691
7.7.0.7-1007134
7.7.1.10-1011247
7.7.2.011-1011427
7.7.2.10-1011249
7.7.3.0-1011963
7.7.4.0-1017976
7.7.5.1-1040473
7.7.5.11-1046187
7.8.0.0-1008134

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.85+|foundation .14+|Disk|Capacity (GB)|Implemented|SSH|use capacity
|Disk Id|Implemented|SSH|Uniquely identifies this disk in the array
|Group|Implemented|SSH|
|Location|Gap|SSH|Where this disk is physically located in the array
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Role|Implemented|SSH|
|Role Enum|Implemented|SSH|enum for disk role
|Serial Number|Implemented|SSH|
|Speed|Implemented|SSH|Speed of disk (RPM)
|Status|Implemented|SSH|
|Status Enum|Implemented|SSH|enum for disk status
|Type|Gap|SSH|
|Type Enum|Implemented|SSH|enum for disk type
```

```
.5+|File Share|Is InternalVolume|Implemented|SSH|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|SSH|whether this fileShare has any shares
associated with it
|Name|Implemented|SSH|
|Path|Implemented|SSH|path of the fileShare
|Qtree Id|Implemented|SSH|unique id of the qtree
.3+|Info|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
.16+|Internal Volume|Data Allocated Capacity|Gap|SSH|capacity allocated
for data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
|Internal Volume Id|Implemented|SSH|
|Name|Implemented|SSH|
|Other Allocated Capacity|Gap|SSH|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|SSH|Any capacity other than data and
snapshot
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Total Used Capacity (MB)|Implemented|SSH|place holder for the used
capacity as read from the device
|Type|Gap|SSH|
.5+|QTree|Name|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Type|Gap|SSH|
.7+|Quota|Hard Capacity Limit (MB)|Implemented|SSH|max amount of disk
space, allowed for the quota target (Hard limit)
|Internal Volume Id|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota Id|Implemented|SSH|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|SSH|Maximum amount of disk space,
allowed for the quota target
|Type|Gap|SSH|
|Used Capacity|Implemented|SSH|
.3+|Share|IP Interfaces|Implemented|SSH|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|SSH|
|Protocol|Implemented|SSH|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|SSH|
|Permission|Implemented|SSH|Permissions for this particular share
.13+|Storage|Cpu Count|Implemented|SSH|Cpu Count of the storage
|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.17+|Storage Pool|Data Allocated Capacity|Gap|SSH|capacity allocated for
data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Other Allocated Capacity|Gap|SSH|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|SSH|Any capacity other than data and
snapshot
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
```

```
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Data Domain CLI
|SSH
|SSH
|22
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC ECS
:description: Support Matrix Asciidoc for EMC ECS

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|ECS
|3.6.1.1
3.6.1.3
3.6.2.1
3.6.2.4
3.7.0.0
3.7.0.3
3.7.0.4
3.7.0.5
3.8.0.1
```

```
3.8.0.2

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.62+|foundation .12+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.5+|Disk Group|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup Id|Implemented|HTTPS|unique id of the disk group
|Name|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.3+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.11+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.11+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.6+|Storage Node|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
|Node Capacity Utilization Total in MB|Implemented|HTTPS|
|Node Capacity Utilization Usable in MB|Implemented|HTTPS|
|Node Capacity Utilization Used in MB|Implemented|HTTPS|
.11+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.21+|performance .4+|Internal Volume|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Total Objects|Implemented|HTTPS|
.4+|Storage|IOPs Total|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.7+|Storage Node|IOPs Total|Implemented|HTTPS|
|Node Capacity Utilization Total|Implemented|HTTPS|
|Node Capacity Utilization Usable|Implemented|HTTPS|
|Node Capacity Utilization Used|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.6+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EMC ECS REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Dell EMC Isilon & PowerScale Rest
:description: Support Matrix Asciidoc for Dell EMC Isilon & PowerScale
Rest

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions
```

```
|A200
A2000
A300
A3000
F200
F600
F800
F900
H400
H500
NL410
S210
X210
X400
X410
|9.1.0.11
9.1.0.6
9.2.1.10
9.2.1.11
9.2.1.12
9.2.1.16
9.2.1.19
9.2.1.21
9.2.1.6
9.2.1.7
9.2.1.9
9.4.0.11
9.4.0.12
9.4.0.13
9.4.0.14
9.4.0.5
9.4.0.7
9.5.0.3
v8.0.0.4
v8.0.0.6
v8.0.0.7
v8.1.2.0
v8.2.2.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.115+|foundation .16+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
```

```
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
|Vendor Id|Implemented|HTTPS|
.10+|Disk Group|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup Id|Implemented|HTTPS|unique id of the disk group
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Redundancy|Implemented|HTTPS|Redundancy level
|Status|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Vendor DiskGroup Type|Implemented|HTTPS|vendor's designation of the disk
group type
|Vendor Tier|Implemented|HTTPS|Vendor Specific Tier Name
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.5+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
.3+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.16+|Internal Volume|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in
MB
|Snapshot Used Capacity|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
.6+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|HTTPS|Space in MB currently used
|Type|Gap|HTTPS|
.12+|Quota|Hard Capacity Limit (MB)|Implemented|HTTPS|max amount of disk
space, allowed for the quota target (Hard limit)
|Hard File Limit|Implemented|HTTPS|max number of files allowed for the
quota target
|Internal Volume Id|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota Id|Implemented|HTTPS|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented|HTTPS|Max number of files allowed for the
quota target
|Threshold (MB)|Implemented|HTTPS|Disk space threshold, for the quota
target
|Type|Gap|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Used Files|Implemented|HTTPS|Number of files currently used
|User/Group Target|Implemented|HTTPS|user/group target this quota refers
to
.4+|Share|Description|Implemented|HTTPS|
|IP Interfaces|Implemented|HTTPS|comma separated list of IP addresses on
which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
```

```
.14+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|UUID|Implemented|HTTPS|
.8+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
|ManagementIp Addresses|Implemented|HTTPS|
.19+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Other Allocated Capacity|Gap|HTTPS|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|HTTPS|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in
```

```
MB
|Snapshot Used Capacity|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.66+|performance .6+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.12+|Internal Volume|Total Capacity|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Snapshot Reserved Capacity|Implemented|HTTPS|
|Snapshot Used Capacity|Implemented|HTTPS|
|Snapshot Used Capacity Ratio|Implemented|HTTPS| Reported as a time series
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.4+|Qtree|Quota Hard Limit|Implemented|HTTPS|Capacity quota hard limit
|Used Capacity|Implemented|HTTPS|
|Total File Count|Implemented|HTTPS|
|Quota Capacity|Implemented|HTTPS|Physical used quota capacity
.12+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
|Failed Disks|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.13+|Storage Node|Failed Disks|Implemented|HTTPS|
|IOPs Read|Implemented|HTTPS|Number of read IOPs on file system
|IOPs Write|Implemented|HTTPS|IOPs write of filesystem
|File Throughput Read|Implemented|HTTPS|
|FileSystem Throughput|Implemented|HTTPS|fileSystem Throughput write
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.19+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Other Total Capacity|Implemented|HTTPS|
|Other Used Capacity|Implemented|HTTPS|
|Snapshot Reserved Capacity|Implemented|HTTPS|
|Snapshot Used Capacity|Implemented|HTTPS|
|Snapshot Used Capacity Ratio|Implemented|HTTPS| Reported as a time series
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)
```

```
|EMC Isilon & PowerScale REST API
|HTTPS
|
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Dell EMC Isilon / PowerScale (CLI)
:description: Support Matrix Asciidoc for Dell EMC Isilon / PowerScale
(CLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|
A200
A2000
A300
F200
F800
F900
H400
H500
H600
H700
NL400
NL410
S210
X200
X210
X400
X410
|9.1.0.10
9.1.0.12
9.1.0.16
9.1.0.18
9.1.0.19
9.1.0.7
```

```
9.2.1.11
9.2.1.13
9.2.1.15
9.2.1.22
9.2.1.7
9.2.1.9
9.3.0.3
9.4.0.0
9.4.0.10
9.4.0.12
9.4.0.13
9.4.0.14
9.4.0.6
9.4.0.7
v7.1.1.8
v7.2.0.5
v7.2.1.3
v7.2.1.6
v8.0.0.4
v8.0.0.6
v8.0.0.7
v8.0.1.1
v8.1.2.0
v8.2.2.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.105+|foundation .16+|Disk|Capacity (GB)|Implemented|SSH|use capacity
|Disk Id|Implemented|SSH|Uniquely identifies this disk in the array
|Group|Implemented|SSH|
|Location|Gap|SSH|Where this disk is physically located in the array
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Role|Implemented|SSH|
|Role Enum|Implemented|SSH|enum for disk role
|Serial Number|Implemented|SSH|
|Speed|Implemented|SSH|Speed of disk (RPM)
|Status|Implemented|SSH|
|Status Enum|Implemented|SSH|enum for disk status
|Type|Gap|SSH|
|Type Enum|Implemented|SSH|enum for disk type
|Vendor|Implemented|SSH|
|Vendor Id|Implemented|SSH|
.10+|Disk Group|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|DiskGroup Id|Implemented|SSH|unique id of the disk group
|Name|Implemented|SSH|
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Redundancy|Implemented|SSH|Redundancy level
|Status|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Vendor DiskGroup Type|Implemented|SSH|vendor's designation of the disk
group type
|Vendor Tier|Implemented|SSH|Vendor Specific Tier Name
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.5+|File Share|Is InternalVolume|Implemented|SSH|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|SSH|whether this fileShare has any shares
associated with it
|Name|Implemented|SSH|
|Path|Implemented|SSH|path of the fileShare
|Qtree Id|Implemented|SSH|unique id of the qtree
.3+|Info|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
.14+|Internal Volume|Data Allocated Capacity|Gap|SSH|capacity allocated
for data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Internal Volume Id|Implemented|SSH|
|Name|Implemented|SSH|
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Snapshot Allocated Capacity|Gap|SSH|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
.6+|QTree|Name|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
```

```
space, allowed for the quota target
|Quota UsedCapacity|Implemented|SSH|Space in MB currently used
|Type|Gap|SSH|
.12+|Quota|Hard Capacity Limit (MB)|Implemented|SSH|max amount of disk
space, allowed for the quota target (Hard limit)
|Hard File Limit|Implemented|SSH|max number of files allowed for the quota
target
|Internal Volume Id|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota Id|Implemented|SSH|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|SSH|Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented|SSH|Max number of files allowed for the quota
target
|Threshold (MB)|Implemented|SSH|Disk space threshold, for the quota target
|Type|Gap|SSH|
|Used Capacity|Implemented|SSH|
|Used Files|Implemented|SSH|Number of files currently used
|User/Group Target|Implemented|SSH|user/group target this quota refers to
.4+|Share|Description|Implemented|SSH|
|IP Interfaces|Implemented|SSH|comma separated list of IP addresses on
which this share is exposed
|Name|Implemented|SSH|
|Protocol|Implemented|SSH|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|SSH|
|Permission|Implemented|SSH|Permissions for this particular share
.12+|Storage|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.6+|Storage Node|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Serial Number|Implemented|SSH|
|State|Implemented|SSH|free text describing the device state
```

```
|UUID|Implemented|SSH|
|ManagementIp Addresses|Implemented|SSH|
.15+|Storage Pool|Data Allocated Capacity|Gap|SSH|capacity allocated for
data
|Data Used Capacity|Implemented|SSH|
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Snapshot Allocated Capacity|Gap|SSH|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.46+|performance .6+|Internal Volume|Total Capacity|Implemented|SSH|
|Total Data Capacity|Implemented|SSH|
|Data Used Capacity|Implemented|SSH|
|Snapshot Reserved Capacity|Implemented|SSH|
|Snapshot Used Capacity|Implemented|SSH|
|Snapshot Used Capacity Ratio|Implemented|SSH| Reported as a time series
.5+|Qtree|Quota Hard Limit|Implemented|SSH|Capacity quota hard limit
|Quota Soft Limit|Implemented|SSH|Capacity Quota soft Limit
|Used Capacity|Implemented|SSH|
|Total File Count|Implemented|SSH|
|Quota Capacity|Implemented|SSH|Physical used quota capacity
.12+|Storage|Failed Raw Capacity|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|SSH|
|IOPs other|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
.12+|Storage Node|IOPs Read|Implemented|SSH|Number of read IOPs on file
system
|IOPs Write|Implemented|SSH|IOPs write of filesystem
|File Throughput Read|Implemented|SSH|
|FileSystem Throughput|Implemented|SSH|fileSystem Throughput write
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
|Utilization Total|Implemented|SSH|
.11+|StoragePool Disk|Capacity Provisioned|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Total Capacity|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Over Commit Capacity Ratio|Implemented|SSH|Reported as a time series
|Capacity Used Ratio|Implemented|SSH|
|Total Data Capacity|Implemented|SSH|
|Data Used Capacity|Implemented|SSH|
|Snapshot Reserved Capacity|Implemented|SSH|
|Snapshot Used Capacity|Implemented|SSH|
|Snapshot Used Capacity Ratio|Implemented|SSH| Reported as a time series

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Isilon SSH
|SSH
|SSH
|22
|
|true
|false
|true
|true
```

```
|===

<<top,Back to Top>>

== EMC PowerStore REST
:description: Support Matrix Asciidoc for EMC PowerStore REST

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|PowerStore 1000T
PowerStore 1200T
PowerStore 3000T
PowerStore 3200T
PowerStore 5000T
PowerStore 5000X
PowerStore 9000T
PowerStore 9200T
|2.0.1.3
2.1.1.0
2.1.1.1
3.0.0.1
3.2.0.0
3.2.0.1
3.2.1.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.110+|foundation .8+|Disk|Capacity (GB)|Implemented||use capacity
|Disk Id|Implemented||Uniquely identifies this disk in the array
|Name|Implemented||
|Speed|Implemented||Speed of disk (RPM)
|Status|Implemented||
|Type|Gap||
|Type Enum|Implemented||enum for disk type
|Vendor|Implemented||
.5+|File Share|Is InternalVolume|Implemented||whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented||whether this fileShare has any shares associated
```

```
with it
|Name|Implemented||
|Path|Implemented||path of the fileShare
|Qtree Id|Implemented||unique id of the qtree
.4+|ISCSI Network Portal|IP|Implemented||
|Listening Port|Implemented||
|Nic|Implemented||
|OID|Implemented||
.3+|ISCSI Network Portal Group|OID|Implemented||
|Portal Group Name|Implemented||
|Portal Group Tag|Implemented||
.4+|ISCSI Node|Host Aliases|Implemented||
|Node Name|Implemented||
|OID|Implemented||
|Type|Gap||
.7+|ISCSI Session|OID|Implemented||
|Initiator OID|Implemented||
|Portal Group OID|Implemented||
|Number Of Connections|Implemented||
|Max Connections|Implemented||
|Initiator Ips|Implemented||
|Security|Implemented||
.5+|Info|Api Name|Implemented||
|DataSource Name|Implemented||Info
|Date|Implemented||
|Originator ID|Implemented||
|Originator Key|Implemented||
.12+|Internal Volume|Dedupe Enabled|Implemented||Is dedupe enabled on the
storage pool
|Internal Volume Id|Implemented||
|Name|Implemented||
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Total Used Capacity (MB)|Implemented||place holder for the used capacity
as read from the device
|Type|Gap||
|Virtual Storage|Implemented||Owning virtual storage (vfiler)
.3+|QTree|Name|Implemented||
|Qtree Id|Implemented||unique id of the qtree
|Type|Gap||
.3+|Share|IP Interfaces|Implemented||comma separated list of IP addresses
on which this share is exposed
|Name|Implemented||
|Protocol|Implemented||enum for share protocol
.2+|Share Initiator|Initiator|Implemented||
|Permission|Implemented||Permissions for this particular share
.14+|Storage|Display IP|Implemented||
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et
al
|IP|Implemented||
|Manage URL|Implemented||
|Manufacturer|Implemented||
|Microcode Version|Implemented||
|Model|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Serial Number|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|SupportActive Active|Implemented||Specified if the storage supports
active-active configurations
|Virtual|Implemented||Is this a storage virtualization device?
.6+|Storage Node|Model|Implemented||
|Name|Implemented||
|Partner Node UUID|Implemented||HA pair's UUID
|UUID|Implemented||
|Version|Implemented||software version
|Parent Serial Number|Implemented||
.12+|Storage Pool|Compression Savings|Implemented||ratio of compression
savings in percentage
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Storage Pool Id|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Type|Gap||
|Virtual|Implemented||Is this a storage virtualization device?
.10+|Volume|Capacity|Implemented||Snapshot Used capacity in MB
|Junction Path|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Type|Gap||
|UUID|Implemented||
|Used Capacity|Implemented||
|QoS - Policy|Implemented||
.5+|Volume Map|LUN|Implemented||Name of the backend lun
|Masking Required|Implemented||
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|Type|Gap||
.3+|Volume Mask|Initiator|Implemented||
|Protocol Controller|Implemented||
|Type|Gap||
.4+|WWN Alias|Host Aliases|Implemented||
|Object Type|Implemented||
|Source|Implemented||
|WWN|Implemented||
.54+|performance .10+|Internal Volume|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.0+|Qtree.14+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.10+|Storage Node|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.7+|StoragePool Disk|Total Compression Savings|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.13+|Volume|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
```

```
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EMC PowerStore REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC RecoverPoint (HTTP)
:description: Support Matrix Asciidoc for EMC RecoverPoint (HTTP)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|RecoverPoint
|5.1.P1(c.175)
5.1.SP4.P1(h.89)
5.1.SP4.P2(h.101)
5.1.SP4.P3(h.109)
5.1.SP4.P4(h.97)

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.34+|foundation .4+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.13+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.8+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
.9+|Storage Synchronization|Mode|Implemented|HTTPS|
|Mode Enum|Implemented|HTTPS|
|Source Storage|Implemented|HTTPS|
|Source Volume|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|State Enum|Implemented|HTTPS|
|Target Storage|Implemented|HTTPS|
|Target Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|RecoverPoint REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC ScaleIO & PowerFlex REST
:description: Support Matrix Asciidoc for EMC ScaleIO & PowerFlex REST

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|ScaleIO
|R2_6.11000.113
R2_6.11000.115
R3_0.1400.101
R3_5.1200.104
R3_6.500.113
R3_6.700.103

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.51+|foundation .8+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Name|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
.8+|Info|Api Version|Implemented|HTTPS|
|Client Api Description|Implemented|HTTPS|
|Client Api Name|Implemented|HTTPS|
|Client Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.13+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix, et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
.12+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable capacity to raw capacity
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.8+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Junction Path|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks on the array)
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Host IPs|Implemented|HTTPS|
.39+|performance .6+|Disk|IOps Read|Implemented||Number of read IOps on
the disk
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented||
.10+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.9+|Storage Node|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.6+|StoragePool Disk|IOps Read|Implemented||Number of read IOps on the
disk
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented||
.8+|Volume|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
```

```
|Throughput Write|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EMC ScaleIO & PowerFlex REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC Symmetrix CLI
:description: Support Matrix Asciidoc for EMC Symmetrix CLI

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|
V10.0.0.0
V10.0.1.0
V7.6.2.67
V8.3.0.22
V8.3.0.6
V8.4.0.7
V8.4.0.9
V9.1.0.18
V9.1.0.5
V9.1.0.6
V9.2.0.0
V9.2.1.0
V9.2.1.1
```

```
V9.2.1.2
V9.2.2.0
V9.2.3.0
V9.2.3.1
V9.2.3.4
V9.2.3.5
V9.2.3.6
V9.2.4.1
V9.2.4.2
|DMX3-24
DMX4-24
PMax2000
PowerMax_2000
PowerMax_8000
VMAX-1
VMAX100K
VMAX10K
VMAX200K
VMAX250F
VMAX400K
VMAX40K
VMAX450F
VMAX850F
VMAX950F
|5773.198.142(168D0000) build 5
5876.272.177(16F40000) build 39
5876.286.194(16F40000) build 115
5876.309.196(16F40000) build 162
5977.1131.1131(17590000) build 551
5977.1151.1151(17590000) build 45
5977.1151.1151(17590000) build 59
5977.1151.1151(17590000) build 60
5977.1151.1151(17590000) build 9
5978.479.479(175A0000) build 195
5978.711.711(175A0000) build 113
5978.711.711(175A0000) build 139
5978.711.711(175A0000) build 149
5978.711.711(175A0000) build 194
5978.711.711(175A0000) build 196
5978.711.711(175A0000) build 220
5978.711.711(175A0000) build 239
5978.711.711(175A0000) build 252
5978.711.711(175A0000) build 267
5978.711.711(175A0000) build 278
5978.711.711(175A0000) build 287
5978.711.711(175A0000) build 335
```

```
5978.711.711(175A0000) build 365
5978.711.711(175A0000) build 366
5978.711.711(175A0000) build 388
5978.711.711(175A0000) build 416
5978.711.711(175A0000) build 436
5978.711.711(175A0000) build 438
5978.711.711(175A0000) build 448
5978.711.711(175A0000) build 461
5978.711.711(175A0000) build 480
5978.711.711(175A0000) build 484
5978.711.711(175A0000) build 502
5978.711.711(175A0000) build 529
5978.711.711(175A0000) build 8

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.153+|foundation .3+|Device Group|Name|Implemented||
|Storage Management Id|Implemented||
|Type|Gap||
.12+|Disk|Capacity (GB)|Implemented||use capacity
|Disk Id|Implemented||Uniquely identifies this disk in the array
|Group|Implemented||
|Model|Implemented||
|Name|Implemented||
|Role|Implemented||
|Role Enum|Implemented||enum for disk role
|Serial Number|Implemented||
|Status|Implemented||
|Status Enum|Implemented||enum for disk status
|Type Enum|Implemented||enum for disk type
|Vendor|Implemented||
.8+|Disk Group|Capacity|Implemented||Snapshot Used capacity in MB
|DiskGroup Id|Implemented||unique id of the disk group
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Redundancy|Implemented||Redundancy level
|Used Capacity|Implemented||
|Vendor DiskGroup Type|Implemented||vendor's designation of the disk group
type
|Virtual|Implemented||Is this a storage virtualization device?
.4+|ISCSI Network Portal|IP|Implemented||
|Listening Port|Implemented||
|Nic|Implemented||
|OID|Implemented||
.3+|ISCSI Network Portal Group|OID|Implemented||
|Portal Group Name|Implemented||
|Portal Group Tag|Implemented||
.3+|ISCSI Node|Node Name|Implemented||
|OID|Implemented||
|Type|Gap||
.2+|ISCSI Node Map|OID|Implemented||
|Portal Group OID|Implemented||
.7+|ISCSI Session|Initiator Ips|Implemented||
|Initiator OID|Implemented||
|Max Connections|Implemented||
|Number Of Connections|Implemented||
|OID|Implemented||
|Portal Group OID|Implemented||
|Security|Implemented||
.10+|Info|Api Description|Implemented||
|Api Name|Implemented||
|Api Version|Implemented||
|Client Api Description|Implemented||
|Client Api Name|Implemented||
|Client Api Version|Implemented||
|DataSource Name|Implemented||Info
|Date|Implemented||
|Originator ID|Implemented||
|Originator Key|Implemented||
.5+|Network Pipe|Auto Recover|Implemented||
|Bidirectional|Implemented||
|Operational Status|Implemented||
|Source Id|Implemented||
|Target Id|Implemented||
.1+|Network Pipe Port Wwn|WWN|Implemented||
.3+|Protocol EndPoint|ID|Implemented||
|Name|Implemented||
|Storage Ip|Implemented||
.12+|Storage|Display IP|Implemented||
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et
al
|IP|Implemented||
|Manufacturer|Implemented||
|Microcode Version|Implemented||
|Model|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Serial Number|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|Virtual|Implemented||Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented||
|UUID|Implemented||
.23+|Storage Pool|Auto Tiering|Implemented||indicates if this storagepool
is participating in auto tiering with other pools
|Compression Enabled|Implemented||Is compression enabled on the storage
pool
|Compression Savings|Implemented||ratio of compression savings in
percentage
|Data Allocated Capacity|Gap||capacity allocated for data
|Data Used Capacity|Implemented||
|Dedupe Enabled|Implemented||Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented||
|Other UsedCapacity (MB)|Implemented||Any capacity other than data and
snapshot
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Redundancy|Implemented||Redundancy level
|Snapshot Used Capacity|Implemented||
|Soft Limit (MB)|Implemented||logical volume size that is defined during
volume creation or resizing operations
|Storage Pool Id|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Type|Gap||
|Vendor Tier|Implemented||Vendor Specific Tier Name
|Virtual|Implemented||Is this a storage virtualization device?
|Effective Used Capacity Percent|Implemented||
.9+|Storage Synchronization|Mode|Implemented||
|Mode Enum|Implemented||
|Source Storage|Implemented||
|Source Volume|Implemented||
|State|Implemented||free text describing the device state
|State Enum|Implemented||
|Target Storage|Implemented||
|Target Volume|Implemented||
|Technology|Implemented||technology which causes storage efficiency
changed
.21+|Volume|AutoTier Policy Identifier|Implemented||Dynamic Tier Policy
identifier
|Auto Tiering|Implemented||indicates if this storagepool is participating
in auto tiering with other pools
|Capacity|Implemented||Snapshot Used capacity in MB
|Disk Size|Implemented||comma seperated list of disk sizes (GB)
|Disk Type|Not Available||
|Mainframe|Implemented||indicates if this volume is a Mainframe Volume
|Meta|Implemented||Flag saying whether this volume is a meta volume with
memeber or not. Meta volumes will have DiskGroup empty!
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Redundancy|Implemented||Redundancy level
|Replica Source|Implemented||
|Replica Target|Implemented||
|Snapshot|Implemented||
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Type|Gap||
|UUID|Implemented||
|Used Capacity|Implemented||
|Virtual|Implemented||Is this a storage virtualization device?
|Written Capacity|Implemented||Total capacity written to this volume by a
Host in MB
|storage Groups|Implemented||
.5+|Volume Map|LUN|Implemented||Name of the backend lun
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|TID|Implemented||
|Type|Gap||
.4+|Volume Mask|Initiator|Implemented||
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|Type|Gap||
.10+|Volume Member|Auto Tiering|Implemented||indicates if this storagepool
is participating in auto tiering with other pools
|Capacity|Implemented||Snapshot Used capacity in MB
|Cylinders|Implemented||
|Name|Implemented||
|Rank|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Redundancy|Implemented||Redundancy level
|Storage Pool Id|Implemented||
|UUID|Implemented||
|Used Capacity|Implemented||
.2+|Volume Ref|Name|Implemented||
|Storage Ip|Implemented||
.4+|WWN Alias|Host Aliases|Implemented||
|Object Type|Implemented||
|Source|Implemented||
|WWN|Implemented||
.69+|performance .6+|Disk|IOps Read|Implemented||Number of read IOps on
the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.16+|Storage|Cache Hit Ratio Read|Implemented||
|Cache Hit Ratio Total|Implemented||
|Cache Hit Ratio Write|Implemented||
|Cache Utilization Total|Implemented||
|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Write Pending|Implemented||total write pending
.11+|Storage Node|Cache Hit Ratio Total|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.17+|StoragePool Disk|Capacity Provisioned|Implemented||
|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
|Capacity Used Ratio|Implemented||
|Total Data Capacity|Implemented||
|Data Used Capacity|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Other Used Capacity|Implemented||
|Snapshot Used Capacity|Implemented||
|Snapshot Used Capacity Ratio|Implemented|| Reported as a time series
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.19+|Volume|Cache Hit Ratio Read|Implemented||
|Cache Hit Ratio Total|Implemented||
|Cache Hit Ratio Write|Implemented||
|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Written Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|CapacityRatio Written|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Write Pending|Implemented||total write pending

|===
Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|symcli
|CLI
|
|2707
|
|true
|true
|true
|true

|Symmetrix SMI-S
|SMI-S
|HTTP/HTTPS
|5988/5989
|
|true
|false
|false
|true

|===

<<top,Back to Top>>

== Dell Unisphere REST
:description: Support Matrix Asciidoc for Dell Unisphere REST

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|V10.0.0.5
V10.0.1.3
V9.2.1.6
V9.2.3.20
V9.2.3.22
V9.2.3.4
V9.2.4.1
|PowerMax_2000
```

```
PowerMax_2500
PowerMax_8000
VMAX250F
VMAX950F
|5978.479.479 build 350
5978.711.711 build 252
5978.711.711 build 278 build 278
5978.711.711 build 287
5978.711.711 build 329 build 329
5978.711.711 build 365
5978.711.711 build 365 build 365
5978.711.711 build 376
5978.711.711 build 388 build 388
5978.711.711 build 416
5978.711.711 build 435
5978.711.711 build 448
5978.711.711 build 461 build 461
5978.711.711 build 481 build 481
5978.711.711 build 484
5978.711.711 build 484 build 484
5978.711.711 build 502
6079.125.0 build 53 build 53
6079.175.0 build 0 build 0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.80+|foundation .9+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.10+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|Client Api Description|Implemented|HTTPS|
|Client Api Name|Implemented|HTTPS|
|Client Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
```

```
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.12+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
.13+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Effective Used Capacity Percent|Implemented|HTTPS|
.9+|Storage Synchronization|Mode|Implemented|HTTPS|
|Mode Enum|Implemented|HTTPS|
|Source Storage|Implemented|HTTPS|
|Source Volume|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|State Enum|Implemented|HTTPS|
|Target Storage|Implemented|HTTPS|
|Target Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.13+|Volume|AutoTier Policy Identifier|Implemented|HTTPS|Dynamic Tier
Policy identifier
|Auto Tiering|Implemented|HTTPS|indicates if this storagepool is
participating in auto tiering with other pools
|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Disk Type|Not Available|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|storage Groups|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|WWN Alias|Host Aliases|Implemented|HTTPS|
|Object Type|Implemented|HTTPS|
|Source|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.48+|performance .15+|Storage|Latency Total|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|IOPs Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|Write Pending|Implemented|HTTPS|total write pending
|Cache Hit Ratio Read|Implemented|HTTPS|
|Cache Hit Ratio Total|Implemented|HTTPS|
|Cache Hit Ratio Write|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
.0+|Storage Node.19+|StoragePool Disk|Capacity
Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|Compression Savings Space|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Snapshot Reserved Capacity|Implemented|HTTPS|
|Snapshot Used Capacity Ratio|Implemented|HTTPS| Reported as a time series
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.14+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|CapacityRatio Written|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)
```

```
|Dell Unisphere API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC VNX (SSH)
:description: Support Matrix Asciidoc for EMC VNX (SSH)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|VNX5300
VNX5400
VNX5700
VNX5800
|05.33.009.5.231
7.1.76-4
7.1.80-3
8.1.9-232

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.135+|foundation .13+|Disk|Disk Id|Implemented|SSH|Uniquely identifies
this disk in the array
|Name|Implemented|SSH|
|Capacity (GB)|Implemented|SSH|use capacity
|Location|Gap|SSH|Where this disk is physically located in the array
|Role Enum|Implemented|SSH|enum for disk role
|Role|Implemented|SSH|
|Status|Implemented|SSH|
|Status Enum|Implemented|SSH|enum for disk status
```

```
|Serial Number|Implemented|SSH|
|Vendor|Implemented|SSH|
|Model|Implemented|SSH|
|Type|Gap|SSH|
|Type Enum|Implemented|SSH|enum for disk type
.6+|File Share|Is InternalVolume|Implemented|SSH|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|SSH|whether this fileShare has any shares
associated with it
|Name|Implemented|SSH|
|Path|Implemented|SSH|path of the fileShare
|Qtree Id|Implemented|SSH|unique id of the qtree
|Status|Implemented|SSH|
.8+|Info|Api Name|Implemented|SSH|
|Api Version|Implemented|SSH|
|Client Api Name|Implemented|SSH|
|Client Api Version|Implemented|SSH|
|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
|Originator Key|Implemented|SSH|
.21+|Internal Volume|Data Allocated Capacity|Gap|SSH|capacity allocated
for data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|Internal Volume Id|Implemented|SSH|
|Last Snapshot Time|Implemented|SSH|time of last snapshot
|Name|Implemented|SSH|
|Other Allocated Capacity|Gap|SSH|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|SSH|Any capacity other than data and
snapshot
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Snapshot Count|Implemented|SSH|Number of snapshots on the internal
volumes
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
```

```
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Total Used Capacity (MB)|Implemented|SSH|place holder for the used
capacity as read from the device
|Type|Gap|SSH|
|Virtual Storage|Implemented|SSH|Owning virtual storage (vfiler)
.8+|QTree|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects
whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|Name|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|SSH|Space in MB currently used
|Type|Gap|SSH|
.11+|Quota|Quota Id|Implemented|SSH|unique id of the quota
|Type|Gap|SSH|
|Internal Volume Id|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Soft File Limit|Implemented|SSH|Max number of files allowed for the quota
target
|Hard Capacity Limit (MB)|Implemented|SSH|max amount of disk space,
allowed for the quota target (Hard limit)
|Soft Capacity Limit (MB)|Implemented|SSH|Maximum amount of disk space,
allowed for the quota target
|Used Files|Implemented|SSH|Number of files currently used
|Used Capacity|Implemented|SSH|
|GuidKey 1|Implemented|SSH|GuidKey1 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|SSH|GuidKey2 is implicit for all objects whose GUID
key has not changed since OCI version 7.3.5.
.3+|Share|IP Interfaces|Implemented|SSH|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|SSH|
|Protocol|Implemented|SSH|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|SSH|
|Permission|Implemented|SSH|Permissions for this particular share
.15+|Storage|Cpu Count|Implemented|SSH|Cpu Count of the storage
|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
```

```
|IP|Implemented|SSH|
|Manage URL|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|SSH|Specified if the storage supports
active-active configurations
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.4+|Storage Node|UUID|Implemented|SSH|
|Name|Implemented|SSH|
|Serial Number|Implemented|SSH|
|ManagementIp Addresses|Implemented|SSH|
.18+|Storage Pool|Data Allocated Capacity|Gap|SSH|capacity allocated for
data
|Data Used Capacity|Implemented|SSH|
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Redundancy|Implemented|SSH|Redundancy level
|Snapshot Allocated Capacity|Gap|SSH|Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented|SSH|
|Status|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.13+|Volume|Name|Implemented|SSH|
|Junction Path|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Auto Tiering|Implemented|SSH|indicates if this storagepool is
```

```
participating in auto tiering with other pools
|AutoTier Policy Identifier|Implemented|SSH|Dynamic Tier Policy identifier
|UUID|Implemented|SSH|
|Type|Gap|SSH|
|Thin Provisioned|Implemented|SSH|
|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Used Capacity|Implemented|SSH|
|Redundancy|Implemented|SSH|Redundancy level
|Disk Type|Not Available|SSH|
.4+|Volume Map|LUN|Implemented|SSH|Name of the backend lun
|Storage Port|Implemented|SSH|
|Protocol Controller|Implemented|SSH|
|Type|Gap|SSH|
.4+|Volume Mask|Storage Port|Implemented|SSH|
|Initiator|Implemented|SSH|
|Protocol Controller|Implemented|SSH|
|Type|Gap|SSH|
.5+|WWN Alias|Source|Implemented|SSH|
|Host Aliases|Implemented|SSH|
|WWN|Implemented|SSH|
|Object Type|Implemented|SSH|
|IP|Implemented|SSH|
.27+|performance .9+|Disk|IOps Read|Implemented|SSH|Number of read IOps on
the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
|Read Utilization|Implemented|SSH|
|Utilization Total|Implemented|SSH|
|Utilization Write|Implemented|SSH|
.14+|Storage|Failed Raw Capacity|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|SSH|
|IOPs other|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
.4+|Storage Node|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Utilization Total|Implemented|SSH|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|VNX SSH and CLI
|SSH
|SSH
|22
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== EMC VNXe & Unity Unisphere (CLI)
:description: Support Matrix Asciidoc for EMC VNXe & Unity Unisphere (CLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|Unity 300
Unity 300F
Unity 350F
Unity 380
Unity 380F
Unity 400
Unity 400F
Unity 450F
Unity 480F
Unity 500
Unity 550F
Unity 600
Unity 600F
Unity 650F
Unity 680F
Unity 880
VNXe3200
|3.1.17.10223906
3.1.17.10229825
4.1.2.9257522
4.2.1.9535982
4.2.3.9670635
4.5.1.0.5.001
5.0.2.0.5.009
5.0.6.0.5.008
5.0.8.0.5.007
5.1.2.0.5.007
5.1.3.0.5.003
5.2.1.0.5.013
5.2.2.0.5.004
5.2.2.0.6.201
5.3.0.0.5.120

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.124+|foundation .15+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.6+|Disk Group|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup Id|Implemented|HTTPS|unique id of the disk group
|Disk Type|Not Available|HTTPS|
|Name|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.5+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.3+|ISCSI Node|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.3+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.17+|Internal Volume|Data Allocated Capacity|Gap|HTTPS|capacity allocated
for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Internal Volume Id|Implemented|HTTPS|
|Last Snapshot Time|Implemented|HTTPS|time of last snapshot
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Snapshot Count|Implemented|HTTPS|Number of snapshots on the internal
volumes
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
```

```
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.4+|Share|Description|Implemented|HTTPS|
|IP Interfaces|Implemented|HTTPS|comma separated list of IP addresses on
which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
.12+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.6+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
.16+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
```

```
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Soft Limit (MB)|Implemented|HTTPS|logical volume size that is defined
during volume creation or resizing operations
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.9+|Storage Synchronization|Mode|Implemented|HTTPS|
|Mode Enum|Implemented|HTTPS|
|Source Storage|Implemented|HTTPS|
|Source Volume|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|State Enum|Implemented|HTTPS|
|Target Storage|Implemented|HTTPS|
|Target Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.8+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Junction Path|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.45+|performance .6+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.7+|Internal Volume|Total Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.0+|Qtree.4+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
.4+|Storage Node|IOps Read|Implemented|HTTPS|Number of read IOps on the
disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.13+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Capacity Soft Limit|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.11+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|VNXe & Unisphere CLI
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== EMC VPLEX
:description: Support Matrix Asciidoc for EMC VPLEX

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|VPLEX
|5.4.1.00.00.07
5.4.1.01.00.05
6.2.0.03.00.02
6.2.0.04.00.07
6.2.0.05.00.11
6.2.0.07.00.02

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information
```

```
.61+|foundation .4+|Info|DataSource Name|Implemented|HTTP/S|Info
|Date|Implemented|HTTP/S|
|Originator ID|Implemented|HTTP/S|
|Originator Key|Implemented|HTTP/S|
.13+|Storage|Display IP|Implemented|HTTP/S|
|Failed Raw Capacity|Implemented|HTTP/S|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTP/S|The storage Family could be Clariion,
Symmetrix, et al
|IP|Implemented|HTTP/S|
|Manage URL|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Microcode Version|Implemented|HTTP/S|
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Serial Number|Implemented|HTTP/S|
|Spare Raw Capacity|Implemented|HTTP/S|Raw capapcity of spare disks (sum
of all disks that are spare)
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.4+|Storage Node|Name|Implemented|HTTP/S|
|Serial Number|Implemented|HTTP/S|
|State|Implemented|HTTP/S|free text describing the device state
|UUID|Implemented|HTTP/S|
.15+|Storage Pool|Dedupe Enabled|Implemented|HTTP/S|Is dedupe enabled on
the storage pool
|Name|Implemented|HTTP/S|
|Other Allocated Capacity|Gap|HTTP/S|Capacity allocated for other (not
data and not snapshot)
|Other UsedCapacity (MB)|Implemented|HTTP/S|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTP/S|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTP/S|indicates whether this storagePool is a
raid group
|Raw to Usable Ratio|Implemented|HTTP/S|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTP/S|Redundancy level
|Status|Implemented|HTTP/S|
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioning Supported|Implemented|HTTP/S|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTP/S|
|Total Used Capacity|Implemented|HTTP/S|Total capacity in MB
|Type|Gap|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.9+|Storage Synchronization|Mode|Implemented|HTTP/S|
|Mode Enum|Implemented|HTTP/S|
|Source Storage|Implemented|HTTP/S|
|Source Volume|Implemented|HTTP/S|
|State|Implemented|HTTP/S|free text describing the device state
|State Enum|Implemented|HTTP/S|
|Target Storage|Implemented|HTTP/S|
|Target Volume|Implemented|HTTP/S|
|Technology|Implemented|HTTP/S|technology which causes storage efficiency
changed
.8+|Volume|Capacity|Implemented|HTTP/S|Snapshot Used capacity in MB
|Name|Implemented|HTTP/S|
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Redundancy|Implemented|HTTP/S|Redundancy level
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioned|Implemented|HTTP/S|
|UUID|Implemented|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.4+|Volume Map|LUN|Implemented|HTTP/S|Name of the backend lun
|Protocol Controller|Implemented|HTTP/S|
|Storage Port|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.4+|Volume Mask|Initiator|Implemented|HTTP/S|
|Protocol Controller|Implemented|HTTP/S|
|Storage Port|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.34+|performance .7+|Storage|IOPs Total|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
.11+|Storage Node|Cache Hit Ratio Total|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
```

```
|Throughput Write|Implemented|SSH|
|Utilization Total|Implemented|SSH|
.7+|StoragePool Disk|Capacity Provisioned|Implemented|SSH|
|Total Capacity|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Over Commit Capacity Ratio|Implemented|SSH|Reported as a time series
|Capacity Used Ratio|Implemented|SSH|
|Other Total Capacity|Implemented|SSH|
|Other Used Capacity|Implemented|SSH|
.9+|Volume|Raw Capacity|Implemented|SSH|
|Total Capacity|Implemented|SSH|
|IOPs Total|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EMC VPLEX CLI
|SSH
|SSH
|22
|
|true
|true
|true
|true

|EMC VPLEX API
|HTTP/HTTPS
|HTTP/HTTPS
|80/443
|
|true
|true
```

```
|true
|true

|===

<<top,Back to Top>>

== EMC XtremIO (HTTP)
:description: Support Matrix Asciidoc for EMC XtremIO (HTTP)

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|6.2.1
6.2.2
6.3.1
6.3.2
6.3.3
6.4.0
|1 Bricks & 125TB
1 Bricks & 24TB
1 Bricks & 26TB
1 Bricks & 31TB
1 Bricks & 62TB
1 Bricks & 8TB
1X10TB
1X20TB
1X40TB
2 Bricks & 52TB
2 Bricks & 62TB
2 Bricks & 76TB
2 Bricks & 83TB
2X10TB
2X20TB
2X40TB
3 Bricks & 251TB
3 Bricks & 283TB
4 Bricks & 125TB
4 Bricks & 503TB
4 Bricks & 628TB
4 Bricks & 754TB
4X20TB
4X40TB
6X20TB
|4.0.27-1
```

```
4.0.31-11
6.1.0-99_X2
6.3.3-8_X2
6.4.0-22_X2
6.4.0-36_hotfix_2_X2

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.92+|foundation .18+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Potential Transfer Rate|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Seek Time|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
|Vendor Id|Implemented|HTTPS|
.8+|Info|Api Version|Implemented|HTTPS|
|Client Api Description|Implemented|HTTPS|
|Client Api Name|Implemented|HTTPS|
|Client Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.15+|Storage|Cpu Count|Implemented|HTTPS|Cpu Count of the storage
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.6+|Storage Node|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|ManagementIp Addresses|Implemented|HTTPS|
.19+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.7+|Storage Synchronization|Mode|Implemented|HTTPS|
|Mode Enum|Implemented|HTTPS|
|Source Volume|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|State Enum|Implemented|HTTPS|
|Target Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.13+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Disk Size|Implemented|HTTPS|comma seperated list of disk sizes (GB)
|Disk Speed|Implemented|HTTPS|comma seperated list of disk speeds (rpm)
|Disk Type|Not Available|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.3+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Type|Gap|HTTPS|
.3+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Type|Gap|HTTPS|
.41+|performance .10+|Storage|IOps Read|Implemented|HTTPS|Number of read
IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Partial Blocked Ratio|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.9+|Storage Node|IOps Read|Implemented|HTTPS|Number of read IOps on the
disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.8+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
.14+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Partial Blocked Ratio|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|EMC XtremIO REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true
```

```
|===

<<top,Back to Top>>

== NetApp E-Series
:description: Support Matrix Asciidoc for NetApp E-Series

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|2600
2660
2680
2702
2704
2800B
2804
2806
3000
5480
5486
5488
5504
5564
5600
5700
5700B
6000
|08.40.60.01
8.10.14.0
8.20.11.0
8.20.27.0
8.20.30.0
8.20.5.0
8.20.8.0
8.25.14.0
8.25.6.0
8.30.1.0
8.40.0.1
8.40.0.3
8.40.20.0
8.40.30.3
8.40.40.0
8.40.50.0
8.40.60.1
```

```
8.40.60.2
8.40.60.3
8.42.20.0
8.50.0.3
8.50.0.4
8.51.0.0
8.52.0.0
8.52.0.1
8.53.0.1
8.53.0.4
8.62.0.0
8.62.0.2
8.63.0.2
8.70.0.3
8.71.2.0
8.71.3.0
8.72.0.0
8.72.1.0
8.72.2.0
8.73.0.0
8.74.0.0
8.74.1.0
8.74.2.0
8.74.3.0
8.75.0.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.94+|foundation .16+|Disk|Capacity (GB)|Implemented|RMI|use capacity
|Disk Id|Implemented|RMI|Uniquely identifies this disk in the array
|Group|Implemented|RMI|
|Location|Gap|RMI|Where this disk is physically located in the array
|Model|Implemented|RMI|
|Name|Implemented|RMI|
|Role|Implemented|RMI|
|Role Enum|Implemented|RMI|enum for disk role
|Serial Number|Implemented|RMI|
|Speed|Implemented|RMI|Speed of disk (RPM)
|Status|Implemented|RMI|
|Status Enum|Implemented|RMI|enum for disk status
|Type|Gap|RMI|
|Type Enum|Implemented|RMI|enum for disk type
```

```
|Vendor|Implemented|RMI|
|Vendor Id|Implemented|RMI|
.4+|ISCSI Network Portal|IP|Implemented|RMI|
|Listening Port|Implemented|RMI|
|Nic|Implemented|RMI|
|OID|Implemented|RMI|
.3+|ISCSI Network Portal Group|OID|Implemented|RMI|
|Portal Group Name|Implemented|RMI|
|Portal Group Tag|Implemented|RMI|
.4+|ISCSI Node|Host Aliases|Implemented|RMI|
|Node Name|Implemented|RMI|
|OID|Implemented|RMI|
|Type|Gap|RMI|
.8+|ISCSI Session|Initiator Ips|Implemented|RMI|
|Initiator OID|Implemented|RMI|
|Max Connections|Implemented|RMI|
|Number Of Connections|Implemented|RMI|
|OID|Implemented|RMI|
|Portal Group OID|Implemented|RMI|
|Security|Implemented|RMI|
|Target Session Id|Implemented|RMI|
.3+|Info|DataSource Name|Implemented|RMI|Info
|Date|Implemented|RMI|
|Originator ID|Implemented|RMI|
.12+|Storage|Display IP|Implemented|RMI|
|Failed Raw Capacity|Implemented|RMI|Raw capapcity of failed disks (sum of
all disks that are failed)
|Family|Implemented|RMI|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|RMI|
|Manufacturer|Implemented|RMI|
|Microcode Version|Implemented|RMI|
|Model|Implemented|RMI|
|Name|Implemented|RMI|
|Total Raw Capacity|Implemented|RMI|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|RMI|
|Spare Raw Capacity|Implemented|RMI|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|RMI|Is this a storage virtualization device?
.8+|Storage Node|Cache Size|Implemented|RMI|device cache size in MB
|Memory Size|Gap|RMI|device memory in MB
|Model|Implemented|RMI|
|Name|Implemented|RMI|
|Serial Number|Implemented|RMI|
|State|Implemented|RMI|free text describing the device state
```

```
|UUID|Implemented|RMI|
|Up Time|Implemented|RMI|time in milliseconds
.18+|Storage Pool|Data Allocated Capacity|Gap|RMI|capacity allocated for data
|Data Used Capacity|Implemented|RMI|
|Dedupe Enabled|Implemented|RMI|Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented|RMI|A way from ACQ to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|RMI|
|Other Allocated Capacity|Gap|RMI|Capacity allocated for other (not data and not snapshot)
|Other UsedCapacity (MB)|Implemented|RMI|Any capacity other than data and snapshot
|Physical Disk  Capacity (MB)|Implemented|RMI|used as raw capacity for storage pool
|Raid Group|Implemented|RMI|indicates whether this storagePool is a raid group
|Raw to Usable Ratio|Implemented|RMI|ratio to convert from usable capacity to raw capacity
|Redundancy|Implemented|RMI|Redundancy level
|Status|Implemented|RMI|
|Storage Pool Id|Implemented|RMI|
|Thin Provisioning Supported|Implemented|RMI|Whether this internal volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|RMI|
|Total Used Capacity|Implemented|RMI|Total capacity in MB
|Type|Gap|RMI|
|Virtual|Implemented|RMI|Is this a storage virtualization device?
.12+|Volume|Capacity|Implemented|RMI|Snapshot Used capacity in MB
|Disk Type|Not Available|RMI|
|Name|Implemented|RMI|
|Total Raw Capacity|Implemented|RMI|Total raw capacity (sum of all disks on the array)
|Redundancy|Implemented|RMI|Redundancy level
|Storage Pool Id|Implemented|RMI|
|Thin Provisioned|Implemented|RMI|
|Type|Gap|RMI|
|UUID|Implemented|RMI|
|Used Capacity|Implemented|RMI|
|Virtual|Implemented|RMI|Is this a storage virtualization device?
|Written Capacity|Implemented|RMI|Total capacity written to this volume by a Host in MB
.3+|Volume Map|LUN|Implemented|RMI|Name of the backend lun
|Storage Port|Implemented|RMI|
|Type|Gap|RMI|
.3+|Volume Mask|Initiator|Implemented|RMI|
|Storage Port|Implemented|RMI|
|Type|Gap|RMI|
.73+|performance .9+|Disk|IOps Read|Implemented|RMI|Number of read IOps on
the disk
|IOPs Total|Implemented|RMI|
|IOPs Write|Implemented|RMI|
|Throughput Read|Implemented|RMI|
|Throughput Total|Implemented|RMI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|RMI|
|Read Utilization|Implemented|RMI|
|Utilization Total|Implemented|RMI|
|Utilization Write|Implemented|RMI|
.17+|Storage|Cache Hit Ratio Read|Implemented|RMI|
|Cache Hit Ratio Total|Implemented|RMI|
|Cache Hit Ratio Write|Implemented|RMI|
|Failed Raw Capacity|Implemented|RMI|
|Raw Capacity|Implemented|RMI|
|Spare Raw Capacity|Implemented|RMI|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|RMI|
|IOPs other|Implemented|RMI|
|IOps Read|Implemented|RMI|Number of read IOps on the disk
|IOPs Total|Implemented|RMI|
|IOPs Write|Implemented|RMI|
|Latency Read|Implemented|RMI|
|Latency Total|Implemented|RMI|
|Latency Write|Implemented|RMI|
|Throughput Read|Implemented|RMI|
|Throughput Total|Implemented|RMI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|RMI|
.10+|Storage Node|Cache Hit Ratio Total|Implemented|RMI|
|IOps Read|Implemented|RMI|Number of read IOps on the disk
|IOPs Total|Implemented|RMI|
|IOPs Write|Implemented|RMI|
|Latency Read|Implemented|RMI|
|Latency Total|Implemented|RMI|
|Latency Write|Implemented|RMI|
|Throughput Read|Implemented|RMI|
|Throughput Total|Implemented|RMI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|RMI|
.19+|StoragePool Disk|Capacity Provisioned|Implemented|RMI|
|Raw Capacity|Implemented|RMI|
|Total Capacity|Implemented|RMI|
|Used Capacity|Implemented|RMI|
|Over Commit Capacity Ratio|Implemented|RMI|Reported as a time series
|Capacity Used Ratio|Implemented|RMI|
|Total Data Capacity|Implemented|RMI|
|Data Used Capacity|Implemented|RMI|
|IOps Read|Implemented|RMI|Number of read IOps on the disk
|IOPs Total|Implemented|RMI|
|IOPs Write|Implemented|RMI|
|Other Total Capacity|Implemented|RMI|
|Other Used Capacity|Implemented|RMI|
|Throughput Read|Implemented|RMI|
|Throughput Total|Implemented|RMI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|RMI|
|Read Utilization|Implemented|RMI|
|Utilization Total|Implemented|RMI|
|Utilization Write|Implemented|RMI|
.18+|Volume|Cache Hit Ratio Read|Implemented|RMI|
|Cache Hit Ratio Total|Implemented|RMI|
|Cache Hit Ratio Write|Implemented|RMI|
|Raw Capacity|Implemented|RMI|
|Total Capacity|Implemented|RMI|
|Used Capacity|Implemented|RMI|
|Written Capacity|Implemented|RMI|
|Capacity Used Ratio|Implemented|RMI|
|CapacityRatio Written|Implemented|RMI|
|IOps Read|Implemented|RMI|Number of read IOps on the disk
|IOPs Total|Implemented|RMI|
|IOPs Write|Implemented|RMI|
|Latency Read|Implemented|RMI|
|Latency Total|Implemented|RMI|
|Latency Write|Implemented|RMI|
|Throughput Read|Implemented|RMI|
|Throughput Total|Implemented|RMI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|RMI|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)
```

```
|SANtricity API
|RMI
|TCP
|
|
|true
|true
|false
|false

|===

<<top,Back to Top>>

== Google Cloud Compute
:description: Support Matrix Asciidoc for Google Cloud Compute

Models and versions supported by this data collector:
|===
<.<|API versions

|v1

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.48+|foundation .7+|Data Store|Capacity|Implemented|HTTPS|Snapshot Used
capacity in MB
|MOID|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.4+|Server|DataCenter Name|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
.5+|Virtual Disk|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
|subscription Id|Implemented|HTTPS|
.17+|VirtualMachine|Guest State|Implemented|HTTPS|
|DataStore OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|OS|Implemented|HTTPS|
|Power State|Implemented|HTTPS|
|State Change Time|Implemented|HTTPS|
|Processors|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Instance Type|Implemented|HTTPS|
|Launch Time|Implemented|HTTPS|
|public Ips|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.3+|VirtualMachine Disk|OID|Implemented|HTTPS|
|VirtualDisk OID|Implemented|HTTPS|
|VirtualMachine OID|Implemented|HTTPS|
.5+|Host|Host OS|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.27+|performance .4+|Data Store|Capacity Provisioned|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
.6+|Virtual Disk|IOps Read|Implemented|HTTPS|Number of read IOps on the
disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.17+|vm|Total Capacity|Implemented|HTTPS|
|Total CPU Utilization|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|diskIops.total|Implemented|HTTPS|
|Disk IOPs write|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Disk Throughput Read|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|total disk throughput read
|Disk Throughput Write|Implemented|HTTPS|
|IP Throughput Read|Implemented|HTTPS|
|Throughput total|Implemented|HTTPS|IP throughput total
|ipThroughput.write|Implemented|HTTPS|
|Total Memory Utilization|Implemented|HTTPS|
|swapRate.inRate|Implemented|HTTPS|
|Swap Rate|Implemented|HTTPS|
|Total Swap Rate|Implemented|HTTPS|
|Schedule wait time|Implemented|HTTPS|Waiting to be scheduled time in
percent

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Google Compute Platform REST API
|HTTPS
|
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== HDS HCP (HTTPS)
:description: Support Matrix Asciidoc for HDS HCP (HTTPS)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions
```

```
|Hitachi Content Platform
|9.3.7.2
9.5.0.121

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.41+|foundation .3+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.11+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.10+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
.12+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Soft Limit (MB)|Implemented|HTTPS|logical volume size that is defined
during volume creation or resizing operations
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.19+|performance .1+|Internal Volume|Total Objects|Implemented||
.7+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.4+|Storage Node|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.7+|StoragePool Disk|Total Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Capacity Provisioned|Implemented||
|Used Capacity|Implemented||
|Raw Capacity|Implemented||
|Capacity Soft Limit|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|HDS HCP REST API
|HTTPS
|HTTPS
|9090
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== HiCommand Device Manager
:description: Support Matrix Asciidoc for HiCommand Device Manager

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|7.6.1
8.7.7
8.8.1
8.8.3
8.8.5
|DF850MH
DF850S
HM800
HM850
P9500
RAID700
RAID800
VSP5000
XP24000
XP7
|0983/A-H
0988/H-S
DKC:60-08-22
DKC:60-08-65
DKC:70-06-46
```

```
DKC:70-06-67-00/00
DKC:80-06-80
DKC:80-06-82-00/00
DKC:80-06-86-00/00
DKC:80-06-87
DKC:80-06-88-00/00
DKC:80-06-91
DKC:80-06-91-00/00
DKC:80-06-93-00/00
DKC:83-05-45-40/00
DKC:83-05-45-60/00
DKC:83-05-46-60/00
DKC:83-05-47-60/00
DKC:83-05-48-40/00
DKC:83-05-48-60/00
DKC:88-08-08-60/00
DKC:88-08-09-60/00
DKC:90-08-81-00/00
DKC:90-08-83-00/01
SVP:60-08-21/00
SVP:60-08-54/00
SVP:70-06-32/00
SVP:70-06-51/00
SVP:80-06-76/02
SVP:80-06-78/00
SVP:80-06-81/00
SVP:80-06-82/00
SVP:80-06-83/00
SVP:80-06-86/00
SVP:80-06-88/00
SVP:83-05-49-40/00
SVP:83-05-49-60/00
SVP:83-05-50-60/00
SVP:83-05-51-60/00
SVP:83-05-52-40/00
SVP:83-05-52-60/00
SVP:88-08-10-60/00
SVP:88-08-11-60/00
SVP:90-08-81/00
SVP:90-08-83/00

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information
```

```
.113+|foundation .14+|Disk|Capacity (GB)|Implemented|HDS XML API|use
capacity
|Disk Id|Implemented|HDS XML API|Uniquely identifies this disk in the
array
|Group|Implemented|HDS XML API|
|Location|Gap|HDS XML API|Where this disk is physically located in the
array
|Model|Implemented|HDS XML API|
|Name|Implemented|HDS XML API|
|Role|Implemented|HDS XML API|
|Role Enum|Implemented|HDS XML API|enum for disk role
|Serial Number|Implemented|HDS XML API|
|Speed|Implemented|HDS XML API|Speed of disk (RPM)
|Type|Gap|HDS XML API|
|Type Enum|Implemented|HDS XML API|enum for disk type
|Vendor|Implemented|HDS XML API|
|Vendor Id|Implemented|HDS XML API|
.11+|Disk Group|Capacity|Implemented|HDS XML API|Snapshot Used capacity in
MB
|DiskGroup Id|Implemented|HDS XML API|unique id of the disk group
|Disk Type|Not Available|HDS XML API|
|Name|Implemented|HDS XML API|
|Physical Disk  Capacity (MB)|Implemented|HDS XML API|used as raw capacity
for storage pool
|Redundancy|Implemented|HDS XML API|Redundancy level
|Status|Implemented|HDS XML API|
|Used Capacity|Implemented|HDS XML API|
|Vendor DiskGroup Type|Implemented|HDS XML API|vendor's designation of the
disk group type
|Vendor Tier|Implemented|HDS XML API|Vendor Specific Tier Name
|Virtual|Implemented|HDS XML API|Is this a storage virtualization device?
.6+|Info|Api Name|Implemented|HDS XML API|
|Api Version|Implemented|HDS XML API|
|DataSource Name|Implemented|HDS XML API|Info
|Date|Implemented|HDS XML API|
|Originator ID|Implemented|HDS XML API|
|Originator Key|Implemented|HDS XML API|
.3+|Network Pipe|Source Id|Implemented|HDS XML API|
|Target Id|Implemented|HDS XML API|
|Bidirectional|Implemented|HDS XML API|
.3+|Protocol EndPoint|ID|Implemented|HDS XML API|
|Name|Implemented|HDS XML API|
|Storage Ip|Implemented|HDS XML API|
.13+|Storage|Display IP|Implemented|HDS XML API|
|Failed Raw Capacity|Implemented|HDS XML API|Raw capapcity of failed disks
```

```
(sum of all disks that are failed)
|Family|Implemented|HDS XML API|The storage Family could be Clariion,
Symmetrix, et al
|IP|Implemented|HDS XML API|
|Manage URL|Implemented|HDS XML API|
|Manufacturer|Implemented|HDS XML API|
|Microcode Version|Implemented|HDS XML API|
|Model|Implemented|HDS XML API|
|Name|Implemented|HDS XML API|
|Total Raw Capacity|Implemented|HDS XML API|Total raw capacity (sum of all
disks on the array)
|Serial Number|Implemented|HDS XML API|
|Spare Raw Capacity|Implemented|HDS XML API|Raw capapcity of spare disks
(sum of all disks that are spare)
|Virtual|Implemented|HDS XML API|Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented|HDS XML API|
|UUID|Implemented|HDS XML API|
.18+|Storage Pool|Auto Tiering|Implemented|HDS XML API|indicates if this
storagepool is participating in auto tiering with other pools
|Compression Enabled|Implemented|HDS XML API|Is compression enabled on the
storage pool
|Compression Savings|Implemented|HDS XML API|ratio of compression savings
in percentage
|Dedupe Enabled|Implemented|HDS XML API|Is dedupe enabled on the storage
pool
|Include In Dwh Capacity|Implemented|HDS XML API|A way from ACQ to cotnrol
which stroage pools are interesting in DWH Capacity
|Name|Implemented|HDS XML API|
|Physical Disk  Capacity (MB)|Implemented|HDS XML API|used as raw capacity
for storage pool
|Raid Group|Implemented|HDS XML API|indicates whether this storagePool is
a raid group
|Raw to Usable Ratio|Implemented|HDS XML API|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HDS XML API|Redundancy level
|Soft Limit (MB)|Implemented|HDS XML API|logical volume size that is
defined during volume creation or resizing operations
|Status|Implemented|HDS XML API|
|Storage Pool Id|Implemented|HDS XML API|
|Thin Provisioning Supported|Implemented|HDS XML API|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HDS XML API|
|Total Used Capacity|Implemented|HDS XML API|Total capacity in MB
|Type|Gap|HDS XML API|
|Virtual|Implemented|HDS XML API|Is this a storage virtualization device?
.9+|Storage Synchronization|Mode|Implemented|HDS XML API|
|Mode Enum|Implemented|HDS XML API|
|Source Storage|Implemented|HDS XML API|
|Source Volume|Implemented|HDS XML API|
|State|Implemented|HDS XML API|free text describing the device state
|State Enum|Implemented|HDS XML API|
|Target Storage|Implemented|HDS XML API|
|Target Volume|Implemented|HDS XML API|
|Technology|Implemented|HDS XML API|technology which causes storage
efficiency changed
.16+|Volume|AutoTier Policy Identifier|Implemented|HDS XML API|Dynamic
Tier Policy identifier
|Auto Tiering|Implemented|HDS XML API|indicates if this storagepool is
participating in auto tiering with other pools
|Capacity|Implemented|HDS XML API|Snapshot Used capacity in MB
|Junction Path|Implemented|HDS XML API|
|Mainframe|Implemented|HDS XML API|indicates if this volume is a Mainframe
Volume
|Meta|Implemented|HDS XML API|Flag saying whether this volume is a meta
volume with memeber or not. Meta volumes will have DiskGroup empty!
|Name|Implemented|HDS XML API|
|Total Raw Capacity|Implemented|HDS XML API|Total raw capacity (sum of all
disks on the array)
|Redundancy|Implemented|HDS XML API|Redundancy level
|Replica Source|Implemented|HDS XML API|
|Replica Target|Implemented|HDS XML API|
|Storage Pool Id|Implemented|HDS XML API|
|Thin Provisioned|Implemented|HDS XML API|
|Type|Gap|HDS XML API|
|Used Capacity|Implemented|HDS XML API|
|Virtual|Implemented|HDS XML API|Is this a storage virtualization device?
.4+|Volume Map|LUN|Implemented|HDS XML API|Name of the backend lun
|Masking Required|Implemented|HDS XML API|
|Protocol Controller|Implemented|HDS XML API|
|Storage Port|Implemented|HDS XML API|
.3+|Volume Mask|Initiator|Implemented|HDS XML API|
|Protocol Controller|Implemented|HDS XML API|
|Storage Port|Implemented|HDS XML API|
.7+|Volume Member|Name|Implemented|HDS XML API|
|Storage Pool Id|Implemented|HDS XML API|
|Rank|Implemented|HDS XML API|
|Cylinders|Implemented|HDS XML API|
|Capacity|Implemented|HDS XML API|Snapshot Used capacity in MB
|Total Raw Capacity|Implemented|HDS XML API|Total raw capacity (sum of all
disks on the array)
|Used Capacity|Implemented|HDS XML API|
.4+|WWN Alias|Host Aliases|Implemented|HDS XML API|
|Object Type|Implemented|HDS XML API|
|Source|Implemented|HDS XML API|
|WWN|Implemented|HDS XML API|
.47+|performance .7+|Disk|IOps Read|Implemented|Export/CLI|Number of read
IOps on the disk
|IOPs Total|Implemented|Export/CLI|
|IOPs Write|Implemented|Export/CLI|
|Throughput Read|Implemented|Export/CLI|
|Throughput Total|Implemented|Export/CLI|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|Export/CLI|
|Utilization Total|Implemented|Export/CLI|
.19+|Storage|Cache Hit Ratio Read|Implemented|Export/CLI|
|Cache Hit Ratio Total|Implemented|Export/CLI|
|Cache Hit Ratio Write|Implemented|Export/CLI|
|Cache Utilization Total|Implemented|Export/CLI|
|Failed Raw Capacity|Implemented|Export/CLI|
|Raw Capacity|Implemented|Export/CLI|
|Spare Raw Capacity|Implemented|Export/CLI|Raw capapcity of spare disks
(sum of all disks that are spare)
|StoragePools Capacity|Implemented|Export/CLI|
|IOPs other|Implemented|Export/CLI|
|IOps Read|Implemented|Export/CLI|Number of read IOps on the disk
|IOPs Total|Implemented|Export/CLI|
|IOPs Write|Implemented|Export/CLI|
|Latency Read|Implemented|Export/CLI|
|Latency Total|Implemented|Export/CLI|
|Latency Write|Implemented|Export/CLI|
|Throughput Read|Implemented|Export/CLI|
|Throughput Total|Implemented|Export/CLI|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|Export/CLI|
|Write Pending|Implemented|Export/CLI|total write pending
.2+|Storage Node|Throughput Total|Implemented|Export/CLI|Average disk
total rate (read and write across all disks) in MB/s
|IOPs Total|Implemented|Export/CLI|
.7+|StoragePool Disk|Total Capacity|Implemented|Export/CLI|
|Capacity Used Ratio|Implemented|Export/CLI|
|Capacity Provisioned|Implemented|Export/CLI|
|Used Capacity|Implemented|Export/CLI|
|Raw Capacity|Implemented|Export/CLI|
|Capacity Soft Limit|Implemented|Export/CLI|
|Over Commit Capacity Ratio|Implemented|Export/CLI|Reported as a time
series
.12+|Volume|Latency Total|Implemented|Export/CLI|
|IOps Read|Implemented|Export/CLI|Number of read IOps on the disk
```

```
|Latency Read|Implemented|Export/CLI|
|Cache Hit Ratio Read|Implemented|Export/CLI|
|IOPs Write|Implemented|Export/CLI|
|Cache Hit Ratio Total|Implemented|Export/CLI|
|Cache Hit Ratio Write|Implemented|Export/CLI|
|Throughput Read|Implemented|Export/CLI|
|Throughput Write|Implemented|Export/CLI|
|Throughput Total|Implemented|Export/CLI|Average disk total rate (read and
write across all disks) in MB/s
|IOPs Total|Implemented|Export/CLI|
|Latency Write|Implemented|Export/CLI|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Export utility (USPV) / SNM CLI (AMS)
|Export/CLI
|
|
|
|false
|false
|false
|false

|HiCommand Device Manager XML API
|HDS XML API
|HTTP/HTTPS
|2001
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Hitachi Ops Center
```

```
:description: Support Matrix Asciidoc for Hitachi Ops Center

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|VSP 5100
VSP 5500
VSP F1500
VSP F600
VSP G800
|80-06-92-00/00:01-65-03/05
83-05-46-60/00:01-65-03/05
83-05-47-40/00:01-65-03/05
83-05-48-40/00:01-65-03/05
90-08-81-00/00:01-65-03/05
90-08-82-00/00:01-65-03/05

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.108+|foundation .15+|Disk|Capacity (GB)|Implemented||use capacity
|Disk Id|Implemented||Uniquely identifies this disk in the array
|Group|Implemented||
|Location|Gap||Where this disk is physically located in the array
|Model|Implemented||
|Name|Implemented||
|Potential Transfer Rate|Implemented||
|Role|Implemented||
|Role Enum|Implemented||enum for disk role
|Seek Time|Implemented||
|Serial Number|Implemented||
|Speed|Implemented||Speed of disk (RPM)
|Status Enum|Implemented||enum for disk status
|Type Enum|Implemented||enum for disk type
|Vendor|Implemented||
.10+|Disk Group|Capacity|Implemented||Snapshot Used capacity in MB
|DiskGroup Id|Implemented||unique id of the disk group
|Disk Type|Not Available||
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Redundancy|Implemented||Redundancy level
```

```
|Status|Implemented||
|Used Capacity|Implemented||
|Vendor DiskGroup Type|Implemented||vendor's designation of the disk group type
|Virtual|Implemented||Is this a storage virtualization device?
.4+|ISCSI Network Portal|OID|Implemented||
|IP|Implemented||
|Nic|Implemented||
|Listening Port|Implemented||
.3+|ISCSI Network Portal Group|OID|Implemented||
|Portal Group Name|Implemented||
|Portal Group Tag|Implemented||
.3+|ISCSI Node|OID|Implemented||
|Node Name|Implemented||
|Type|Gap||
.2+|ISCSI Node Map|OID|Implemented||
|Portal Group OID|Implemented||
.7+|ISCSI Session|OID|Implemented||
|Initiator OID|Implemented||
|Portal Group OID|Implemented||
|Number Of Connections|Implemented||
|Max Connections|Implemented||
|Initiator Ips|Implemented||
|Security|Implemented||
.4+|Info|DataSource Name|Implemented||Info
|Date|Implemented||
|Originator ID|Implemented||
|Originator Key|Implemented||
.14+|Storage|Display IP|Implemented||
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of all disks that are failed)
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et al
|IP|Implemented||
|Manage URL|Implemented||
|Manufacturer|Implemented||
|Microcode Version|Implemented||
|Model|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on the array)
|Serial Number|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all disks that are spare)
|SupportActive Active|Implemented||Specified if the storage supports active-active configurations
```

```
|Virtual|Implemented||Is this a storage virtualization device?
.2+|Storage Node|Name|Implemented||
|UUID|Implemented||
.16+|Storage Pool|Dedupe Enabled|Implemented||Is dedupe enabled on the
storage pool
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Redundancy|Implemented||Redundancy level
|Soft Limit (MB)|Implemented||logical volume size that is defined during
volume creation or resizing operations
|Status|Implemented||
|Storage Pool Id|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Type|Gap||
|Virtual|Implemented||Is this a storage virtualization device?
|Encrypted|Implemented||
.9+|Storage Synchronization|Source Volume|Implemented||
|Target Volume|Implemented||
|Mode|Implemented||
|Mode Enum|Implemented||
|State|Implemented||free text describing the device state
|State Enum|Implemented||
|Source Storage|Implemented||
|Target Storage|Implemented||
|Technology|Implemented||technology which causes storage efficiency
changed
.10+|Volume|Capacity|Implemented||Snapshot Used capacity in MB
|Junction Path|Implemented||
|Name|Implemented||
|Protection Type|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Type|Gap||
|Used Capacity|Implemented||
|Compression Enabled|Implemented||
.5+|Volume Map|LUN|Implemented||Name of the backend lun
|Masking Required|Implemented||
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|Type|Gap||
.4+|Volume Mask|Initiator|Implemented||
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|Type|Gap||
.28+|performance .6+|Disk|IOps Read|Implemented||Number of read IOps on
the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.13+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.2+|Storage Node|Throughput Total|Implemented||Average disk total rate
(read and write across all disks) in MB/s
|IOPs Total|Implemented||
.7+|StoragePool Disk|Total Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Capacity Provisioned|Implemented||
|Used Capacity|Implemented||
|Raw Capacity|Implemented||
|Capacity Soft Limit|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series

|===
Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Hitachi Ops Center REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== HDS HNAS (CLI)
:description: Support Matrix Asciidoc for HDS HNAS (CLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|G600
G800
HNAS 4080
HNAS 4100
N800
|13.9.6918.05
14.5.7413.01
14.6.7520.04

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.87+|foundation .6+|Disk Group|DiskGroup Id|Implemented|SSH|unique id of
the disk group
|Name|Implemented|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
|Vendor Tier|Implemented|SSH|Vendor Specific Tier Name
|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|Used Capacity|Implemented|SSH|
.5+|File Share|Name|Implemented|SSH|
|Path|Implemented|SSH|path of the fileShare
|Qtree Id|Implemented|SSH|unique id of the qtree
|Is InternalVolume|Implemented|SSH|whether the file share represents an
internal volume (netapp volume) or is it a qtree/folder within the
internal volume
|Is Shared|Implemented|SSH|whether this fileShare has any shares
associated with it
.4+|Info|DataSource Name|Implemented|SSH|Info
|Originator ID|Implemented|SSH|
|Date|Implemented|SSH|
|Originator Key|Implemented|SSH|
.16+|Internal Volume|Internal Volume Id|Implemented|SSH|
|Name|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Type|Gap|SSH|
|Thin Provisioned|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Status|Implemented|SSH|
|Virtual Storage|Implemented|SSH|Owning virtual storage (vfiler)
|Snapshot Used Capacity|Implemented|SSH|
|Data Used Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Total Used Capacity (MB)|Implemented|SSH|place holder for the used
capacity as read from the device
|Total Allocated Capacity|Implemented|SSH|
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Dedupe Savings|Implemented|SSH|ratio of dedupe savings in percentage
.6+|QTree|Qtree Id|Implemented|SSH|unique id of the qtree
|Name|Implemented|SSH|
|Type|Gap|SSH|
|Quota HardCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|SSH|Space in MB currently used
|Quota SoftCapacity Limit (MB)|Implemented|SSH|Maximum amount of disk
space, allowed for the quota target
.10+|Quota|Quota Id|Implemented|SSH|unique id of the quota
|Type|Gap|SSH|
|Internal Volume Id|Implemented|SSH|
|Qtree Id|Implemented|SSH|unique id of the qtree
|Hard File Limit|Implemented|SSH|max number of files allowed for the quota
target
|Soft File Limit|Implemented|SSH|Max number of files allowed for the quota
target
|Hard Capacity Limit (MB)|Implemented|SSH|max amount of disk space,
allowed for the quota target (Hard limit)
|Used Files|Implemented|SSH|Number of files currently used
|Used Capacity|Implemented|SSH|
|Soft Capacity Limit (MB)|Implemented|SSH|Maximum amount of disk space,
allowed for the quota target
.4+|Share|Name|Implemented|SSH|
|Protocol|Implemented|SSH|enum for share protocol
|IP Interfaces|Implemented|SSH|comma separated list of IP addresses on
which this share is exposed
|Description|Implemented|SSH|
.2+|Share Initiator|Initiator|Implemented|SSH|
|Permission|Implemented|SSH|Permissions for this particular share
.14+|Storage|IP|Implemented|SSH|
|Display IP|Implemented|SSH|
|Name|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Model|Implemented|SSH|
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|Serial Number|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
|SupportActive Active|Implemented|SSH|Specified if the storage supports
active-active configurations
|Cpu Count|Implemented|SSH|Cpu Count of the storage
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
.7+|Storage Node|UUID|Implemented|SSH|
|Name|Implemented|SSH|
|Version|Implemented|SSH|software version
|Serial Number|Implemented|SSH|
|State|Implemented|SSH|free text describing the device state
|Memory Size|Gap|SSH|device memory in MB
|Processors Count|Implemented|SSH|device CPU
.13+|Storage Pool|Storage Pool Id|Implemented|SSH|
|Name|Implemented|SSH|
|Type|Gap|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Virtual|Implemented|SSH|Is this a storage virtualization device?
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Snapshot Used Capacity|Implemented|SSH|
|Data Used Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Total Allocated Capacity|Implemented|SSH|
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|HDS HNAS CLI
|SSH
|SSH
|22
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== HPE Nimble / Alletra 6000 Storage
:description: Support Matrix Asciidoc for HPE Nimble / Alletra 6000
Storage

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions
```

```
|v1
|6030
AF1000
AF20Q
AF3000
AF40
AF5000
CS1000
CS300
CS3000
CS500
CS5000
HF20
HF20H
HF40
HF60
|5.0.10.0-742719-opt
5.0.7.0-604814-opt
5.0.8.0-677726-opt
5.2.1.1000-1017822-opt
5.2.1.400-796142-opt
5.2.1.600-841103-opt
5.2.1.700-882343-opt
5.2.1.800-930936-opt
5.2.1.900-1003439-opt
6.0.0.300-956221-opt
6.0.0.400-991061-opt
6.1.1.200-1020304-opt
6.1.1.300-1028597-opt

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.104+|foundation .17+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Potential Transfer Rate|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Seek Time|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.4+|ISCSI Node|Host Aliases|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.7+|ISCSI Session|Initiator Ips|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Security|Implemented|HTTPS|
.6+|Info|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.14+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.6+|Storage Node|Name|Implemented|HTTPS|
|Partner Node UUID|Implemented|HTTPS|HA pair's UUID
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|Parent Serial Number|Implemented|HTTPS|
.18+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Reserved Capacity|Implemented|HTTPS|Reserved Capacity in MB
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.12+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
```

```
|Compression Enabled|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
.5+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Masking Required|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|WWN Alias|Host Aliases|Implemented|HTTPS|
|Object Type|Implemented|HTTPS|
|Source|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
.35+|performance .14+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.6+|StoragePool Disk|IOps Read|Implemented|HTTPS|Number of read IOps on
the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.15+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|Compression Savings Space|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
```

```
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|HP Nimble REST API
|HTTPS
|HTTPS
|5392
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== Huawei OceanStor (REST/HTTPS)
:description: Support Matrix Asciidoc for Huawei OceanStor (REST/HTTPS)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|5300 V5
5500 V3
5500 V5
5800 V3
Dorado 5000 V6 SAS
Dorado 6000 V3
Dorado 6000 V6 NVMe
|V300R001C01
V300R002C10
V300R006C20
V300R006C50
V500R007C10
V500R007C30
V600R003C00
V600R005C03

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.126+|foundation .14+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.5+|File Share|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Is InternalVolume|Implemented|HTTPS|whether the file share represents an
internal volume (netapp volume) or is it a qtree/folder within the
internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
.4+|ISCSI Network Portal|OID|Implemented|HTTPS|
|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.3+|ISCSI Node|OID|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|Type|Gap|HTTPS|
.2+|ISCSI Node Map|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
.7+|ISCSI Session|OID|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Initiator Ips|Implemented|HTTPS|
|Security|Implemented|HTTPS|
.4+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.13+|Internal Volume|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Snapshot Used Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Allocated Capacity|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
.7+|QTree|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Name|Implemented|HTTPS|
|Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Quota HardCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|HTTPS|Space in MB currently used
.11+|Quota|Quota Id|Implemented|HTTPS|unique id of the quota
|Type|Gap|HTTPS|
|Internal Volume Id|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Hard File Limit|Implemented|HTTPS|max number of files allowed for the
quota target
|Soft File Limit|Implemented|HTTPS|Max number of files allowed for the
```

```
quota target
|Hard Capacity Limit (MB)|Implemented|HTTPS|max amount of disk space,
allowed for the quota target (Hard limit)
|Soft Capacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk space,
allowed for the quota target
|Used Files|Implemented|HTTPS|Number of files currently used
|Used Capacity|Implemented|HTTPS|
|User/Group Target|Implemented|HTTPS|user/group target this quota refers
to
.4+|Share|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
|Description|Implemented|HTTPS|
|IP Interfaces|Implemented|HTTPS|comma separated list of IP addresses on
which this share is exposed
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
.14+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.3+|Storage Node|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
.12+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
```

```
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.10+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Junction Path|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.33+|performance .7+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|IOPs Total|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.10+|Storage Node|Latency Total|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|Latency Read|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|IOPs Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.16+|Volume|Cache Hit Ratio Read|Implemented|HTTPS|
|Cache Hit Ratio Total|Implemented|HTTPS|
|Cache Hit Ratio Write|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Huawei OceanStor REST API
|HTTPS
|HTTPS
|8088
|
|true
|true
|true
|true

|Huawei OceanStor Performance REST API
|HTTPS
|HTTPS
|8088
|
|true
|false
```

```
|true
|true

|===

<<top,Back to Top>>

== IBM Cleversafe
:description: Support Matrix Asciidoc for IBM Cleversafe



|===




|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.57+|foundation .10+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
.3+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
.14+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Protection Type|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
```

```
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Comment|Gap|HTTPS|state: free text comment describing the svm
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.10+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.6+|Storage Node|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
|ManagementIp Addresses|Implemented|HTTPS|
.11+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?

|===
Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|IBM Cleversafe REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== IBM DS 8K (DSCLI)
:description: Support Matrix Asciidoc for IBM DS 8K (DSCLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|2107-951
2107-961
2107-985
2107-996
|7.6.31.4250
7.7.51.1400
7.8.57.18
7.9.21.91
7.9.32.126

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.67+|foundation .14+|Disk|Capacity (GB)|Implemented|DSNI|use capacity
```

```
|Disk Id|Implemented|DSNI|Uniquely identifies this disk in the array
|Group|Implemented|DSNI|
|Location|Gap|DSNI|Where this disk is physically located in the array
|Model|Implemented|DSNI|
|Name|Implemented|Manual Entry|
|Role|Implemented|DSNI|
|Role Enum|Implemented|DSNI|enum for disk role
|Speed|Implemented|DSNI|Speed of disk (RPM)
|Status|Implemented|DSNI|
|Type|Gap|DSNI|
|Type Enum|Implemented|DSNI|enum for disk type
|Vendor|Implemented|DSNI|
|Vendor Id|Implemented|DSNI|
.4+|Info|DataSource Name|Implemented|DSNI|Info
|Date|Implemented|DSNI|
|Originator ID|Implemented|DSNI|
|Originator Key|Implemented|DSNI|
.13+|Storage|Display IP|Implemented|DSNI|
|Failed Raw Capacity|Implemented|DSNI|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|DSNI|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|DSNI|
|Manage URL|Implemented|DSNI|
|Manufacturer|Implemented|DSNI|
|Microcode Version|Implemented|DSNI|
|Model|Implemented|DSNI|
|Name|Implemented|Manual Entry|
|Total Raw Capacity|Implemented|DSNI|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|DSNI|
|Spare Raw Capacity|Implemented|DSNI|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|DSNI|Is this a storage virtualization device?
.16+|Storage Pool|Data Allocated Capacity|Gap|DSNI|capacity allocated for
data
|Data Used Capacity|Implemented|DSNI|
|Dedupe Enabled|Implemented|DSNI|Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented|DSNI|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|Manual Entry|
|Physical Disk  Capacity (MB)|Implemented|DSNI|used as raw capacity for
storage pool
|Raid Group|Implemented|DSNI|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|DSNI|ratio to convert from usable
```

```
capacity to raw capacity
|Redundancy|Implemented|DSNI|Redundancy level
|Status|Implemented|DSNI|
|Storage Pool Id|Implemented|DSNI|
|Thin Provisioning Supported|Implemented|DSNI|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|DSNI|
|Total Used Capacity|Implemented|DSNI|Total capacity in MB
|Type|Gap|DSNI|
|Virtual|Implemented|DSNI|Is this a storage virtualization device?
.9+|Volume|Capacity|Implemented|DSNI|Snapshot Used capacity in MB
|Disk Type|Not Available|DSNI|
|Junction Path|Implemented|DSNI|
|Name|Implemented|Manual Entry|
|Total Raw Capacity|Implemented|DSNI|Total raw capacity (sum of all disks
on the array)
|Storage Pool Id|Implemented|DSNI|
|Thin Provisioned|Implemented|DSNI|
|Type|Gap|DSNI|
|Used Capacity|Implemented|DSNI|
.3+|Volume Map|LUN|Implemented|DSNI|Name of the backend lun
|Protocol Controller|Implemented|DSNI|
|Storage Port|Implemented|DSNI|
.3+|Volume Mask|Initiator|Implemented|DSNI|
|Protocol Controller|Implemented|DSNI|
|Storage Port|Implemented|DSNI|
.5+|WWN Alias|Host Aliases|Implemented|DSNI|
|Host OS|Implemented|DSNI|
|Object Type|Implemented|DSNI|
|Source|Implemented|DSNI|
|WWN|Implemented|DSNI|
.53+|performance .9+|Disk|Utilization Write|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|Read Utilization|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|Throughput Write|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s
|IOPs Total|Implemented|DSNI|
|Utilization Total|Implemented|DSNI|
.13+|Storage|Latency Total|Implemented|DSNI|
|Latency Read|Implemented|DSNI|
|IOPs other|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|IOPs Total|Implemented|DSNI|
|Latency Write|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|Cache Hit Ratio Read|Implemented|DSNI|
|Cache Hit Ratio Total|Implemented|DSNI|
|Cache Hit Ratio Write|Implemented|DSNI|
|Throughput Write|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s
.17+|StoragePool Disk|Capacity Provisioned|Implemented|DSNI|
|Raw Capacity|Implemented|DSNI|
|Total Capacity|Implemented|DSNI|
|Used Capacity|Implemented|DSNI|
|Over Commit Capacity Ratio|Implemented|DSNI|Reported as a time series
|Capacity Used Ratio|Implemented|DSNI|
|Total Data Capacity|Implemented|DSNI|
|Data Used Capacity|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|IOPs Total|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|DSNI|
|Read Utilization|Implemented|DSNI|
|Utilization Total|Implemented|DSNI|
|Utilization Write|Implemented|DSNI|
.14+|Volume|Cache Hit Ratio Read|Implemented|DSNI|
|Cache Hit Ratio Total|Implemented|DSNI|
|Cache Hit Ratio Write|Implemented|DSNI|
|Raw Capacity|Implemented|DSNI|
|Total Capacity|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|IOPs Total|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Latency Read|Implemented|DSNI|
|Latency Total|Implemented|DSNI|
|Latency Write|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|DSNI|

|===

Management APIs used by this data collector:
```

```
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Data source wizard configuration
|Manual Entry
|
|
|
|true
|true
|true
|true

|IBM DS CLI
|DSNI
|DSNI
|
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== IBM PowerVM (SSH)
:description: Support Matrix Asciidoc for IBM PowerVM (SSH)


|===




|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.54+|foundation .6+|Data Store|Capacity|Implemented|SSH|Snapshot Used
capacity in MB
|MOID|Implemented|SSH|
|Name|Implemented|SSH|
|OID|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Virtual Center Ip|Implemented|SSH|
.5+|LUN|Disk Name|Implemented|SSH|
|DataStore OID|Implemented|SSH|
|Host OID|Implemented|SSH|
|Number|Implemented|SSH|
|OID|Implemented|SSH|
.6+|Path|Active|Implemented|SSH|
|Lun OID|Implemented|SSH|
|Host Port WWPN|Implemented|SSH|
|OID|Implemented|SSH|
|Storage Port WWPN|Implemented|SSH|
|Type|Gap|SSH|
.4+|Server|Host OID|Implemented|SSH|
|MOID|Implemented|SSH|
|OID|Implemented|SSH|
|Virtual Center Ip|Implemented|SSH|
.6+|Virtual Disk|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|DataStore OID|Implemented|SSH|
|Lun OID|Implemented|SSH|
|Name|Implemented|SSH|
|OID|Implemented|SSH|
|Type|Gap|SSH|
.12+|VirtualMachine|Dns Name|Implemented|SSH|
|Guest State|Implemented|SSH|
|Host OID|Implemented|SSH|
|IPs|Implemented|SSH|
|MOID|Implemented|SSH|
|Memory|Implemented|SSH|
|Name|Implemented|SSH|
|OID|Implemented|SSH|
|OS|Implemented|SSH|
|Power State|Implemented|SSH|
|State Change Time|Implemented|SSH|
|Processors|Implemented|SSH|
.3+|VirtualMachine Disk|OID|Implemented|SSH|
|VirtualDisk OID|Implemented|SSH|
|VirtualMachine OID|Implemented|SSH|
.9+|Host|Host Cpu Count|Implemented|SSH|
|Host Installed Memory|Implemented|SSH|
|Host Model|Implemented|SSH|
|NIC count|Implemented|SSH|
|IPs|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Name|Implemented|SSH|
|OID|Implemented|SSH|
|Platform Type|Implemented|SSH|
.3+|Info|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|IBM Hardware Management Console SSH access
|SSH
|SSH
|22
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== IBM SVC (CLI)
:description: Support Matrix Asciidoc for IBM SVC (CLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|2072-12F
2072-12G
2072-2N4
2072-324
2072-3H4
2072-3N4
2076-124
2076-12F
2076-224
```

```
2076-24F
2076-24G
2076-624
2076-724
2076-824
2076-AF6
2076-AFF
2077-24F
2077-424
2078-12F
2078-224
2078-24C
2078-24F
2078-324
2078-424
2078-4H4
2078-92G
2078-AF3
4657-924
4662-12G
4662-6H2
4666-AH8
9843-AE2
9843-AE3
9846-AG8
9848-AE2
9848-AF7
9848-AF8
9848-AG8
SVC
|1.5.2.7
1.6.1.2
1.6.1.4
1.6.1.5
7.5.0.11
7.5.0.12
7.7.1.8
7.8.1.14
7.8.1.6
7.8.1.8
8.2.1.10
8.2.1.11
8.2.1.14
8.2.1.9
8.3.1.1
8.3.1.2
```

```
8.3.1.5
8.3.1.6
8.3.1.7
8.3.1.9
8.4.0.10
8.4.0.11
8.4.0.6
8.4.0.7
8.4.0.8
8.4.0.9
8.5.0.5
8.5.0.6
8.5.0.7
8.5.0.8
8.5.0.9
8.5.2.2
8.5.3.1
8.5.4.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.94+|foundation .15+|Disk|Capacity (GB)|Implemented|SSH|use capacity
|Disk Id|Implemented|SSH|Uniquely identifies this disk in the array
|Group|Implemented|SSH|
|Location|Gap|SSH|Where this disk is physically located in the array
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Role|Implemented|SSH|
|Role Enum|Implemented|SSH|enum for disk role
|Serial Number|Implemented|SSH|
|Speed|Implemented|SSH|Speed of disk (RPM)
|Status|Implemented|SSH|
|Type|Gap|SSH|
|Type Enum|Implemented|SSH|enum for disk type
|Vendor|Implemented|SSH|
|Vendor Id|Implemented|SSH|
.3+|Info|DataSource Name|Implemented|SSH|Info
|Date|Implemented|SSH|
|Originator ID|Implemented|SSH|
.13+|Storage|Display IP|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|Raw capapcity of failed disks (sum of
all disks that are failed)
```

```
|Family|Implemented|SSH|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|SSH|
|Manage URL|Implemented|SSH|
|Manufacturer|Implemented|SSH|
|Microcode Version|Implemented|SSH|
|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
.7+|Storage Node|Model|Implemented|SSH|
|Name|Implemented|SSH|
|Partner Node UUID|Implemented|SSH|HA pair's UUID
|Serial Number|Implemented|SSH|
|State|Implemented|SSH|free text describing the device state
|UUID|Implemented|SSH|
|Parent Serial Number|Implemented|SSH|
.18+|Storage Pool|Compression Enabled|Implemented|SSH|Is compression
enabled on the storage pool
|Compression Savings|Implemented|SSH|ratio of compression savings in
percentage
|Dedupe Enabled|Implemented|SSH|Is dedupe enabled on the storage pool
|Include In Dwh Capacity|Implemented|SSH|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|SSH|
|Physical Disk  Capacity (MB)|Implemented|SSH|used as raw capacity for
storage pool
|Raid Group|Implemented|SSH|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|SSH|ratio to convert from usable capacity
to raw capacity
|Redundancy|Implemented|SSH|Redundancy level
|Status|Implemented|SSH|
|Storage Pool Id|Implemented|SSH|
|Thin Provisioning Supported|Implemented|SSH|Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|SSH|
|Total Used Capacity|Implemented|SSH|Total capacity in MB
|Type|Gap|SSH|
|Uses FlashPools|Implemented|SSH|indicate if this storagepool uses Flash
Pools(NetApp specific)
|Virtual|Implemented|SSH|Is this a storage virtualization device?
```

```
|Encrypted|Implemented|SSH|
.9+|Storage Synchronization|Mode|Implemented|SSH|
|Mode Enum|Implemented|SSH|
|Source Storage|Implemented|SSH|
|Source Volume|Implemented|SSH|
|State|Implemented|SSH|free text describing the device state
|State Enum|Implemented|SSH|
|Target Storage|Implemented|SSH|
|Target Volume|Implemented|SSH|
|Technology|Implemented|SSH|technology which causes storage efficiency
changed
.18+|Volume|AutoTier Policy Identifier|Implemented|SSH|Dynamic Tier Policy
identifier
|Auto Tiering|Implemented|SSH|indicates if this storagepool is
participating in auto tiering with other pools
|Capacity|Implemented|SSH|Snapshot Used capacity in MB
|DiskGroup|Implemented|SSH|Disk Group Type
|Head|Implemented|SSH|Specify the head (in netapp) for this volume
|Junction Path|Implemented|SSH|
|Name|Implemented|SSH|
|Protection Type|Implemented|SSH|
|Total Raw Capacity|Implemented|SSH|Total raw capacity (sum of all disks
on the array)
|Storage Pool Id|Implemented|SSH|
|Thin Provisioned|Implemented|SSH|
|Type|Gap|SSH|
|UUID|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Virtual|Implemented|SSH|Is this a storage virtualization device?
|Written Capacity|Implemented|SSH|Total capacity written to this volume by
a Host in MB
|Compression Enabled|Implemented|SSH|
|Encrypted|Implemented|SSH|
.3+|Volume Map|LUN|Implemented|SSH|Name of the backend lun
|Protocol Controller|Implemented|SSH|
|Storage Port|Implemented|SSH|
.4+|Volume Mask|Initiator|Implemented|SSH|
|Protocol Controller|Implemented|SSH|
|Storage Port|Implemented|SSH|
|Type|Gap|SSH|
.4+|WWN Alias|Host Aliases|Implemented|SSH|
|Object Type|Implemented|SSH|
|Source|Implemented|SSH|
|WWN|Implemented|SSH|
.70+|performance .9+|Disk|IOps Read|Implemented|SSH|Number of read IOps on
the disk
```

```
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
|Read Utilization|Implemented|SSH|
|Utilization Total|Implemented|SSH|
|Utilization Write|Implemented|SSH|
.17+|Storage|Cache Hit Ratio Read|Implemented|SSH|
|Cache Hit Ratio Total|Implemented|SSH|
|Cache Hit Ratio Write|Implemented|SSH|
|Failed Raw Capacity|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Spare Raw Capacity|Implemented|SSH|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|SSH|
|IOPs other|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
.11+|Storage Node|Cache Hit Ratio Total|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
|Utilization Total|Implemented|SSH|
.15+|StoragePool Disk|Capacity Provisioned|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Total Capacity|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Over Commit Capacity Ratio|Implemented|SSH|Reported as a time series
|Capacity Used Ratio|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|
|Read Utilization|Implemented|SSH|
|Utilization Total|Implemented|SSH|
|Utilization Write|Implemented|SSH|
.18+|Volume|Cache Hit Ratio Read|Implemented|SSH|
|Cache Hit Ratio Total|Implemented|SSH|
|Cache Hit Ratio Write|Implemented|SSH|
|Raw Capacity|Implemented|SSH|
|Total Capacity|Implemented|SSH|
|Used Capacity|Implemented|SSH|
|Written Capacity|Implemented|SSH|
|Capacity Used Ratio|Implemented|SSH|
|CapacityRatio Written|Implemented|SSH|
|IOps Read|Implemented|SSH|Number of read IOps on the disk
|IOPs Total|Implemented|SSH|
|IOPs Write|Implemented|SSH|
|Latency Read|Implemented|SSH|
|Latency Total|Implemented|SSH|
|Latency Write|Implemented|SSH|
|Throughput Read|Implemented|SSH|
|Throughput Total|Implemented|SSH|Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented|SSH|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|IBM SVC CLI
|SSH
|SSH
|22
|
|true
|false
```

```
|true
|true

|===

<<top,Back to Top>>

== IBM XIV & A9000 (XIVCLI)
:description: Support Matrix Asciidoc for IBM XIV & A9000 (XIVCLI)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|415
A14
|10.2.4.e
12.3.2.c

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.94+|foundation .13+|Disk|Capacity (GB)|Implemented|XIV CLI|use capacity
|Disk Id|Implemented|XIV CLI|Uniquely identifies this disk in the array
|Model|Implemented|XIV CLI|
|Name|Implemented|XIV CLI|
|Role|Implemented|XIV CLI|
|Role Enum|Implemented|XIV CLI|enum for disk role
|Serial Number|Implemented|XIV CLI|
|Speed|Implemented|XIV CLI|Speed of disk (RPM)
|Status|Implemented|XIV CLI|
|Status Enum|Implemented|XIV CLI|enum for disk status
|Type|Gap|XIV CLI|
|Type Enum|Implemented|XIV CLI|enum for disk type
|Vendor|Implemented|XIV CLI|
.6+|Info|Client Api Name|Implemented|XIV CLI|
|Client Api Version|Implemented|XIV CLI|
|DataSource Name|Implemented|XIV CLI|Info
|Date|Implemented|XIV CLI|
|Originator ID|Implemented|XIV CLI|
|Originator Key|Implemented|XIV CLI|
.16+|Internal Volume|Internal Volume Id|Implemented|XIV CLI|
|Name|Implemented|XIV CLI|
|Storage Pool Id|Implemented|XIV CLI|
|Type|Gap|XIV CLI|
|Thin Provisioned|Implemented|XIV CLI|
|Thin Provisioning Supported|Implemented|XIV CLI|Whether this internal volume supports thin provisioning for the volume layer on top of it
|Dedupe Enabled|Implemented|XIV CLI|Is dedupe enabled on the storage pool
|Snapshot Used Capacity|Implemented|XIV CLI|
|Snapshot Allocated Capacity|Gap|XIV CLI|Allocated capacity of snapshots in MB
|Data Used Capacity|Implemented|XIV CLI|
|Data Allocated Capacity|Gap|XIV CLI|capacity allocated for data
|Total Used Capacity|Implemented|XIV CLI|Total capacity in MB
|Total Used Capacity (MB)|Implemented|XIV CLI|place holder for the used capacity as read from the device
|Total Allocated Capacity|Implemented|XIV CLI|
|Other Allocated Capacity|Gap|XIV CLI|Capacity allocated for other (not data and not snapshot)
|Raw to Usable Ratio|Implemented|XIV CLI|ratio to convert from usable capacity to raw capacity
.3+|QTree|Qtree Id|Implemented|XIV CLI|unique id of the qtree
|Name|Implemented|XIV CLI|
|Type|Gap|XIV CLI|
.12+|Storage|Display IP|Implemented|XIV CLI|
|Failed Raw Capacity|Implemented|XIV CLI|Raw capapcity of failed disks (sum of all disks that are failed)
|Family|Implemented|XIV CLI|The storage Family could be Clariion, Symmetrix, et al
|IP|Implemented|XIV CLI|
|Manufacturer|Implemented|XIV CLI|
|Microcode Version|Implemented|XIV CLI|
|Model|Implemented|XIV CLI|
|Name|Implemented|XIV CLI|
|Total Raw Capacity|Implemented|XIV CLI|Total raw capacity (sum of all disks on the array)
|Serial Number|Implemented|XIV CLI|
|Spare Raw Capacity|Implemented|XIV CLI|Raw capapcity of spare disks (sum of all disks that are spare)
|Virtual|Implemented|XIV CLI|Is this a storage virtualization device?
.23+|Storage Pool|Auto Tiering|Implemented|XIV CLI|indicates if this storagepool is participating in auto tiering with other pools
|Compression Enabled|Implemented|XIV CLI|Is compression enabled on the storage pool
|Compression Savings|Implemented|XIV CLI|ratio of compression savings in percentage
|Data Allocated Capacity|Gap|XIV CLI|capacity allocated for data
|Data Used Capacity|Implemented|XIV CLI|
|Dedupe Enabled|Implemented|XIV CLI|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|XIV CLI|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|XIV CLI|A way from ACQ to cotnrol
which stroage pools are interesting in DWH Capacity
|Name|Implemented|XIV CLI|
|Other UsedCapacity (MB)|Implemented|XIV CLI|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|XIV CLI|used as raw capacity for
storage pool
|Raid Group|Implemented|XIV CLI|indicates whether this storagePool is a
raid group
|Raw to Usable Ratio|Implemented|XIV CLI|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|XIV CLI|Redundancy level
|Snapshot Allocated Capacity|Gap|XIV CLI|Allocated capacity of snapshots
in MB
|Snapshot Used Capacity|Implemented|XIV CLI|
|Soft Limit (MB)|Implemented|XIV CLI|logical volume size that is defined
during volume creation or resizing operations
|Storage Pool Id|Implemented|XIV CLI|
|Thin Provisioning Supported|Implemented|XIV CLI|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|XIV CLI|
|Total Used Capacity|Implemented|XIV CLI|Total capacity in MB
|Type|Gap|XIV CLI|
|Virtual|Implemented|XIV CLI|Is this a storage virtualization device?
.12+|Volume|Capacity|Implemented|XIV CLI|Snapshot Used capacity in MB
|DiskGroup|Implemented|XIV CLI|Disk Group Type
|Disk Type|Not Available|XIV CLI|
|Name|Implemented|XIV CLI|
|Qtree Id|Implemented|XIV CLI|unique id of the qtree
|Total Raw Capacity|Implemented|XIV CLI|Total raw capacity (sum of all
disks on the array)
|Redundancy|Implemented|XIV CLI|Redundancy level
|Storage Pool Id|Implemented|XIV CLI|
|Thin Provisioned|Implemented|XIV CLI|
|Type|Gap|XIV CLI|
|Used Capacity|Implemented|XIV CLI|
|Compression Enabled|Implemented|XIV CLI|
.2+|Volume Map|LUN|Implemented|XIV CLI|Name of the backend lun
|Protocol Controller|Implemented|XIV CLI|
.2+|Volume Mask|Initiator|Implemented|XIV CLI|
|Protocol Controller|Implemented|XIV CLI|
.5+|WWN Alias|Host Aliases|Implemented|XIV CLI|
|Host OS|Implemented|XIV CLI|
|Object Type|Implemented|XIV CLI|
|Source|Implemented|XIV CLI|
|WWN|Implemented|XIV CLI|
.33+|performance .13+|Storage|Latency Total|Implemented|DSNI|
|Latency Read|Implemented|DSNI|
|IOPs other|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|IOPs Total|Implemented|DSNI|
|Latency Write|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|Cache Hit Ratio Read|Implemented|DSNI|
|Cache Hit Ratio Total|Implemented|DSNI|
|Cache Hit Ratio Write|Implemented|DSNI|
|Throughput Write|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s
.6+|StoragePool Disk|Total Capacity|Implemented|DSNI|
|Capacity Used Ratio|Implemented|DSNI|
|Capacity Provisioned|Implemented|DSNI|
|Used Capacity|Implemented|DSNI|
|Raw Capacity|Implemented|DSNI|
|Over Commit Capacity Ratio|Implemented|DSNI|Reported as a time series
.14+|Volume|Latency Total|Implemented|DSNI|
|Latency Read|Implemented|DSNI|
|IOPs Write|Implemented|DSNI|
|Compression Savings Space|Implemented|DSNI|
|Throughput Read|Implemented|DSNI|
|IOPs Total|Implemented|DSNI|
|Latency Write|Implemented|DSNI|
|IOps Read|Implemented|DSNI|Number of read IOps on the disk
|Cache Hit Ratio Read|Implemented|DSNI|
|Total Compression Savings|Implemented|DSNI|
|Cache Hit Ratio Total|Implemented|DSNI|
|Cache Hit Ratio Write|Implemented|DSNI|
|Throughput Write|Implemented|DSNI|
|Throughput Total|Implemented|DSNI|Average disk total rate (read and write
across all disks) in MB/s

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)
```

```
|IBM DS CLI
|DSNI
|DSNI
|
|
|true
|true
|true
|true

|IBM XIV CLI
|XIV CLI
|TCP
|7778
|
|true
|false
|true
|false

|===

<<top,Back to Top>>

== Infinidat Infinibox (HTTP)
:description: Support Matrix Asciidoc for Infinidat Infinibox (HTTP)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|F6230
F6240
F6303
F6304
|6.0.31.0
7.0.14.20

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.99+|foundation .11+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
```

```
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Vendor|Implemented|HTTPS|
.5+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
.4+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.11+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Other Allocated Capacity|Gap|HTTPS|Capacity allocated for other (not data
and not snapshot)
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.3+|Share|IP Interfaces|Implemented|HTTPS|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
```

```
.14+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.4+|Storage Node|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
.17+|Storage Pool|Data Allocated Capacity|Gap|HTTPS|capacity allocated for
data
|Data Used Capacity|Implemented|HTTPS|
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Reserved Capacity|Implemented|HTTPS|Reserved Capacity in MB
|Soft Limit (MB)|Implemented|HTTPS|logical volume size that is defined
during volume creation or resizing operations
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.13+|Volume|Name|Implemented|HTTPS|
|Junction Path|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Thin Provisioned|Implemented|HTTPS|
|Replica Source|Implemented|HTTPS|
|Replica Target|Implemented|HTTPS|
|Snapshot|Implemented|HTTPS|
|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Used Capacity|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Storage Port|Implemented|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Storage Port|Implemented|HTTPS|
.4+|WWN Alias|Source|Implemented|HTTPS|
|Host Aliases|Implemented|HTTPS|
|WWN|Implemented|HTTPS|
|Object Type|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Infinidat REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true
```

```
|===

<<top,Back to Top>>

== Microsoft Azure Compute
:description: Support Matrix Asciidoc for Microsoft Azure Compute

Models and versions supported by this data collector:
|===
<.<|API versions

|2018-06-01

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.54+|foundation .7+|Data Store|Capacity|Implemented|HTTPS|Snapshot Used
capacity in MB
|MOID|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.6+|Server|Cluster|Implemented|HTTPS|Cluster name
|DataCenter Name|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
.8+|Virtual Disk|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DataStore OID|Implemented|HTTPS|
|Lun OID|Implemented|HTTPS|
|Is Chargeable|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
|subscription Id|Implemented|HTTPS|
.18+|VirtualMachine|Guest State|Implemented|HTTPS|
|DataStore OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|OS|Implemented|HTTPS|
|Power State|Implemented|HTTPS|
|State Change Time|Implemented|HTTPS|
|Processors|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Instance Type|Implemented|HTTPS|
|Launch Time|Implemented|HTTPS|
|public Ips|Implemented|HTTPS|
|Security Groups|Implemented|HTTPS|
|subscription Id|Implemented|HTTPS|
.3+|VirtualMachine Disk|OID|Implemented|HTTPS|
|VirtualDisk OID|Implemented|HTTPS|
|VirtualMachine OID|Implemented|HTTPS|
.5+|Host|Host OS|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.20+|performance .3+|Data Store|Capacity Provisioned|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
.7+|Virtual Disk|Total Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.10+|vm|Total CPU Utilization|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|diskIops.total|Implemented|HTTPS|
|Disk IOPs write|Implemented|HTTPS|
|Disk Throughput Read|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|total disk throughput read
```

```
|Disk Throughput Write|Implemented|HTTPS|
|IP Throughput Read|Implemented|HTTPS|
|Throughput total|Implemented|HTTPS|IP throughput total
|ipThroughput.write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Microsoft Azure Compute REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Microsoft Hyper-V
:description: Support Matrix Asciidoc for Microsoft Hyper-V


|===



|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.82+|foundation .7+|Data Store|Capacity|Implemented|WMI|Snapshot Used
capacity in MB
|MOID|Implemented|WMI|
|Name|Implemented|WMI|
|OID|Implemented|WMI|
|Provisioned Capacity|Implemented|WMI|
|Used Capacity|Implemented|WMI|
|Virtual Center Ip|Implemented|WMI|
.3+|NasShare DataStore|DataStore OID|Implemented|WMI|
|Nas Share OID|Implemented|WMI|
|OID|Implemented|WMI|
.4+|NasShare Host|Nas Share OID|Implemented|WMI|
|Host OID|Implemented|WMI|
|OID|Implemented|WMI|
|Read Only|Implemented|WMI|
.6+|LUN|Disk Name|Implemented|WMI|
|DataStore OID|Implemented|WMI|
|Host OID|Implemented|WMI|
|Number|Implemented|WMI|
|OID|Implemented|WMI|
|TID|Implemented|WMI|
.6+|NAS Share|Capacity|Implemented|WMI|Allocated capacity in MB
|Filer Ip|Implemented|WMI|
|Filer Name|Implemented|WMI|
|OID|Implemented|WMI|
|Share Path|Implemented|WMI| For a HvNasShare to be matched to a Share
|Type|Gap|WMI|
.6+|Path|Active|Implemented|WMI|
|Lun OID|Implemented|WMI|
|Host Port WWPN|Implemented|WMI|
|OID|Implemented|WMI|
|Storage Port WWPN|Implemented|WMI|
|Type|Gap|WMI|
.6+|Server|Cluster|Implemented|WMI|Cluster name
|DataCenter Name|Implemented|WMI|
|Host OID|Implemented|WMI|
|MOID|Implemented|WMI|
|OID|Implemented|WMI|
|Virtual Center Ip|Implemented|WMI|
.7+|Virtual Disk|Capacity|Implemented|WMI|Snapshot Used capacity in MB
|DataStore OID|Implemented|WMI|
|Name|Implemented|WMI|
|OID|Implemented|WMI|
|Type|Gap|WMI|
|Used Capacity|Implemented|WMI|used capacity for reporting (MB)
|Used Capacity|Implemented|WMI|
.15+|VirtualMachine|Dns Name|Implemented|WMI|
|Guest State|Implemented|WMI|
|DataStore OID|Implemented|WMI|
|Host OID|Implemented|WMI|
|IPs|Implemented|WMI|
|MOID|Implemented|WMI|
|Memory|Implemented|WMI|
|Name|Implemented|WMI|
|OID|Implemented|WMI|
|OS|Implemented|WMI|
|Power State|Implemented|WMI|
|State Change Time|Implemented|WMI|
|Processors|Implemented|WMI|
|Provisioned Capacity|Implemented|WMI|
|Used Capacity|Implemented|WMI|
.3+|VirtualMachine Disk|OID|Implemented|WMI|
|VirtualDisk OID|Implemented|WMI|
|VirtualMachine OID|Implemented|WMI|
.12+|Host|Host Cpu Count|Implemented|WMI|
|Host Cpu Speed|Implemented|WMI|
|Host Domain|Implemented|WMI|
|Host Installed Memory|Implemented|WMI|
|Host Model|Implemented|WMI|
|NIC count|Implemented|WMI|
|NIC speed|Implemented|WMI|
|IPs|Implemented|WMI|
|Manufacturer|Implemented|WMI|
|Name|Implemented|WMI|
|OID|Implemented|WMI|
|Platform Type|Implemented|WMI|
.4+|ISCSI Node|Host Aliases|Implemented|WMI|
|Node Name|Implemented|WMI|
|OID|Implemented|WMI|
|Type|Gap|WMI|
.3+|Info|DataSource Name|Implemented|WMI|Info
|Date|Implemented|WMI|
|Originator ID|Implemented|WMI|
.43+|performance .5+|Data Store|Capacity Provisioned|Implemented|WS-
Management|
|Total Capacity|Implemented|WS-Management|
|Used Capacity|Implemented|WS-Management|
|Over Commit Capacity Ratio|Implemented|WS-Management|Reported as a time
series
|Capacity Used Ratio|Implemented|WS-Management|
.14+|Host|Total CPU Utilization|Implemented|WS-Management|
|IOps Read|Implemented|WS-Management|Number of read IOps on the disk
|diskIops.total|Implemented|WS-Management|
|Disk IOPs write|Implemented|WS-Management|
|Latency Read|Implemented|WS-Management|
|Latency Total|Implemented|WS-Management|
|Latency Write|Implemented|WS-Management|
|Disk Throughput Read|Implemented|WS-Management|
|Throughput Read|Implemented|WS-Management|total disk throughput read
|Disk Throughput Write|Implemented|WS-Management|
|IP Throughput Read|Implemented|WS-Management|
|Throughput total|Implemented|WS-Management|IP throughput total
|ipThroughput.write|Implemented|WS-Management|
|Total Memory Utilization|Implemented|WS-Management|
.10+|Virtual Disk|Total Capacity|Implemented|WS-Management|
|Used Capacity|Implemented|WS-Management|
|Capacity Used Ratio|Implemented|WS-Management|
|IOps Read|Implemented|WS-Management|Number of read IOps on the disk
|IOPs Total|Implemented|WS-Management|
|IOPs Write|Implemented|WS-Management|
|Latency Total|Implemented|WS-Management|
|Throughput Read|Implemented|WS-Management|
|Throughput Total|Implemented|WS-Management|Average disk total rate (read
and write across all disks) in MB/s
|Throughput Write|Implemented|WS-Management|
.14+|vm|Total Capacity|Implemented|WS-Management|
|Used Capacity|Implemented|WS-Management|
|Capacity Used Ratio|Implemented|WS-Management|
|Total CPU Utilization|Implemented|WS-Management|
|IOps Read|Implemented|WS-Management|Number of read IOps on the disk
|diskIops.total|Implemented|WS-Management|
|Disk IOPs write|Implemented|WS-Management|
|Latency Total|Implemented|WS-Management|
|Disk Throughput Read|Implemented|WS-Management|
|Throughput Read|Implemented|WS-Management|total disk throughput read
|Disk Throughput Write|Implemented|WS-Management|
|IP Throughput Read|Implemented|WS-Management|
|Throughput total|Implemented|WS-Management|IP throughput total
|ipThroughput.write|Implemented|WS-Management|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|PowerShell
|WS-Management
|HTTP
|5985
```

```
|
|true
|false
|false
|true

|WMI
|WMI
|WMI
|135
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== NetApp 7 Mode
:description: Support Matrix Asciidoc for NetApp 7 Mode

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|1.12
1.14
1.17
1.19
1.20
1.21
|FAS2040
FAS2050
FAS2220
FAS2240-2
FAS2240-4
FAS2520
FAS2554
FAS3140
FAS3160
FAS3210
FAS3220
FAS3240
FAS3250
```

```
FAS3270
FAS6240
FAS6290
FAS8020
FAS8040
FAS8060
FAS8080
N6070
N6240
V3240
|7.3.6
8.1.1 7-Mode
8.1.3P2 7-Mode
8.1.4P1 7-Mode
8.1.4P10 7-Mode
8.1.4P9D18 7-Mode
8.2.1 7-Mode
8.2.2 7-Mode
8.2.3 7-Mode
8.2.3P2 7-Mode
8.2.3P3 7-Mode
8.2.4 7-Mode
8.2.4P2 7-Mode
8.2.4P4 7-Mode
8.2.4P5 7-Mode
8.2.4P6 7-Mode
8.2.5 7-Mode
8.2.5P1 7-Mode
8.2.5P2 7-Mode
8.2.5P4 7-Mode
8.2.5P5 7-Mode
8.2P3 7-Mode
8.2P4 7-Mode
Data ONTAP Release 7.3.3
Data ONTAP Release 7.3.4
Data ONTAP Release 8.2.5 7-Mode

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.180+|foundation .4+|Capability|Active|Implemented||
|Licensed|Implemented||
|Type|Gap||
|Used|Implemented||
.15+|Disk|Capacity (GB)|Implemented||use capacity
|Disk Id|Implemented||Uniquely identifies this disk in the array
|Group|Implemented||
|Location|Gap||Where this disk is physically located in the array
|Model|Implemented||
|Name|Implemented||
|Role|Implemented||
|Role Enum|Implemented||enum for disk role
|Serial Number|Implemented||
|Speed|Implemented||Speed of disk (RPM)
|Status|Implemented||
|Status Enum|Implemented||enum for disk status
|Type|Gap||
|Type Enum|Implemented||enum for disk type
|Vendor|Implemented||
.8+|File Share|Is InternalVolume|Implemented||whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Oplocks Enabled|Implemented||whether opportunistic locks are enabled
on the FileShare
|Is Shared|Implemented||whether this fileShare has any shares associated
with it
|Name|Implemented||
|Path|Implemented||path of the fileShare
|Qtree Id|Implemented||unique id of the qtree
|Security Type|Implemented||
|Status|Implemented||
.4+|ISCSI Network Portal|IP|Implemented||
|Listening Port|Implemented||
|Nic|Implemented||
|OID|Implemented||
.3+|ISCSI Network Portal Group|OID|Implemented||
|Portal Group Name|Implemented||
|Portal Group Tag|Implemented||
.4+|ISCSI Node|Host Aliases|Implemented||
|Node Name|Implemented||
|OID|Implemented||
|Type|Gap||
.2+|ISCSI Node Map|OID|Implemented||
|Portal Group OID|Implemented||
.9+|ISCSI Session|Initiator Ips|Implemented||
|Initiator OID|Implemented||
|Initiator Session Id|Implemented||
|Max Connections|Implemented||
|Number Of Connections|Implemented||
|OID|Implemented||
|Portal Group OID|Implemented||
|Security|Implemented||
|Target Session Id|Implemented||
.6+|Info|Api Name|Implemented||
|Api Version|Implemented||
|DataSource Name|Implemented||Info
|Date|Implemented||
|Originator ID|Implemented||
|Originator Key|Implemented||
.27+|Internal Volume|Clone Sourc|Implemented||name of the source internal volume
|Compression Enabled|Implemented||Is compression enabled on the storage pool
|Compression Savings|Implemented||ratio of compression savings in percentage
|Data Allocated Capacity|Gap||capacity allocated for data
|Data Used Capacity|Implemented||
|Dedupe Enabled|Implemented||Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented||ratio of dedupe savings in percentage
|Internal Volume Id|Implemented||
|Last Known Access Time|Implemented||Last know access to the volume
|Last Snapshot Time|Implemented||time of last snapshot
|Name|Implemented||
|Protection Type|Implemented||
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to raw capacity
|Snapshot Allocated Capacity|Gap||Allocated capacity of snapshots in MB
|Snapshot Count|Implemented||Number of snapshots on the internal volumes
|Snapshot Used Capacity|Implemented||
|Space Guarantee|Implemented||Space  Guatantee policy (file, volume or none)
|Status|Implemented||
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Clone Saved Capacity in MB|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Total Used Capacity (MB)|Implemented||place holder for the used capacity as read from the device
|Type|Gap||
|Virtual Storage|Implemented||Owning virtual storage (vfiler)
.3+|Storage Synchronization|Source Internal Volume|Implemented||
|Target Internal Volume|Implemented||
|Technology|Implemented||technology which causes storage efficiency
changed
.9+|QTree|Name|Implemented||
|Oplocks|Implemented||Indicates whether opportunistic locks are enabled on
the Qtree
|Qtree Id|Implemented||unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented||Maximum amount of disk space,
allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented||Maximum amount of disk space,
allowed for the quota target
|Quota UsedCapacity|Implemented||Space in MB currently used
|Security Style|Implemented||Security style of the directory: unix, ntfs,
or mixed
|Status|Implemented||
|Type|Gap||
.3+|Qtree Storage Synchronization|Source Qtree Id|Implemented||
|Target Qtree Id|Implemented||
|Technology|Implemented||technology which causes storage efficiency
changed
.12+|Quota|Hard Capacity Limit (MB)|Implemented||max amount of disk space,
allowed for the quota target (Hard limit)
|Hard File Limit|Implemented||max number of files allowed for the quota
target
|Internal Volume Id|Implemented||
|Qtree Id|Implemented||unique id of the qtree
|Quota Id|Implemented||unique id of the quota
|Soft Capacity Limit (MB)|Implemented||Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented||Max number of files allowed for the quota
target
|Threshold (MB)|Implemented||Disk space threshold, for the quota target
|Type|Gap||
|Used Capacity|Implemented||
|Used Files|Implemented||Number of files currently used
|User/Group Target|Implemented||user/group target this quota refers to
.4+|Share|Description|Implemented||
|IP Interfaces|Implemented||comma separated list of IP addresses on which
this share is exposed
|Name|Implemented||
|Protocol|Implemented||enum for share protocol
.2+|Share Initiator|Initiator|Implemented||
|Permission|Implemented||Permissions for this particular share
.15+|Storage|Cpu Count|Implemented||Cpu Count of the storage
|Display IP|Implemented||
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of
all disks that are failed)
```

```
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et
al
|IP|Implemented||
|Manage URL|Implemented||
|Manufacturer|Implemented||
|Memory|Implemented||
|Microcode Version|Implemented||
|Model|Implemented||
|Name|Implemented||
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Serial Number|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|Virtual|Implemented||Is this a storage virtualization device?
.10+|Storage Node|Cache Size|Implemented||device cache size in MB
|Memory Size|Gap||device memory in MB
|Model|Implemented||
|Name|Implemented||
|Processors Count|Implemented||device CPU
|Partner Node UUID|Implemented||HA pair's UUID
|Serial Number|Implemented||
|UUID|Implemented||
|Version|Implemented||software version
|ManagementIp Addresses|Implemented||
.18+|Storage Pool|Data Allocated Capacity|Gap||capacity allocated for data
|Data Used Capacity|Implemented||
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
|Redundancy|Implemented||Redundancy level
|Snapshot Allocated Capacity|Gap||Allocated capacity of snapshots in MB
|Snapshot Used Capacity|Implemented||
|Status|Implemented||
|Storage Pool Id|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented||
|Total Used Capacity|Implemented||Total capacity in MB
|Type|Gap||
|Uses FlashPools|Implemented||indicate if this storagepool uses Flash
Pools(NetApp specific)
|Virtual|Implemented||Is this a storage virtualization device?
.15+|Volume|Capacity|Implemented||Snapshot Used capacity in MB
|DiskGroup|Implemented||Disk Group Type
|Disk Size|Implemented||comma seperated list of disk sizes (GB)
|Disk Speed|Implemented||comma seperated list of disk speeds (rpm)
|Disk Type|Not Available||
|Junction Path|Implemented||
|Last Known Access Time|Implemented||Last know access to the volume
|Name|Implemented||
|Protection Type|Implemented||
|Qtree Id|Implemented||unique id of the qtree
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Storage Pool Id|Implemented||
|Thin Provisioned|Implemented||
|Type|Gap||
|Used Capacity|Implemented||
.3+|Volume Map|LUN|Implemented||Name of the backend lun
|Protocol Controller|Implemented||
|Type|Gap||
.4+|Volume Mask|Initiator|Implemented||
|Protocol Controller|Implemented||
|Storage Port|Implemented||
|Type|Gap||
.94+|performance .9+|Disk|IOps Read|Implemented||Number of read IOps on
the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Read Utilization|Implemented||
|Utilization Total|Implemented||
|Utilization Write|Implemented||
.13+|Internal Volume|IO Density Read|Implemented||
|IO Density Total|Implemented||
|Write IO Density|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.5+|Qtree|Quota Hard Limit|Implemented||Capacity quota hard limit
|Quota Soft Limit|Implemented||Capacity Quota soft Limit
|Used Capacity|Implemented||
|Total File Count|Implemented||
|IOPs Total|Implemented||
.17+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IO Density Read|Implemented||
|IO Density Total|Implemented||
|Write IO Density|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.12+|Storage Node|Cache Hit Ratio Total|Implemented||
|Total Disk Read Replaced|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.20+|StoragePool Disk|Capacity Provisioned|Implemented||
|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
|Capacity Used Ratio|Implemented||
|Total Data Capacity|Implemented||
|Data Used Capacity|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Snapshot Reserved Capacity|Implemented||
|Snapshot Used Capacity|Implemented||
|Snapshot Used Capacity Ratio|Implemented|| Reported as a time series
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Read Utilization|Implemented||
|Utilization Total|Implemented||
|Utilization Write|Implemented||
.18+|Volume|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|IO Density Read|Implemented||
|IO Density Total|Implemented||
|Write IO Density|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Partial Blocked Ratio|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Write Pending|Implemented||total write pending

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)
```

```
|NetApp 7 Mode ZAPI
|ZAPI
|ZAPI
|
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== NetApp Cloud Volumes Service
:description: Support Matrix Asciidoc for NetApp Cloud Volumes Service

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|AWS Cloud Volumes
|v1

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.54+|foundation .4+|Capability|Type|Gap||
|Active|Implemented||
|Licensed|Implemented||
|Used|Implemented||
.3+|Info|DataSource Name|Implemented||Info
|Originator ID|Implemented||
|Date|Implemented||
.17+|Internal Volume|Internal Volume Id|Implemented||
|Name|Implemented||
|Storage Pool Id|Implemented||
|Type|Gap||
|Thin Provisioned|Implemented||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Dedupe Enabled|Implemented||Is dedupe enabled on the storage pool
|Snapshot Count|Implemented||Number of snapshots on the internal volumes
```

```
|Status|Implemented||
|UUID|Implemented||
|Snapshot Used Capacity|Implemented||
|Data Used Capacity|Implemented||
|Data Allocated Capacity|Gap||capacity allocated for data
|Total Used Capacity|Implemented||Total capacity in MB
|Total Used Capacity (MB)|Implemented||place holder for the used capacity
as read from the device
|Total Allocated Capacity|Implemented||
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity
.5+|QTree|Qtree Id|Implemented||unique id of the qtree
|Name|Implemented||
|Security Style|Implemented||Security style of the directory: unix, ntfs,
or mixed
|Status|Implemented||
|Type|Gap||
.11+|Storage|IP|Implemented||
|Display IP|Implemented||
|Name|Implemented||
|Manufacturer|Implemented||
|Model|Implemented||
|Family|Implemented||The storage Family could be Clariion, Symmetrix, et
al
|Microcode Version|Implemented||
|Virtual|Implemented||Is this a storage virtualization device?
|Total Raw Capacity|Implemented||Total raw capacity (sum of all disks on
the array)
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|Failed Raw Capacity|Implemented||Raw capapcity of failed disks (sum of
all disks that are failed)
.14+|Storage Pool|Storage Pool Id|Implemented||
|Name|Implemented||
|Type|Gap||
|Thin Provisioning Supported|Implemented||Whether this internal volume
supports thin provisioning for the volume layer on top of it
|Include In Dwh Capacity|Implemented||A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Virtual|Implemented||Is this a storage virtualization device?
|Raid Group|Implemented||indicates whether this storagePool is a raid
group
|Snapshot Used Capacity|Implemented||
|Data Used Capacity|Implemented||
|Data Allocated Capacity|Gap||capacity allocated for data
|Total Used Capacity|Implemented||Total capacity in MB
```

```
|Total Allocated Capacity|Implemented||
|Physical Disk  Capacity (MB)|Implemented||used as raw capacity for
storage pool
|Raw to Usable Ratio|Implemented||ratio to convert from usable capacity to
raw capacity

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Cloud Volumes Service REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Amazon FSx for NetApp ONTAP
:description: Support Matrix Asciidoc for Amazon FSx for NetApp ONTAP

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|FSx for ONTAP
|Data ONTAP

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.200+|foundation .4+|Capability|Active|Implemented|HTTPS|
|Licensed|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Used|Implemented|HTTPS|
.8+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Oplocks Enabled|Implemented|HTTPS|whether opportunistic locks are
enabled on the FileShare
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Security Type|Implemented|HTTPS|
|Status|Implemented|HTTPS|
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.4+|ISCSI Node|Host Aliases|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.2+|ISCSI Node Map|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
.6+|ISCSI Security Info|Auth Type|Implemented|HTTPS|
|Inbound Keyword|Implemented|HTTPS|
|Initiator Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Outbound Keyword|Implemented|HTTPS|
|Target Node Name|Implemented|HTTPS|
.9+|ISCSI Session|Initiator Ips|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Initiator Session Id|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Security|Implemented|HTTPS|
|Target Session Id|Implemented|HTTPS|
.6+|Info|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.36+|Internal Volume|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Internal Volume Id|Implemented|HTTPS|
|Last Known Access Time|Implemented|HTTPS|Last know access to the volume
|Name|Implemented|HTTPS|
|Protection Type|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in
MB
|Snapshot Count|Implemented|HTTPS|Number of snapshots on the internal
volumes
|Snapshot Used Capacity|Implemented|HTTPS|
|Space Guarantee|Implemented|HTTPS|Space  Guatantee policy (file, volume
or none)
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Clone Saved Capacity in MB|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Virtual Storage|Implemented|HTTPS|Owning virtual storage (vfiler)
|Comment|Gap|HTTPS|state: free text comment describing the svm
|Group Id|Implemented|HTTPS|
|Group Name|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
|Tiering Minimum Cooling Days|Implemented|HTTPS|
.3+|Storage Synchronization|Source Internal Volume|Implemented|HTTPS|
|Target Internal Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.12+|QTree|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all
objects whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 3|Implemented|HTTPS|GuidKey3 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Name|Implemented|HTTPS|
|Oplocks|Implemented|HTTPS|Indicates whether opportunistic locks are
enabled on the Qtree
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|HTTPS|Space in MB currently used
|Security Style|Implemented|HTTPS|Security style of the directory: unix,
ntfs, or mixed
|Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
.15+|Quota|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all
objects whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 3|Implemented|HTTPS|GuidKey3 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Hard Capacity Limit (MB)|Implemented|HTTPS|max amount of disk space,
allowed for the quota target (Hard limit)
|Hard File Limit|Implemented|HTTPS|max number of files allowed for the
quota target
|Internal Volume Id|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota Id|Implemented|HTTPS|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented|HTTPS|Max number of files allowed for the
quota target
|Threshold (MB)|Implemented|HTTPS|Disk space threshold, for the quota
target
|Type|Gap|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Used Files|Implemented|HTTPS|Number of files currently used
|User/Group Target|Implemented|HTTPS|user/group target this quota refers
to
.4+|Share|Description|Implemented|HTTPS|
|IP Interfaces|Implemented|HTTPS|comma separated list of IP addresses on
which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
.18+|Storage|Cluster|Not Available|HTTPS|Whether this storage is a cluster
|Cpu Count|Implemented|HTTPS|Cpu Count of the storage
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|UUID|Implemented|HTTPS|
.6+|Storage Node|Cache Size|Implemented|HTTPS|device cache size in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
.23+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
```

```
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in
MB
|Snapshot Used Capacity|Implemented|HTTPS|
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Uses FlashPools|Implemented|HTTPS|indicate if this storagepool uses Flash
Pools(NetApp specific)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|UUID|Implemented|HTTPS|
.11+|Storage VirtualMachine|Allocated capacity
(MB)|Implemented|HTTPS|Allocated capacity of snapshots
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Guid Key|Implemented|HTTPS|Globally Unique Key of the storage virtual
machine
|IP Space|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Protocols|Implemented|HTTPS|csv of svm enabled protocols (fcp, iscsi,
nfs, cifs...)
|State|Implemented|HTTPS|free text describing the device state
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
.1+|VirtualMachine Internal Volume Ref|Internal Volume
Id|Implemented|HTTPS|
.1+|VirtualMachine StoragePool lRef|Storage Pool Id|Implemented|HTTPS|
.1+|VirtualMachine Volume Ref|Volume Name|Implemented|HTTPS|
.13+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup|Implemented|HTTPS|Disk Group Type
```

```
|Junction Path|Implemented|HTTPS|
|Last Known Access Time|Implemented|HTTPS|Last know access to the volume
|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|performance .0+|Qtree.1+|Storage|Failed Disks|Implemented|HTTPS|
.3+|Storage Node|Cache Hit Ratio Total|Implemented|HTTPS|
|Total Disk Read Replaced|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|NetApp ONTAP API
|HTTP/HTTPS
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===
<<top,Back to Top>>

== NetApp Clustered Data ONTAP 8.1.1+
:description: Support Matrix Asciidoc for NetApp Clustered Data ONTAP
8.1.1+

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|AFF-A150
AFF-A200
AFF-A220
AFF-A250
AFF-A300
AFF-A320
AFF-A400
AFF-A700
AFF-A700s
AFF-A800
AFF-A900
AFF-C190
AFF-C250
AFF-C400
AFF-C800
AFF8020
AFF8040
AFF8060
AFF8080
CDvM100
CDvM200
DM5000H
FAS2240-2
FAS2240-4
FAS2520
FAS2552
FAS2554
FAS2620
FAS2650
FAS2720
FAS2750
FAS3220
FAS3250
FAS3270
FAS500f
FAS6210
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FAS6220
FAS8020
FAS8040
FAS8060
FAS8080
FAS8200
FAS8300
FAS8700
FAS9000
FAS9500
FASDvM300
SIMBOX
V6240
|8.2.3P5
8.3.0
8.3.1
8.3.1P2
8.3.2
8.3.2P12
8.3.2P2
8.3.2P5
9.0.1
9.1.0
9.1.0P1
9.1.0P10
9.1.0P11
9.1.0P12
9.1.0P14
9.1.0P15
9.1.0P17
9.1.0P19
9.1.0P20
9.1.0P5
9.1.0P7
9.1.0P8
9.10.0
9.10.1
9.10.1P1
9.10.1P10
9.10.1P11
9.10.1P12
9.10.1P13
9.10.1P2
9.10.1P3
9.10.1P4
9.10.1P5
```

```
9.10.1P6
9.10.1P7
9.10.1P8
9.10.1P9
9.11.0P1
9.11.1
9.11.1P1
9.11.1P10
9.11.1P2
9.11.1P3
9.11.1P4
9.11.1P5
9.11.1P6
9.11.1P7
9.11.1P8
9.11.1P9
9.11.1X12
9.11.1X26
9.12.1
9.12.1P1
9.12.1P2
9.12.1P3
9.12.1P4
9.13.0
9.13.0P1
9.13.0P2
9.13.0P3
9.13.1
9.13.1X19
9.13.1X25
9.13.1X33
9.13.1X34
9.13.1X35
9.13.1X36
9.3.0P1
9.3.0P10
9.3.0P12
9.3.0P13
9.3.0P14
9.3.0P15
9.3.0P18
9.3.0P19
9.3.0P2
9.3.0P20
9.3.0P21
9.3.0P4
```

```
9.3.0P6
9.3.0P7
9.3.0P8
9.3.0P9
9.4.0
9.4.0P2
9.4.0P3
9.4.0P4
9.4.0P6
9.5.0
9.5.0P1
9.5.0P10
9.5.0P12
9.5.0P13
9.5.0P14
9.5.0P15
9.5.0P16
9.5.0P17
9.5.0P18
9.5.0P19
9.5.0P2
9.5.0P3
9.5.0P4
9.5.0P5
9.5.0P6
9.5.0P7
9.5.0P8
9.5.0P9
9.6.0
9.6.0P11
9.6.0P14
9.6.0P15
9.6.0P18
9.6.0P2
9.6.0P3
9.6.0P4
9.6.0P5
9.6.0X11
9.7.0
9.7.0P1
9.7.0P10
9.7.0P11
9.7.0P12
9.7.0P13
9.7.0P14
9.7.0P15
```

```
9.7.0P16
9.7.0P17
9.7.0P18
9.7.0P19
9.7.0P2
9.7.0P20
9.7.0P21
9.7.0P22
9.7.0P3
9.7.0P4
9.7.0P5
9.7.0P6
9.7.0P7
9.7.0P8
9.7.0P9
9.7.0X17
9.8.0
9.8.0P1
9.8.0P10
9.8.0P11
9.8.0P11D2
9.8.0P12
9.8.0P13
9.8.0P14
9.8.0P15
9.8.0P16
9.8.0P17
9.8.0P18
9.8.0P19
9.8.0P2
9.8.0P3
9.8.0P4
9.8.0P5
9.8.0P6
9.8.0P7
9.8.0P8
9.8.0P9
9.9.0
9.9.1
9.9.1P1
9.9.1P10
9.9.1P11
9.9.1P12
9.9.1P13
9.9.1P14
9.9.1P15
```

```
9.9.1P16
9.9.1P2
9.9.1P3
9.9.1P4
9.9.1P5
9.9.1P6
9.9.1P7
9.9.1P8
9.9.1P9

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.258+|foundation .4+|Capability|Active|Implemented|HTTPS|
|Licensed|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Used|Implemented|HTTPS|
.15+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.5+|Disk Group|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup Id|Implemented|HTTPS|unique id of the disk group
|Name|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.8+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Oplocks Enabled|Implemented|HTTPS|whether opportunistic locks are
enabled on the FileShare
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
```

```
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Security Type|Implemented|HTTPS|
|Status|Implemented|HTTPS|
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.4+|ISCSI Node|Host Aliases|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.2+|ISCSI Node Map|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
.6+|ISCSI Security Info|Auth Type|Implemented|HTTPS|
|Inbound Keyword|Implemented|HTTPS|
|Initiator Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Outbound Keyword|Implemented|HTTPS|
|Target Node Name|Implemented|HTTPS|
.9+|ISCSI Session|Initiator Ips|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Initiator Session Id|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Security|Implemented|HTTPS|
|Target Session Id|Implemented|HTTPS|
.6+|Info|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.43+|Internal Volume|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|FlashPool Eligibility|Implemented|HTTPS|Whether the internal volume can participate in hybrid caching
|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all objects whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose GUID key has not changed since OCI version 7.3.5.
|Internal Volume Id|Implemented|HTTPS|
|Last Known Access Time|Implemented|HTTPS|Last know access to the volume
|Name|Implemented|HTTPS|
|Other Allocated Capacity|Gap|HTTPS|Capacity allocated for other (not data and not snapshot)
|Protection Type|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable capacity to raw capacity
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in MB
|Snapshot Count|Implemented|HTTPS|Number of snapshots on the internal volumes
|Snapshot Used Capacity|Implemented|HTTPS|
|Space Guarantee|Implemented|HTTPS|Space  Guatantee policy (file, volume or none)
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Clone Saved Capacity in MB|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used capacity as read from the device
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Virtual Storage|Implemented|HTTPS|Owning virtual storage (vfiler)
|Adaptive Qos Policy|Implemented|HTTPS|
|Comment|Gap|HTTPS|state: free text comment describing the svm
|Group Id|Implemented|HTTPS|
|Group Name|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
|Qos Limit IOPS|Implemented|HTTPS|
|Qos Limit MBPS|Implemented|HTTPS|
|Qos Limit Raw|Implemented|HTTPS|
|QoS - Policy|Implemented|HTTPS|
|Tiering Minimum Cooling Days|Implemented|HTTPS|
.3+|Storage Synchronization|Source Internal Volume|Implemented|HTTPS|
|Target Internal Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.12+|QTree|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all
objects whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 3|Implemented|HTTPS|GuidKey3 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Name|Implemented|HTTPS|
|Oplocks|Implemented|HTTPS|Indicates whether opportunistic locks are
enabled on the Qtree
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota HardCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota SoftCapacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk
space, allowed for the quota target
|Quota UsedCapacity|Implemented|HTTPS|Space in MB currently used
|Security Style|Implemented|HTTPS|Security style of the directory: unix,
ntfs, or mixed
|Status|Implemented|HTTPS|
|Type|Gap|HTTPS|
.15+|Quota|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all
objects whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 3|Implemented|HTTPS|GuidKey3 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Hard Capacity Limit (MB)|Implemented|HTTPS|max amount of disk space,
allowed for the quota target (Hard limit)
|Hard File Limit|Implemented|HTTPS|max number of files allowed for the
quota target
|Internal Volume Id|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Quota Id|Implemented|HTTPS|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|HTTPS|Maximum amount of disk space,
allowed for the quota target
|Soft File Limit|Implemented|HTTPS|Max number of files allowed for the
quota target
|Threshold (MB)|Implemented|HTTPS|Disk space threshold, for the quota
target
|Type|Gap|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Used Files|Implemented|HTTPS|Number of files currently used
|User/Group Target|Implemented|HTTPS|user/group target this quota refers
to
.4+|Share|Description|Implemented|HTTPS|
|IP Interfaces|Implemented|HTTPS|comma separated list of IP addresses on
which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.2+|Share Initiator|Initiator|Implemented|HTTPS|
|Permission|Implemented|HTTPS|Permissions for this particular share
.18+|Storage|Cluster|Not Available|HTTPS|Whether this storage is a cluster
|Cpu Count|Implemented|HTTPS|Cpu Count of the storage
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|UUID|Implemented|HTTPS|
.12+|Storage Node|Cache Size|Implemented|HTTPS|device cache size in MB
|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|Partner Node UUID|Implemented|HTTPS|HA pair's UUID
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|Up Time|Implemented|HTTPS|time in milliseconds
|Version|Implemented|HTTPS|software version
|ManagementIp Addresses|Implemented|HTTPS|
.38+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Reserved Capacity|Implemented|HTTPS|Reserved Capacity in MB
|Snapshot Allocated Capacity|Gap|HTTPS|Allocated capacity of snapshots in
MB
|Snapshot Used Capacity|Implemented|HTTPS|
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Uses FlashPools|Implemented|HTTPS|indicate if this storagepool uses Flash
Pools(NetApp specific)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|CompactionSavings Enabled|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
|License Used Percent|Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
||Implemented|HTTPS|
|UUID|Implemented|HTTPS|
.13+|Storage VirtualMachine|Allocated capacity
(MB)|Implemented|HTTPS|Allocated capacity of snapshots
|Comment|Implemented|HTTPS|
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Guid Key|Implemented|HTTPS|Globally Unique Key of the storage virtual
machine
|IP Space|Implemented|HTTPS|
|Internal Volume Limit|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Protocols|Implemented|HTTPS|csv of svm enabled protocols (fcp, iscsi,
nfs, cifs...)
|State|Implemented|HTTPS|free text describing the device state
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
.1+|VirtualMachine Internal Volume Ref|Internal Volume
Id|Implemented|HTTPS|
.1+|VirtualMachine StoragePool lRef|Storage Pool Id|Implemented|HTTPS|
.1+|VirtualMachine Volume Ref|Volume Name|Implemented|HTTPS|
.21+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DiskGroup|Implemented|HTTPS|Disk Group Type
|Disk Size|Implemented|HTTPS|comma seperated list of disk sizes (GB)
|Disk Speed|Implemented|HTTPS|comma seperated list of disk speeds (rpm)
|Disk Type|Not Available|HTTPS|
|Junction Path|Implemented|HTTPS|
|Last Known Access Time|Implemented|HTTPS|Last know access to the volume
|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Encrypted|Implemented|HTTPS|
|Qos Limit IOPS|Implemented|HTTPS|
|Qos Limit MBPS|Implemented|HTTPS|
|Qos Limit Raw|Implemented|HTTPS|
|QoS - Policy|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.142+|performance .9+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Read Utilization|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
|Utilization Write|Implemented|HTTPS|
.31+|Internal Volume|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Clone Saved Capacity Total|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|Compression Savings Space|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|deduplicationSavingsPercent.total|Implemented|HTTPS|
|Deduplication Savings Space|Implemented|HTTPS|
|File System Capacity Logical Used|Implemented|HTTPS|
|File System Capacity Physical Available|Implemented|HTTPS|
|File System Capacity Physical Used|Implemented|HTTPS|
|IO Density Read|Implemented|HTTPS|
|IO Density Total|Implemented|HTTPS|
|Write IO Density|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Other Total Capacity|Implemented|HTTPS|
|QOS Wait|Implemented|HTTPS|Total qos wait time
|Snapshot Reserved Capacity|Implemented|HTTPS|
|Snapshot Used Capacity|Implemented|HTTPS|
|Snapshot Used Capacity Ratio|Implemented|HTTPS| Reported as a time series
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.5+|Qtree|Quota Hard Limit|Implemented|HTTPS|Capacity quota hard limit
|Quota Soft Limit|Implemented|HTTPS|Capacity Quota soft Limit
|Used Capacity|Implemented|HTTPS|
|Total File Count|Implemented|HTTPS|
|IOPs Total|Implemented|HTTPS|
.18+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
|Failed Disks|Implemented|HTTPS|
|IO Density Read|Implemented|HTTPS|
|IO Density Total|Implemented|HTTPS|
|Write IO Density|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.16+|Storage Node|Cache Hit Ratio Total|Implemented|HTTPS|
|Total Disk Read Replaced|Implemented|HTTPS|
|Failed Disks|Implemented|HTTPS|
|Failed Fans|Implemented|HTTPS|
|Failed Power Units|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Optimal Utilization|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.32+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Reserved Capacity|Implemented|HTTPS|Fractional reserved (included in data
allocated capacity)
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|compactionSavingsPercent.total|Implemented|HTTPS|
|Total Compaction Space|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|Compression Savings Space|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|deduplicationSavingsPercent.total|Implemented|HTTPS|
|Deduplication Savings Space|Implemented|HTTPS|
|Failed Disks|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Object Store Space Physical Space Used|Implemented|HTTPS|
|Object Store Space Referenced Space|Implemented|HTTPS|
|Object Store Space SIS Space Saved|Implemented|HTTPS|
|Object Store Space Used|Implemented|HTTPS|
|Snapshot Reserved Capacity|Implemented|HTTPS|
|Snapshot Used Capacity|Implemented|HTTPS|
|Snapshot Used Capacity Ratio|Implemented|HTTPS| Reported as a time series
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Read Utilization|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
|Utilization Write|Implemented|HTTPS|
.14+|Virtual Machine|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|IO Density Read|Implemented|HTTPS|
|IO Density Total|Implemented|HTTPS|
|Write IO Density|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.17+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|IO Density Read|Implemented|HTTPS|
|IO Density Total|Implemented|HTTPS|
|Write IO Density|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Partial Blocked Ratio|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|NetApp ONTAP API
|HTTP/HTTPS
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== NetApp SolidFire 8.1+
:description: Support Matrix Asciidoc for NetApp SolidFire 8.1+
Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

| H410S-2
 H610S-2
 H610S-4
 SF19210
 SF2405
 SF38410
 SF4805
 SF9605
 SF9608
FCN001
H300S
H410S-0
H410S-1
H410S-2
H500S
H610S-1
H610S-2
H610S-4
H610S2
SF19210
SF38410
SF4805
SF9605
|11.1.0.72
11.5.0.63
11.7.0.76
11.8.0.23
12.0.0.333
12.2.0.777
12.3.0.958
12.3.1.103
12.3.1.165
12.3.2.3
12.5.0.897
12.7.0.380

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

```

```
.117+|foundation .18+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Group|Implemented|HTTPS|
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Potential Transfer Rate|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Seek Time|Implemented|HTTPS|
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.4+|ISCSI Node|Host Aliases|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.2+|ISCSI Node Map|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
.7+|ISCSI Session|Initiator Ips|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Security|Implemented|HTTPS|
.4+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.15+|Storage|Cpu Count|Implemented|HTTPS|Cpu Count of the storage
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
```

```
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.8+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|Serial Number|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
|ManagementIp Addresses|Implemented|HTTPS|
.22+|Storage Pool|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Data Allocated Capacity|Gap|HTTPS|capacity allocated for data
|Data Used Capacity|Implemented|HTTPS|
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTPS|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Other Allocated Capacity|Gap|HTTPS|Capacity allocated for other (not data
and not snapshot)
|Other UsedCapacity (MB)|Implemented|HTTPS|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
```

```
|Status|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Encrypted|Implemented|HTTPS|
.21+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Junction Path|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Replica Source|Implemented|HTTPS|
|Replica Target|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Account Identifier|Implemented|HTTPS|
|Account Name|Implemented|HTTPS|
|Compression Enabled|Implemented|HTTPS|
|Encrypted|Implemented|HTTPS|
|Qos Burst IOPS|Implemented|HTTPS|
|Qos Limit IOPS|Implemented|HTTPS|
|qos Min IOPS|Implemented|HTTPS|
|QoS - Policy|Implemented|HTTPS|
.5+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Masking Required|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.62+|performance .6+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.16+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Partial Blocked Ratio|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.10+|Storage Node|IOps Read|Implemented|HTTPS|Number of read IOps on the
disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.14+|StoragePool Disk|Capacity Provisioned|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Over Commit Capacity Ratio|Implemented|HTTPS|Reported as a time series
|Capacity Used Ratio|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|Compression Savings Space|Implemented|HTTPS|
|Total Data Capacity|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|deduplicationSavingsPercent.total|Implemented|HTTPS|
|Deduplication Savings Space|Implemented|HTTPS|
|Other Total Capacity|Implemented|HTTPS|
|Other Used Capacity|Implemented|HTTPS|
.16+|Volume|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Total Compression Savings|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Partial Blocked Ratio|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|SolidFire REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== NetApp StorageGRID (HTTPS)
:description: Support Matrix Asciidoc for NetApp StorageGRID (HTTPS)

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Models <.<|Firmware versions

|3.0
3.2
3.3
3.4
3.5
|Webscale
|11.2.0
11.4.0
11.4.0.3
11.4.0.4
11.5.0.1
11.5.0.11
11.5.0.2
11.5.0.3
11.5.0.6
11.5.0.7
11.5.0.8
11.5.0.9
11.6.0
11.6.0.1
11.6.0.10
11.6.0.2
11.6.0.4
11.6.0.5
11.6.0.7
11.6.0.8
11.6.0.9
11.7.0

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.60+|foundation .7+|Info|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
|Version|Implemented|HTTPS|software version
.13+|Internal Volume|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on
the storage pool
```

```
|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
.5+|QTree|GuidKey 1|Implemented|HTTPS|GuidKey1 is implicit for all objects
whose GUID key has not changed since OCI version 7.3.5.
|GuidKey 2|Implemented|HTTPS|GuidKey2 is implicit for all objects whose
GUID key has not changed since OCI version 7.3.5.
|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.13+|Storage|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.11+|Storage Node|Cache Size|Implemented|HTTPS|device cache size in MB
|Memory Size|Gap|HTTPS|device memory in MB
|Name|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
|ManagementIp Addresses|Implemented|HTTPS|
|Node Capacity Utilization Allowed Meta Data in MB|Implemented|HTTPS|
|Node Capacity Utilization Total in MB|Implemented|HTTPS|
|Node Capacity Utilization Usable in MB|Implemented|HTTPS|
|Node Capacity Utilization Used in MB|Implemented|HTTPS|
|Node Capacity Utilization Used Meta Data in MB|Implemented|HTTPS|
|Site Name|Implemented|HTTPS|
.11+|Storage Pool|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ
to cotnrol which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.22+|performance .4+|Internal Volume|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Total Objects|Implemented||
.0+|Qtree.4+|Storage|Failed Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|Raw Capacity|Implemented||
.8+|Storage Node|Node Capacity Utilization Allowed Meta Data|Implemented||
|Node Capacity Utilization Total|Implemented||
|Node Capacity Utilization Usable|Implemented||
|Node Capacity Utilization Used|Implemented||
|Node Capacity Utilization Used Meta Data|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.6+|StoragePool Disk|Capacity Provisioned|Implemented||
|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
|Capacity Used Ratio|Implemented||
|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|StorageGrid REST API
|HTTPS
|HTTPS
|443
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== Nutanix Storage (REST)
:description: Support Matrix Asciidoc for Nutanix Storage (REST)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

| HPE DL360-8 G10
 NX-3060-G6
 NX-3170-G6
 NX-8035-G6
 NX-8150-G7
HPE DL360-8 G10
HPE DL380-12 G10
NX-3060-G5
NX-3170-G7
NX-5155-G6
NX-8035-G6
NX-8035-G7
NX-8150-G7
NX-8150-G8
|6.5.1.6
```

```
6.5.2
6.5.2.5
6.5.2.6
6.5.2.7
6.5.3
6.5.3.1

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.121+|foundation .14+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Serial Number|Implemented|HTTPS|
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Vendor|Implemented|HTTPS|
.5+|File Share|Is InternalVolume|Implemented|HTTPS|whether the file share
represents an internal volume (netapp volume) or is it a qtree/folder
within the internal volume
|Is Shared|Implemented|HTTPS|whether this fileShare has any shares
associated with it
|Name|Implemented|HTTPS|
|Path|Implemented|HTTPS|path of the fileShare
|Qtree Id|Implemented|HTTPS|unique id of the qtree
.4+|ISCSI Network Portal|IP|Implemented|HTTPS|
|Listening Port|Implemented|HTTPS|
|Nic|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTPS|
|Portal Group Name|Implemented|HTTPS|
|Portal Group Tag|Implemented|HTTPS|
.3+|ISCSI Node|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.2+|ISCSI Node Map|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
.7+|ISCSI Session|Initiator Ips|Implemented|HTTPS|
|Initiator OID|Implemented|HTTPS|
|Max Connections|Implemented|HTTPS|
|Number Of Connections|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Portal Group OID|Implemented|HTTPS|
|Security|Implemented|HTTPS|
.5+|Info|Api Name|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.14+|Internal Volume|Compression Enabled|Implemented|HTTPS|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTPS|ratio of compression savings in
percentage
|Dedupe Enabled|Implemented|HTTPS|Is dedupe enabled on the storage pool
|Internal Volume Id|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTPS|place holder for the used
capacity as read from the device
|Type|Gap|HTTPS|
|UUID|Implemented|HTTPS|
.3+|Storage Synchronization|Source Internal Volume|Implemented|HTTPS|
|Target Internal Volume|Implemented|HTTPS|
|Technology|Implemented|HTTPS|technology which causes storage efficiency
changed
.3+|QTree|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Type|Gap|HTTPS|
.3+|Share|IP Interfaces|Implemented|HTTPS|comma separated list of IP
addresses on which this share is exposed
|Name|Implemented|HTTPS|
|Protocol|Implemented|HTTPS|enum for share protocol
.1+|Share Initiator|Initiator|Implemented|HTTPS|
.15+|Storage|Cluster|Not Available|HTTPS|Whether this storage is a cluster
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Serial Number|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|SupportActive Active|Implemented|HTTPS|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.7+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Model|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|Serial Number|Implemented|HTTPS|
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
.15+|Storage Pool|Auto Tiering|Implemented|HTTPS|indicates if this
storagepool is participating in auto tiering with other pools
|Data Used Capacity|Implemented|HTTPS|
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTPS|
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid
group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTPS|Redundancy level
|Reserved Capacity|Implemented|HTTPS|Reserved Capacity in MB
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
```

```
.9+|Volume|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|Junction Path|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|Qtree Id|Implemented|HTTPS|unique id of the qtree
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Redundancy|Implemented|HTTPS|Redundancy level
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioned|Implemented|HTTPS|
|UUID|Implemented|HTTPS|
.4+|Volume Map|LUN|Implemented|HTTPS|Name of the backend lun
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Volume Mask|Initiator|Implemented|HTTPS|
|Protocol Controller|Implemented|HTTPS|
|Storage Port|Implemented|HTTPS|
|Type|Gap|HTTPS|
.54+|performance .6+|Disk|IOps Read|Implemented|HTTPS|Number of read IOps
on the disk
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|IOPs Total|Implemented|HTTPS|
.10+|Internal Volume|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.0+|Qtree.14+|Storage|Failed Raw Capacity|Implemented|HTTPS|
|Raw Capacity|Implemented|HTTPS|
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|StoragePools Capacity|Implemented|HTTPS|
|IOPs other|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.9+|Storage Node|Latency Total|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|Latency Read|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|IOPs Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
.6+|StoragePool Disk|IOps Read|Implemented|HTTPS|Number of read IOps on
the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
.9+|Volume|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Latency Read|Implemented|HTTPS|
|Latency Total|Implemented|HTTPS|
|Latency Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Nutanix REST API
```

```
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== OpenStack (REST API / SSH)
:description: Support Matrix Asciidoc for OpenStack (REST API / SSH)


|===



|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.76+|foundation .7+|Data Store|Capacity|Implemented|HTTPS|Snapshot Used
capacity in MB
|MOID|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
.3+|NasShare DataStore|DataStore OID|Implemented|HTTPS|
|Nas Share OID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.4+|NasShare Host|Nas Share OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Read Only|Implemented|HTTPS|
.6+|LUN|Disk Name|Implemented|HTTPS|
|DataStore OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|Number|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|TID|Implemented|HTTPS|
.6+|NAS Share|Capacity|Implemented|HTTPS|Allocated capacity in MB
|Filer Ip|Implemented|HTTPS|
|Filer Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Share Path|Implemented|HTTPS| For a HvNasShare to be matched to a Share
|Type|Gap|HTTPS|
.6+|Path|Active|Implemented|HTTPS|
|Lun OID|Implemented|HTTPS|
|Host Port WWPN|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Storage Port WWPN|Implemented|HTTPS|
|Type|Gap|HTTPS|
.6+|Server|Cluster|Implemented|HTTPS|Cluster name
|DataCenter Name|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Virtual Center Ip|Implemented|HTTPS|
.7+|Virtual Disk|Capacity|Implemented|HTTPS|Snapshot Used capacity in MB
|DataStore OID|Implemented|HTTPS|
|Lun OID|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
|Used Capacity|Implemented|HTTPS|
.13+|VirtualMachine|Guest State|Implemented|HTTPS|
|DataStore OID|Implemented|HTTPS|
|Host OID|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|MOID|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Power State|Implemented|HTTPS|
|State Change Time|Implemented|HTTPS|
|Processors|Implemented|HTTPS|
|Provisioned Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
.3+|VirtualMachine Disk|OID|Implemented|HTTPS|
|VirtualDisk OID|Implemented|HTTPS|
|VirtualMachine OID|Implemented|HTTPS|
.7+|Host|Host Cpu Count|Implemented|HTTPS|
|Host Domain|Implemented|HTTPS|
|Host Installed Memory|Implemented|HTTPS|
|Host OS|Implemented|HTTPS|
|IPs|Implemented|HTTPS|
|Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
.4+|ISCSI Node|Host Aliases|Implemented|HTTPS|
|Node Name|Implemented|HTTPS|
|OID|Implemented|HTTPS|
|Type|Gap|HTTPS|
.4+|Info|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.10+|performance .5+|Data Store|Total Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Capacity Provisioned|Implemented||
|Used Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
.2+|Host|Total CPU Utilization|Implemented||
|Total Memory Utilization|Implemented||
.3+|Virtual Disk|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|OpenStack REST API
|HTTPS
|HTTPS
|443
|
|true
|false
|true
|true

|OpenStack SSH
|SSH
|SSH
|22
```

```
|
|true
|false
|true
|true

|===

<<top,Back to Top>>

== Oracle ZFS (HTTPS)
:description: Support Matrix Asciidoc for Oracle ZFS (HTTPS)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|Sun ZFS Storage 7330
Sun ZFS Storage 7335
Sun ZFS Storage 7350
Sun ZFS Storage 7370
Sun ZFS Storage 7420
Sun ZFS Storage 7430
Sun ZFS Storage 7450
|1-1.1
1-1.2
1-1.3
1-1.34
1-1.4
2013.06.05.6.12
2013.06.05.6.15
2013.06.05.7.21
2013.06.05.7.24
2013.06.05.7.25
2013.06.05.7.26
2013.06.05.8.0
2013.06.05.8.26
2013.06.05.8.29
2013.06.05.8.35
2013.06.05.8.37
2013.06.05.8.47
2013.06.05.8.50
2013.06.05.8.53
2013.06.05.8.6
2013.06.05.8.7
```

```
|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.114+|foundation .14+|Disk|Capacity (GB)|Implemented|HTTP/S|use capacity
|Disk Id|Implemented|HTTP/S|Uniquely identifies this disk in the array
|Location|Gap|HTTP/S|Where this disk is physically located in the array
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Role|Implemented|HTTP/S|
|Role Enum|Implemented|HTTP/S|enum for disk role
|Serial Number|Implemented|HTTP/S|
|Speed|Implemented|HTTP/S|Speed of disk (RPM)
|Status|Implemented|HTTP/S|
|Status Enum|Implemented|HTTP/S|enum for disk status
|Type|Gap|HTTP/S|
|Type Enum|Implemented|HTTP/S|enum for disk type
|Vendor|Implemented|HTTP/S|
.4+|Info|DataSource Name|Implemented|HTTP/S|Info
|Date|Implemented|HTTP/S|
|Originator ID|Implemented|HTTP/S|
|Originator Key|Implemented|HTTP/S|
.18+|Internal Volume|Compression Enabled|Implemented|HTTP/S|Is compression
enabled on the storage pool
|Compression Savings|Implemented|HTTP/S|ratio of compression savings in
percentage
|Data Used Capacity|Implemented|HTTP/S|
|Dedupe Enabled|Implemented|HTTP/S|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTP/S|ratio of dedupe savings in percentage
|Internal Volume Id|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Other UsedCapacity (MB)|Implemented|HTTP/S|Any capacity other than data
and snapshot
|Protection Type|Implemented|HTTP/S|
|Raw to Usable Ratio|Implemented|HTTP/S|ratio to convert from usable
capacity to raw capacity
|Snapshot Used Capacity|Implemented|HTTP/S|
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioned|Implemented|HTTP/S|
|Thin Provisioning Supported|Implemented|HTTP/S|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTP/S|
|Total Used Capacity|Implemented|HTTP/S|Total capacity in MB
|Total Used Capacity (MB)|Implemented|HTTP/S|place holder for the used
```

```
capacity as read from the device
|Type|Gap|HTTP/S|
.4+|QTree|Name|Implemented|HTTP/S|
|Qtree Id|Implemented|HTTP/S|unique id of the qtree
|Quota UsedCapacity|Implemented|HTTP/S|Space in MB currently used
|Type|Gap|HTTP/S|
.7+|Quota|Internal Volume Id|Implemented|HTTP/S|
|Qtree Id|Implemented|HTTP/S|unique id of the qtree
|Quota Id|Implemented|HTTP/S|unique id of the quota
|Soft Capacity Limit (MB)|Implemented|HTTP/S|Maximum amount of disk space,
allowed for the quota target
|Type|Gap|HTTP/S|
|Used Capacity|Implemented|HTTP/S|
|User/Group Target|Implemented|HTTP/S|user/group target this quota refers
to
.13+|Storage|Display IP|Implemented|HTTP/S|
|Failed Raw Capacity|Implemented|HTTP/S|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTP/S|The storage Family could be Clariion,
Symmetrix, et al
|IP|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Microcode Version|Implemented|HTTP/S|
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Serial Number|Implemented|HTTP/S|
|Spare Raw Capacity|Implemented|HTTP/S|Raw capapcity of spare disks (sum
of all disks that are spare)
|SupportActive Active|Implemented|HTTP/S|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.8+|Storage Node|Memory Size|Gap|HTTP/S|device memory in MB
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Processors Count|Implemented|HTTP/S|device CPU
|Serial Number|Implemented|HTTP/S|
|State|Implemented|HTTP/S|free text describing the device state
|UUID|Implemented|HTTP/S|
|Version|Implemented|HTTP/S|software version
.22+|Storage Pool|Auto Tiering|Implemented|HTTP/S|indicates if this
storagepool is participating in auto tiering with other pools
|Compression Enabled|Implemented|HTTP/S|Is compression enabled on the
storage pool
|Compression Savings|Implemented|HTTP/S|ratio of compression savings in
```

```
percentage
|Data Allocated Capacity|Gap|HTTP/S|capacity allocated for data
|Data Used Capacity|Implemented|HTTP/S|
|Dedupe Enabled|Implemented|HTTP/S|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTP/S|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTP/S|A way from ACQ to cotnrol
which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTP/S|
|Other UsedCapacity (MB)|Implemented|HTTP/S|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTP/S|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTP/S|indicates whether this storagePool is a
raid group
|Raw to Usable Ratio|Implemented|HTTP/S|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTP/S|Redundancy level
|Snapshot Used Capacity|Implemented|HTTP/S|
|Status|Implemented|HTTP/S|
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioning Supported|Implemented|HTTP/S|Whether this internal
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTP/S|
|Total Used Capacity|Implemented|HTTP/S|Total capacity in MB
|Type|Gap|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.15+|Volume|Name|Implemented|HTTP/S|
|Junction Path|Implemented|HTTP/S|
|Storage Pool Id|Implemented|HTTP/S|
|Auto Tiering|Implemented|HTTP/S|indicates if this storagepool is
participating in auto tiering with other pools
|UUID|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
|Disk Type|Not Available|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
|Thin Provisioned|Implemented|HTTP/S|
|Disk Speed|Implemented|HTTP/S|comma seperated list of disk speeds (rpm)
|Disk Size|Implemented|HTTP/S|comma seperated list of disk sizes (GB)
|Capacity|Implemented|HTTP/S|Snapshot Used capacity in MB
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Used Capacity|Implemented|HTTP/S|
|Redundancy|Implemented|HTTP/S|Redundancy level
.5+|Volume Map|LUN|Implemented|HTTP/S|Name of the backend lun
|Storage Port|Implemented|HTTP/S|
|Masking Required|Implemented|HTTP/S|
|Protocol Controller|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.4+|Volume Mask|Storage Port|Implemented|HTTP/S|
|Initiator|Implemented|HTTP/S|
|Protocol Controller|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.41+|performance .1+|Internal Volume|IOPs Total|Implemented||
.2+|Qtree|Used Capacity|Implemented||
|Total File Count|Implemented||
.8+|Storage|Cache Hit Ratio Total|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.8+|Storage Node|Cache Hit Ratio Total|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
|Utilization Total|Implemented||
.10+|Storage Node Data|key|Implemented||
|Server ID|Implemented||
|Throughput Read|Implemented||
|Throughput Write|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Write|Implemented||
|IOPs Total|Implemented||
|Cache Hit Ratio Total|Implemented||
|Utilization Total|Implemented||
.12+|StoragePool Disk|IOPs Total|Implemented||
|Total Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|Total Data Capacity|Implemented||
|Capacity Provisioned|Implemented||
|Data Used Capacity|Implemented||
|Used Capacity|Implemented||
|Other Used Capacity|Implemented||
|Raw Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
|Snapshot Used Capacity|Implemented||
|Snapshot Used Capacity Ratio|Implemented|| Reported as a time series

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Oracle ZFS REST API
|HTTP/HTTPS
|HTTP/HTTPS
|215
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Pure Storage FlashArray (HTTP)
:description: Support Matrix Asciidoc for Pure Storage FlashArray (HTTP)

Models and versions supported by this data collector:
|===
<.<|Models <.<|Firmware versions

|DFSC1
FA-420
FA-450
FA-C40R3
FA-C60
FA-C60R3
FA-X10R2
FA-X10R3
FA-X20R2
FA-X20R3
FA-X50R2
```

```
FA-X50R3
FA-X70R2
FA-X70R3
FA-X90R2
FA-X90R3
FA-XL130
FA-XL170
FA-m10r2
FA-m20
FA-m20r2
FA-m50
FA-m50r2
FA-m70
FA-m70r2
FA-x70
|4.8.8
5.3.14
5.3.15
5.3.17
5.3.18
5.3.20
5.3.21
5.3.6
5.3.8
6.1.10
6.1.11
6.1.13
6.1.14
6.1.15
6.1.17
6.1.18
6.1.19
6.1.21
6.1.22
6.1.23
6.1.5
6.2.13
6.2.7
6.2.9
6.3.10
6.3.11
6.3.12
6.3.2
6.3.5
6.3.6
6.3.7
```

```
6.3.9
6.4.3
6.4.4
6.4.5

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.98+|foundation .13+|Disk|Capacity (GB)|Implemented|HTTP/S|use capacity
|Disk Id|Implemented|HTTP/S|Uniquely identifies this disk in the array
|Name|Implemented|HTTP/S|
|Potential Transfer Rate|Implemented|HTTP/S|
|Role|Implemented|HTTP/S|
|Role Enum|Implemented|HTTP/S|enum for disk role
|Seek Time|Implemented|HTTP/S|
|Speed|Implemented|HTTP/S|Speed of disk (RPM)
|Status|Implemented|HTTP/S|
|Status Enum|Implemented|HTTP/S|enum for disk status
|Type|Gap|HTTP/S|
|Type Enum|Implemented|HTTP/S|enum for disk type
|Vendor|Implemented|HTTP/S|
.4+|ISCSI Network Portal|IP|Implemented|HTTP/S|
|Listening Port|Implemented|HTTP/S|
|Nic|Implemented|HTTP/S|
|OID|Implemented|HTTP/S|
.3+|ISCSI Network Portal Group|OID|Implemented|HTTP/S|
|Portal Group Name|Implemented|HTTP/S|
|Portal Group Tag|Implemented|HTTP/S|
.3+|ISCSI Node|Node Name|Implemented|HTTP/S|
|OID|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.2+|ISCSI Node Map|OID|Implemented|HTTP/S|
|Portal Group OID|Implemented|HTTP/S|
.7+|ISCSI Session|Initiator Ips|Implemented|HTTP/S|
|Initiator OID|Implemented|HTTP/S|
|Max Connections|Implemented|HTTP/S|
|Number Of Connections|Implemented|HTTP/S|
|OID|Implemented|HTTP/S|
|Portal Group OID|Implemented|HTTP/S|
|Security|Implemented|HTTP/S|
.4+|Info|DataSource Name|Implemented|HTTP/S|Info
|Date|Implemented|HTTP/S|
|Originator ID|Implemented|HTTP/S|
|Originator Key|Implemented|HTTP/S|
.14+|Storage|Display IP|Implemented|HTTP/S|
|Failed Raw Capacity|Implemented|HTTP/S|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTP/S|The storage Family could be Clariion,
Symmetrix, et al
|IP|Implemented|HTTP/S|
|Manage URL|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Microcode Version|Implemented|HTTP/S|
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Serial Number|Implemented|HTTP/S|
|Spare Raw Capacity|Implemented|HTTP/S|Raw capapcity of spare disks (sum
of all disks that are spare)
|SupportActive Active|Implemented|HTTP/S|Specified if the storage supports
active-active configurations
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.6+|Storage Node|Memory Size|Gap|HTTP/S|device memory in MB
|Model|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|State|Implemented|HTTP/S|free text describing the device state
|UUID|Implemented|HTTP/S|
|Version|Implemented|HTTP/S|software version
.18+|Storage Pool|Data Allocated Capacity|Gap|HTTP/S|capacity allocated
for data
|Data Used Capacity|Implemented|HTTP/S|
|Dedupe Enabled|Implemented|HTTP/S|Is dedupe enabled on the storage pool
|Dedupe Savings|Implemented|HTTP/S|ratio of dedupe savings in percentage
|Include In Dwh Capacity|Implemented|HTTP/S|A way from ACQ to cotnrol
which stroage pools are interesting in DWH Capacity
|Name|Implemented|HTTP/S|
|Other UsedCapacity (MB)|Implemented|HTTP/S|Any capacity other than data
and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTP/S|used as raw capacity for
storage pool
|Raid Group|Implemented|HTTP/S|indicates whether this storagePool is a
raid group
|Raw to Usable Ratio|Implemented|HTTP/S|ratio to convert from usable
capacity to raw capacity
|Redundancy|Implemented|HTTP/S|Redundancy level
|Snapshot Used Capacity|Implemented|HTTP/S|
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioning Supported|Implemented|HTTP/S|Whether this internal
```

```
volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTP/S|
|Total Used Capacity|Implemented|HTTP/S|Total capacity in MB
|Type|Gap|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.12+|Volume|Capacity|Implemented|HTTP/S|Snapshot Used capacity in MB
|Disk Size|Implemented|HTTP/S|comma seperated list of disk sizes (GB)
|Disk Speed|Implemented|HTTP/S|comma seperated list of disk speeds (rpm)
|Disk Type|Not Available|HTTP/S|
|Name|Implemented|HTTP/S|
|Total Raw Capacity|Implemented|HTTP/S|Total raw capacity (sum of all
disks on the array)
|Redundancy|Implemented|HTTP/S|Redundancy level
|Storage Pool Id|Implemented|HTTP/S|
|Thin Provisioned|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
|Used Capacity|Implemented|HTTP/S|
|Virtual|Implemented|HTTP/S|Is this a storage virtualization device?
.4+|Volume Map|LUN|Implemented|HTTP/S|Name of the backend lun
|Protocol Controller|Implemented|HTTP/S|
|Storage Port|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.4+|Volume Mask|Initiator|Implemented|HTTP/S|
|Protocol Controller|Implemented|HTTP/S|
|Storage Port|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.4+|WWN Alias|Host Aliases|Implemented|HTTP/S|
|Object Type|Implemented|HTTP/S|
|Source|Implemented|HTTP/S|
|WWN|Implemented|HTTP/S|
.38+|performance .14+|Storage|Failed Raw Capacity|Implemented||
|Raw Capacity|Implemented||
|Spare Raw Capacity|Implemented||Raw capapcity of spare disks (sum of all
disks that are spare)
|StoragePools Capacity|Implemented||
|IOPs other|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||
.11+|StoragePool Disk|Capacity Provisioned|Implemented||
|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Over Commit Capacity Ratio|Implemented||Reported as a time series
|Capacity Used Ratio|Implemented||
|Total Data Capacity|Implemented||
|Data Used Capacity|Implemented||
|Other Used Capacity|Implemented||
|Snapshot Used Capacity|Implemented||
|Snapshot Used Capacity Ratio|Implemented|| Reported as a time series
.13+|Volume|Raw Capacity|Implemented||
|Total Capacity|Implemented||
|Used Capacity|Implemented||
|Capacity Used Ratio|Implemented||
|IOps Read|Implemented||Number of read IOps on the disk
|IOPs Total|Implemented||
|IOPs Write|Implemented||
|Latency Read|Implemented||
|Latency Total|Implemented||
|Latency Write|Implemented||
|Throughput Read|Implemented||
|Throughput Total|Implemented||Average disk total rate (read and write
across all disks) in MB/s
|Throughput Write|Implemented||

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Pure Storage REST API
|HTTP/HTTPS
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===
<<top,Back to Top>>

== Red Hat RHV (REST)
:description: Support Matrix Asciidoc for Red Hat RHV (REST)


|===



|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.74+|foundation .7+|Data Store|OID|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Capacity|Implemented|HTTP/S|Snapshot Used capacity in MB
|Used Capacity|Implemented|HTTP/S|
|Provisioned Capacity|Implemented|HTTP/S|
|Virtual Center Ip|Implemented|HTTP/S|
|MOID|Implemented|HTTP/S|
.3+|NasShare DataStore|DataStore OID|Implemented|HTTP/S|
|Nas Share OID|Implemented|HTTP/S|
|OID|Implemented|HTTP/S|
.4+|NasShare Host|Host OID|Implemented|HTTP/S|
|Nas Share OID|Implemented|HTTP/S|
|Read Only|Implemented|HTTP/S|
|OID|Implemented|HTTP/S|
.4+|LUN|OID|Implemented|HTTP/S|
|Number|Implemented|HTTP/S|
|DataStore OID|Implemented|HTTP/S|
|Host OID|Implemented|HTTP/S|
.6+|NAS Share|Filer Name|Implemented|HTTP/S|
|Filer Ip|Implemented|HTTP/S|
|Share Path|Implemented|HTTP/S| For a HvNasShare to be matched to a Share
|Capacity|Implemented|HTTP/S|Allocated capacity in MB
|Type|Gap|HTTP/S|
|OID|Implemented|HTTP/S|
.4+|Path|OID|Implemented|HTTP/S|
|Lun OID|Implemented|HTTP/S|
|Active|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.6+|Server|OID|Implemented|HTTP/S|
|Virtual Center Ip|Implemented|HTTP/S|
|Cluster|Implemented|HTTP/S|Cluster name
|DataCenter Name|Implemented|HTTP/S|
|Host OID|Implemented|HTTP/S|
|MOID|Implemented|HTTP/S|
.6+|Virtual Disk|OID|Implemented|HTTP/S|
|DataStore OID|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|Capacity|Implemented|HTTP/S|Snapshot Used capacity in MB
|Used Capacity|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.14+|VirtualMachine|OID|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|OS|Implemented|HTTP/S|
|Processors|Implemented|HTTP/S|
|Memory|Implemented|HTTP/S|
|DataStore OID|Implemented|HTTP/S|
|Power State|Implemented|HTTP/S|
|State Change Time|Implemented|HTTP/S|
|Host OID|Implemented|HTTP/S|
|IPs|Implemented|HTTP/S|
|Guest State|Implemented|HTTP/S|
|Used Capacity|Implemented|HTTP/S|
|Provisioned Capacity|Implemented|HTTP/S|
|MOID|Implemented|HTTP/S|
.3+|VirtualMachine Disk|OID|Implemented|HTTP/S|
|VirtualMachine OID|Implemented|HTTP/S|
|VirtualDisk OID|Implemented|HTTP/S|
.11+|Host|OID|Implemented|HTTP/S|
|Name|Implemented|HTTP/S|
|IPs|Implemented|HTTP/S|
|Platform Type|Implemented|HTTP/S|
|Host Installed Memory|Implemented|HTTP/S|
|Manufacturer|Implemented|HTTP/S|
|Host Model|Implemented|HTTP/S|
|Host Cpu Count|Implemented|HTTP/S|
|Host Cpu Speed|Implemented|HTTP/S|
|NIC count|Implemented|HTTP/S|
|NIC speed|Implemented|HTTP/S|
.3+|ISCSI Node|OID|Implemented|HTTP/S|
|Node Name|Implemented|HTTP/S|
|Type|Gap|HTTP/S|
.3+|Info|DataSource Name|Implemented|HTTP/S|Info
|Originator ID|Implemented|HTTP/S|
|Date|Implemented|HTTP/S|
|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Red Hat RHEV REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== Rubrik Storage
:description: Support Matrix Asciidoc for Rubrik Storage

Models and versions supported by this data collector:
|===
<.<|API versions <.<|Firmware versions

|v5.3
|5.3.3-p1-19391
6.0.3-p3-13584
7.0.2-p4-15876
7.0.3-p1-15949
8.0.3-p2-22743

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.57+|foundation .12+|Disk|Capacity (GB)|Implemented|HTTPS|use capacity
|Disk Id|Implemented|HTTPS|Uniquely identifies this disk in the array
|Location|Gap|HTTPS|Where this disk is physically located in the array
```

```
|Name|Implemented|HTTPS|
|Role|Implemented|HTTPS|
|Role Enum|Implemented|HTTPS|enum for disk role
|Speed|Implemented|HTTPS|Speed of disk (RPM)
|Status|Implemented|HTTPS|
|Status Enum|Implemented|HTTPS|enum for disk status
|Type|Gap|HTTPS|
|Type Enum|Implemented|HTTPS|enum for disk type
|Encrypted|Implemented|HTTPS|
.7+|Info|Api Description|Implemented|HTTPS|
|Api Name|Implemented|HTTPS|
|Api Version|Implemented|HTTPS|
|DataSource Name|Implemented|HTTPS|Info
|Date|Implemented|HTTPS|
|Originator ID|Implemented|HTTPS|
|Originator Key|Implemented|HTTPS|
.13+|Storage|Cluster|Not Available|HTTPS|Whether this storage is a cluster
|Cpu Count|Implemented|HTTPS|Cpu Count of the storage
|Display IP|Implemented|HTTPS|
|Failed Raw Capacity|Implemented|HTTPS|Raw capapcity of failed disks (sum
of all disks that are failed)
|Family|Implemented|HTTPS|The storage Family could be Clariion, Symmetrix,
et al
|IP|Implemented|HTTPS|
|Manage URL|Implemented|HTTPS|
|Manufacturer|Implemented|HTTPS|
|Memory|Implemented|HTTPS|
|Microcode Version|Implemented|HTTPS|
|Total Raw Capacity|Implemented|HTTPS|Total raw capacity (sum of all disks
on the array)
|Spare Raw Capacity|Implemented|HTTPS|Raw capapcity of spare disks (sum of
all disks that are spare)
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
.10+|Storage Node|Memory Size|Gap|HTTPS|device memory in MB
|Name|Implemented|HTTPS|
|Processors Count|Implemented|HTTPS|device CPU
|State|Implemented|HTTPS|free text describing the device state
|UUID|Implemented|HTTPS|
|ManagementIp Addresses|Implemented|HTTPS|
|Node Capacity Utilization Total in MB|Implemented|HTTPS|
|Node Capacity Utilization Usable in MB|Implemented|HTTPS|
|Node Capacity Utilization Used in MB|Implemented|HTTPS|
|Site Name|Implemented|HTTPS|
.15+|Storage Pool|Data Used Capacity|Implemented|HTTPS|
|Include In Dwh Capacity|Implemented|HTTPS|A way from ACQ to cotnrol which
stroage pools are interesting in DWH Capacity
```

```
|Name|Implemented|HTTPS|
|Other UsedCapacity (MB)|Implemented|HTTPS|Any capacity other than data and snapshot
|Physical Disk  Capacity (MB)|Implemented|HTTPS|used as raw capacity for storage pool
|Raid Group|Implemented|HTTPS|indicates whether this storagePool is a raid group
|Raw to Usable Ratio|Implemented|HTTPS|ratio to convert from usable capacity to raw capacity
|Snapshot Used Capacity|Implemented|HTTPS|
|Storage Pool Id|Implemented|HTTPS|
|Thin Provisioning Supported|Implemented|HTTPS|Whether this internal volume supports thin provisioning for the volume layer on top of it
|Total Allocated Capacity|Implemented|HTTPS|
|Total Used Capacity|Implemented|HTTPS|Total capacity in MB
|Type|Gap|HTTPS|
|Virtual|Implemented|HTTPS|Is this a storage virtualization device?
|Effective Used Capacity Percent|Implemented|HTTPS|
.30+|performance .7+|Storage|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs other|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Write|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and write across all disks) in MB/s
|IOPs Total|Implemented|HTTPS|
.10+|Storage Node|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Node Capacity Utilization Total|Implemented|HTTPS|
|Node Capacity Utilization Usable|Implemented|HTTPS|
|Node Capacity Utilization Used|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|
|Utilization Total|Implemented|HTTPS|
.13+|StoragePool Disk|Raw Capacity|Implemented|HTTPS|
|Total Capacity|Implemented|HTTPS|
|Used Capacity|Implemented|HTTPS|
|Capacity Used Ratio|Implemented|HTTPS|
|Data Used Capacity|Implemented|HTTPS|
|IOps Read|Implemented|HTTPS|Number of read IOps on the disk
|IOPs Total|Implemented|HTTPS|
|IOPs Write|Implemented|HTTPS|
|Other Used Capacity|Implemented|HTTPS|
|Snapshot Used Capacity|Implemented|HTTPS|
|Throughput Read|Implemented|HTTPS|
|Throughput Total|Implemented|HTTPS|Average disk total rate (read and
write across all disks) in MB/s
|Throughput Write|Implemented|HTTPS|

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|Rubrik Storage REST API
|HTTPS
|HTTPS
|443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== NetApp HCI Virtual Center
:description: Support Matrix Asciidoc for NetApp HCI Virtual Center

Models and versions supported by this data collector:
|===
<.<|API versions

|VMware vCenter Server 6.7.0 build-10244857
VMware vCenter Server 6.7.0 build-14368073
VMware vCenter Server 7.0.3 build-19234570
VMware vCenter Server 7.0.3 build-20150588
VMware vCenter Server 7.0.3 build-20395099
VMware vCenter Server 7.0.3 build-20990077
VMware vCenter Server 7.0.3 build-21477706
VMware vCenter Server 7.0.3 build-21784236
VMware vCenter Server 8.0.1 build-21815093

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.91+|foundation .8+|Data Store|Capacity|Implemented|Web Services|Snapshot
Used capacity in MB
|MOID|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
|Type|Implemented|Web Services|
.3+|NasShare DataStore|DataStore OID|Implemented|Web Services|
|Nas Share OID|Implemented|Web Services|
|OID|Implemented|Web Services|
.4+|NasShare Host|Nas Share OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|OID|Implemented|Web Services|
|Read Only|Implemented|Web Services|
.8+|LUN|Disk Name|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|Number|Implemented|Web Services|
|OID|Implemented|Web Services|
|Policy|Implemented|Web Services|
|TID|Implemented|Web Services|
|Volume Uuid|Implemented|Web Services|
.6+|NAS Share|Capacity|Implemented|Web Services|Allocated capacity in MB
|Filer Ip|Implemented|Web Services|
|Filer Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Share Path|Implemented|Web Services| For a HvNasShare to be matched to a
Share
|Type|Gap|Web Services|
.6+|Path|Active|Implemented|Web Services|
|Lun OID|Implemented|Web Services|
|Host Port WWPN|Implemented|Web Services|
|OID|Implemented|Web Services|
|Storage Port WWPN|Implemented|Web Services|
|Type|Gap|Web Services|
.6+|Server|Cluster|Implemented|Web Services|Cluster name
```

```
|DataCenter Name|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|MOID|Implemented|Web Services|
|OID|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
.8+|Virtual Disk|Capacity|Implemented|Web Services|Snapshot Used capacity in MB
|DataStore OID|Implemented|Web Services|
|Lun OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Type|Gap|Web Services|
|Used Capacity|Implemented|Web Services|used capacity for reporting (MB)
|Used Capacity|Implemented|Web Services|
.15+|VirtualMachine|Dns Name|Implemented|Web Services|
|Guest State|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|IPs|Implemented|Web Services|
|MOID|Implemented|Web Services|
|Memory|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|OS|Implemented|Web Services|
|Power State|Implemented|Web Services|
|State Change Time|Implemented|Web Services|
|Processors|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
.3+|VirtualMachine Disk|OID|Implemented|Web Services|
|VirtualDisk OID|Implemented|Web Services|
|VirtualMachine OID|Implemented|Web Services|
.12+|Host|Host Cpu Count|Implemented|Web Services|
|Host Cpu Speed|Implemented|Web Services|
|Host Domain|Implemented|Web Services|
|Host Installed Memory|Implemented|Web Services|
|Host Model|Implemented|Web Services|
|NIC count|Implemented|Web Services|
|NIC speed|Implemented|Web Services|
|IPs|Implemented|Web Services|
|Manufacturer|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Platform Type|Implemented|Web Services|
.4+|ISCSI Node|Host Aliases|Implemented|Web Services|
|Node Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Type|Gap|Web Services|
.8+|Info|Api Description|Implemented|Web Services|
|Api Name|Implemented|Web Services|
|Api Version|Implemented|Web Services|
|Client Api Name|Implemented|Web Services|
|Client Api Version|Implemented|Web Services|
|DataSource Name|Implemented|Web Services|Info
|Date|Implemented|Web Services|
|Originator ID|Implemented|Web Services|
.53+|performance .14+|Data Store|Capacity Provisioned|Implemented|Web
Services|
|Total Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Over Commit Capacity Ratio|Implemented|Web Services|Reported as a time
series
|Capacity Used Ratio|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|IOPs Total|Implemented|Web Services|
|IOPs Write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|
|Throughput Total|Implemented|Web Services|Average disk total rate (read
and write across all disks) in MB/s
|Throughput Write|Implemented|Web Services|
.17+|Host|Total CPU Utilization|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|diskIops.total|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read
|Disk Throughput Write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|ipThroughput.write|Implemented|Web Services|
|Total Memory Utilization|Implemented|Web Services|
|swapRate.inRate|Implemented|Web Services|
|Swap Rate|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
.22+|vm|cpuCoSchedulingDelayTimePercent.total|Implemented|Web Services|
|cpuDemandToEntitlementPercent.total|Implemented|Web Services|
|Idle CPU Time|Implemented|Web Services|idle time in percent
|CPU Wait Time|Implemented|Web Services|total cpu wait time in percent
|Total CPU Utilization|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|diskIops.total|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read
|Disk Throughput Write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|ipThroughput.write|Implemented|Web Services|
|Total Memory Utilization|Implemented|Web Services|
|swapRate.inRate|Implemented|Web Services|
|Swap Rate|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
|Schedule wait time|Implemented|Web Services|Waiting to be scheduled time
in percent

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|VMware REST API
|Web Services
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== VMware Cloud on AWS
```

```
:description: Support Matrix Asciidoc for VMware Cloud on AWS

Models and versions supported by this data collector:
|===
<.<|API versions

|VMware vCenter Server 7.0.3 build-20532039
VMware vCenter Server 7.0.3 build-20870699
VMware vCenter Server 8.0.0 build-21709157

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.59+|foundation .8+|Data Store|OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|Capacity|Implemented|Web Services|Snapshot Used capacity in MB
|Used Capacity|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
|MOID|Implemented|Web Services|
|Type|Implemented|Web Services|
.6+|Server|OID|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
|Cluster|Implemented|Web Services|Cluster name
|DataCenter Name|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|MOID|Implemented|Web Services|
.7+|Virtual Disk|OID|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|Capacity|Implemented|Web Services|Snapshot Used capacity in MB
|Used Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|used capacity for reporting (MB)
|Type|Gap|Web Services|
.15+|VirtualMachine|OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|Dns Name|Implemented|Web Services|
|OS|Implemented|Web Services|
|Processors|Implemented|Web Services|
|Memory|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Power State|Implemented|Web Services|
|State Change Time|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|IPs|Implemented|Web Services|
|Guest State|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|MOID|Implemented|Web Services|
.3+|VirtualMachine Disk|OID|Implemented|Web Services|
|VirtualMachine OID|Implemented|Web Services|
|VirtualDisk OID|Implemented|Web Services|
.12+|Host|OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|IPs|Implemented|Web Services|
|Host Domain|Implemented|Web Services|
|Platform Type|Implemented|Web Services|
|Host Installed Memory|Implemented|Web Services|
|Manufacturer|Implemented|Web Services|
|Host Model|Implemented|Web Services|
|Host Cpu Count|Implemented|Web Services|
|Host Cpu Speed|Implemented|Web Services|
|NIC count|Implemented|Web Services|
|NIC speed|Implemented|Web Services|
.8+|Info|DataSource Name|Implemented|Web Services|Info
|Originator ID|Implemented|Web Services|
|Date|Implemented|Web Services|
|Api Name|Implemented|Web Services|
|Api Version|Implemented|Web Services|
|Api Description|Implemented|Web Services|
|Client Api Name|Implemented|Web Services|
|Client Api Version|Implemented|Web Services|
.62+|performance .14+|Data Store|Latency Total|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|Latency Read|Implemented|Web Services|
|IOPs Write|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|
|Throughput Write|Implemented|Web Services|
|Throughput Total|Implemented|Web Services|Average disk total rate (read
and write across all disks) in MB/s
|IOPs Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Total Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Capacity Used Ratio|Implemented|Web Services|
|Capacity Provisioned|Implemented|Web Services|
|Over Commit Capacity Ratio|Implemented|Web Services|Reported as a time
series
.17+|Host|Latency Write|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|Swap Rate|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|Total Memory Utilization|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|ipThroughput.write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|swapRate.inRate|Implemented|Web Services|
|Disk Throughput Write|Implemented|Web Services|
|Total CPU Utilization|Implemented|Web Services|
|diskIops.total|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read
.9+|Virtual Disk|Latency Total|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|Latency Read|Implemented|Web Services|
|IOPs Write|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|
|Throughput Write|Implemented|Web Services|
|Throughput Total|Implemented|Web Services|Average disk total rate (read
and write across all disks) in MB/s
|IOPs Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
.22+|vm|Latency Write|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|Swap Rate|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|cpuCoSchedulingDelayTimePercent.total|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|Total Memory Utilization|Implemented|Web Services|
|Idle CPU Time|Implemented|Web Services|idle time in percent
|Latency Read|Implemented|Web Services|
|cpuDemandToEntitlementPercent.total|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|ipThroughput.write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|CPU Wait Time|Implemented|Web Services|total cpu wait time in percent
|swapRate.inRate|Implemented|Web Services|
|Disk Throughput Write|Implemented|Web Services|
|Total CPU Utilization|Implemented|Web Services|
|Schedule wait time|Implemented|Web Services|Waiting to be scheduled time
in percent
```

```
|diskIops.total|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|VMware REST API
|Web Services
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>

== VMware vSphere (Web Services)
:description: Support Matrix Asciidoc for VMware vSphere (Web Services)

Models and versions supported by this data collector:
|===
<.<|API versions

|VMware ESXi 6.0.0 build-10719132
VMware ESXi 6.0.0 build-2494585
VMware ESXi 6.0.0 build-5572656
VMware ESXi 6.0.0 build-9313334
VMware ESXi 6.5.0 build-14990892
VMware ESXi 6.5.0 build-5969303
VMware ESXi 7.0.0 build-15843807
VMware ESXi 7.0.3 build-20036589
VMware ESXi 7.0.3 build-20328353
VMware ESXi 7.0.3 build-20842708
VMware vCenter Server 5.0.0 build-3073236
VMware vCenter Server 5.0.0 build-455964
VMware vCenter Server 5.0.0 build-623373
VMware vCenter Server 5.1.0 build-3814779
VMware vCenter Server 5.5.0 build-1750787
VMware vCenter Server 5.5.0 build-2442329
VMware vCenter Server 5.5.0 build-3000241
VMware vCenter Server 5.5.0 build-3252642
VMware vCenter Server 5.5.0 build-3721164
VMware vCenter Server 5.5.0 build-4180647
VMware vCenter Server 5.5.0 build-6516310
VMware vCenter Server 5.5.0 build-9911218
VMware vCenter Server 6.0.0 build-13638472
VMware vCenter Server 6.0.0 build-14510545
VMware vCenter Server 6.0.0 build-2776511
VMware vCenter Server 6.0.0 build-3634793
VMware vCenter Server 6.0.0 build-3634794
VMware vCenter Server 6.0.0 build-5960847
VMware vCenter Server 6.0.0 build-7924803
VMware vCenter Server 6.0.0 build-8803875
VMware vCenter Server 6.0.0 build-9313458
VMware vCenter Server 6.5.0 build-10964411
VMware vCenter Server 6.5.0 build-15679215
VMware vCenter Server 6.5.0 build-17590285
VMware vCenter Server 6.5.0 build-17994927
VMware vCenter Server 6.5.0 build-18499837
VMware vCenter Server 6.5.0 build-18711281
VMware vCenter Server 6.5.0 build-19261680
VMware vCenter Server 6.5.0 build-20510539
VMware vCenter Server 6.5.0 build-7119157
VMware vCenter Server 6.7.0 build-10244857
VMware vCenter Server 6.7.0 build-11727113
VMware vCenter Server 6.7.0 build-13007421
VMware vCenter Server 6.7.0 build-13639324
VMware vCenter Server 6.7.0 build-14368073
VMware vCenter Server 6.7.0 build-15129973
VMware vCenter Server 6.7.0 build-15679289
VMware vCenter Server 6.7.0 build-17137327
VMware vCenter Server 6.7.0 build-18010599
VMware vCenter Server 6.7.0 build-18485185
VMware vCenter Server 6.7.0 build-18831049
VMware vCenter Server 6.7.0 build-19299595
VMware vCenter Server 6.7.0 build-19832247
VMware vCenter Server 6.7.0 build-19832280
VMware vCenter Server 6.7.0 build-20504301
VMware vCenter Server 6.7.0 build-20504362
VMware vCenter Server 6.7.0 build-8170161
VMware vCenter Server 6.7.0 build-9433931
VMware vCenter Server 7.0.0 build-16620013
VMware vCenter Server 7.0.0 build-16749670
VMware vCenter Server 7.0.1 build-17491160
VMware vCenter Server 7.0.2 build-17694817
VMware vCenter Server 7.0.2 build-17958471
VMware vCenter Server 7.0.2 build-18356314
VMware vCenter Server 7.0.2 build-18455184
VMware vCenter Server 7.0.3 build-18700403
VMware vCenter Server 7.0.3 build-18778458
VMware vCenter Server 7.0.3 build-19234570
VMware vCenter Server 7.0.3 build-19480866
VMware vCenter Server 7.0.3 build-19717403
VMware vCenter Server 7.0.3 build-20051473
VMware vCenter Server 7.0.3 build-20150588
VMware vCenter Server 7.0.3 build-20395099
VMware vCenter Server 7.0.3 build-20845200
VMware vCenter Server 7.0.3 build-20990077
VMware vCenter Server 7.0.3 build-21290409
VMware vCenter Server 7.0.3 build-21477706
VMware vCenter Server 7.0.3 build-21784236
VMware vCenter Server 7.0.3 build-21958406
VMware vCenter Server 8.0.0 build-20920323
VMware vCenter Server 8.0.0 build-21216066
VMware vCenter Server 8.0.0 build-21457384
VMware vCenter Server 8.0.1 build-21560480
VMware vCenter Server 8.0.1 build-21815093
VMware vCenter Server 8.0.1 build-21860503

|===
Products supported by this data collector:
|===
^|Product ^|Category ^|Feature/Attribute ^|Status ^|Protocol Used
^|Additional Information

.91+|foundation .8+|Data Store|Capacity|Implemented|Web Services|Snapshot
Used capacity in MB
|MOID|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
|Type|Implemented|Web Services|
.3+|NasShare DataStore|DataStore OID|Implemented|Web Services|
|Nas Share OID|Implemented|Web Services|
|OID|Implemented|Web Services|
.4+|NasShare Host|Nas Share OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|OID|Implemented|Web Services|
|Read Only|Implemented|Web Services|
.8+|LUN|Disk Name|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|Number|Implemented|Web Services|
|OID|Implemented|Web Services|
|Policy|Implemented|Web Services|
|TID|Implemented|Web Services|
|Volume Uuid|Implemented|Web Services|
.6+|NAS Share|Capacity|Implemented|Web Services|Allocated capacity in MB
|Filer Ip|Implemented|Web Services|
|Filer Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Share Path|Implemented|Web Services| For a HvNasShare to be matched to a
Share
|Type|Gap|Web Services|
.6+|Path|Active|Implemented|Web Services|
|Lun OID|Implemented|Web Services|
|Host Port WWPN|Implemented|Web Services|
|OID|Implemented|Web Services|
|Storage Port WWPN|Implemented|Web Services|
|Type|Gap|Web Services|
.6+|Server|Cluster|Implemented|Web Services|Cluster name
|DataCenter Name|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|MOID|Implemented|Web Services|
|OID|Implemented|Web Services|
|Virtual Center Ip|Implemented|Web Services|
.8+|Virtual Disk|Capacity|Implemented|Web Services|Snapshot Used capacity
in MB
|DataStore OID|Implemented|Web Services|
|Lun OID|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Type|Gap|Web Services|
|Used Capacity|Implemented|Web Services|used capacity for reporting (MB)
|Used Capacity|Implemented|Web Services|
.15+|VirtualMachine|Dns Name|Implemented|Web Services|
|Guest State|Implemented|Web Services|
|DataStore OID|Implemented|Web Services|
|Host OID|Implemented|Web Services|
|IPs|Implemented|Web Services|
|MOID|Implemented|Web Services|
|Memory|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|OS|Implemented|Web Services|
|Power State|Implemented|Web Services|
|State Change Time|Implemented|Web Services|
|Processors|Implemented|Web Services|
|Provisioned Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
.3+|VirtualMachine Disk|OID|Implemented|Web Services|
|VirtualDisk OID|Implemented|Web Services|
|VirtualMachine OID|Implemented|Web Services|
.12+|Host|Host Cpu Count|Implemented|Web Services|
|Host Cpu Speed|Implemented|Web Services|
|Host Domain|Implemented|Web Services|
|Host Installed Memory|Implemented|Web Services|
|Host Model|Implemented|Web Services|
|NIC count|Implemented|Web Services|
|NIC speed|Implemented|Web Services|
|IPs|Implemented|Web Services|
|Manufacturer|Implemented|Web Services|
|Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Platform Type|Implemented|Web Services|
.4+|ISCSI Node|Host Aliases|Implemented|Web Services|
|Node Name|Implemented|Web Services|
|OID|Implemented|Web Services|
|Type|Gap|Web Services|
.8+|Info|Api Description|Implemented|Web Services|
|Api Name|Implemented|Web Services|
|Api Version|Implemented|Web Services|
|Client Api Name|Implemented|Web Services|
|Client Api Version|Implemented|Web Services|
|DataSource Name|Implemented|Web Services|Info
|Date|Implemented|Web Services|
|Originator ID|Implemented|Web Services|
.68+|performance .14+|Data Store|Capacity Provisioned|Implemented|Web
Services|
|Total Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Over Commit Capacity Ratio|Implemented|Web Services|Reported as a time
series
|Capacity Used Ratio|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|IOPs Total|Implemented|Web Services|
|IOPs Write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|
|Throughput Total|Implemented|Web Services|Average disk total rate (read
and write across all disks) in MB/s
|Throughput Write|Implemented|Web Services|
.17+|Host|Total CPU Utilization|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|diskIops.total|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read
|Disk Throughput Write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|ipThroughput.write|Implemented|Web Services|
|Total Memory Utilization|Implemented|Web Services|
|swapRate.inRate|Implemented|Web Services|
|Swap Rate|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
.12+|Virtual Disk|Total Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Capacity Used Ratio|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
|IOPs Total|Implemented|Web Services|
|IOPs Write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|
|Throughput Total|Implemented|Web Services|Average disk total rate (read
and write across all disks) in MB/s
|Throughput Write|Implemented|Web Services|
.25+|vm|Total Capacity|Implemented|Web Services|
|Used Capacity|Implemented|Web Services|
|Capacity Used Ratio|Implemented|Web Services|
|cpuCoSchedulingDelayTimePercent.total|Implemented|Web Services|
|cpuDemandToEntitlementPercent.total|Implemented|Web Services|
|Idle CPU Time|Implemented|Web Services|idle time in percent
|CPU Wait Time|Implemented|Web Services|total cpu wait time in percent
|Total CPU Utilization|Implemented|Web Services|
|IOps Read|Implemented|Web Services|Number of read IOps on the disk
```

```
|diskIops.total|Implemented|Web Services|
|Disk IOPs write|Implemented|Web Services|
|Latency Read|Implemented|Web Services|
|Latency Total|Implemented|Web Services|
|Latency Write|Implemented|Web Services|
|Disk Throughput Read|Implemented|Web Services|
|Throughput Read|Implemented|Web Services|total disk throughput read
|Disk Throughput Write|Implemented|Web Services|
|IP Throughput Read|Implemented|Web Services|
|Throughput total|Implemented|Web Services|IP throughput total
|ipThroughput.write|Implemented|Web Services|
|Total Memory Utilization|Implemented|Web Services|
|swapRate.inRate|Implemented|Web Services|
|Swap Rate|Implemented|Web Services|
|Total Swap Rate|Implemented|Web Services|
|Schedule wait time|Implemented|Web Services|Waiting to be scheduled time
in percent

|===

Management APIs used by this data collector:
|===
^|API ^|Protocol Used ^|Transport layer protocol used ^|Incoming ports
used ^|Outgoing ports used ^|Supports authentication ^|Requires only
'Read-only' credentials ^|Supports Encryption ^|Firewall friendly (static
ports)

|VMware REST API
|Web Services
|HTTP/HTTPS
|80/443
|
|true
|true
|true
|true

|===

<<top,Back to Top>>




= Reference & Support

:leveloffset: +1
```

```
[[ID8ef22cc0df5070a4c8a59bcf2480e66a]]
= Requesting Support
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]

toc::[]

You can access support options in Cloud Insights by clicking on *Help >
Support*. The support options available to you depend on your Cloud
Insights Edition.

NOTE: The Live Chat support option is not available in Cloud Insights
Federal Edition.

//image:SupportPageExample.png[Support Page]
//image:SupportPageExample-NA.png[Support page]
image:SupportPageWithLearningCenter.png[Support page]

== Activating support entitlement

//Once you have access to Cloud Insights Service shortly after subscribing
in the AWS marketplace, it is strongly recommended that you activate
support entitlement. Activating support entitlement enables you to access
technical support over online chat, web ticketing system, and phone. The
default support level is self-service until registration is completed.

Cloud Insights offers self-service and email support when running in trial
mode. Once you have subscribed to the service, it is strongly recommended
that you activate support entitlement. Activating support entitlement
enables you to access technical support over the online chat, the web
ticketing system, and the phone. The default support mode is self-service
until registration is completed. See xref:{relative_path}#obtaining-
support-information[details] below.

During the initial subscription process, your Cloud Insights instance will
generate a 20-digit NetApp serial number starting with "950". This NetApp
serial number represents the Cloud Insights subscription associated with
your account. You must register the NetApp serial number to activate
```

```
support entitlement. We offer two options for support registration:

. User with pre-existing NetApp Support Site (NSS) SSO account (e.g.
current NetApp customer)
. New NetApp customer with no pre-existing NetApp Support Site (NSS) SSO
account

=== Option 1: Steps for a user with a pre-existing NetApp Support Site
(NSS) SSO account

.Steps

. Navigate to the NetApp registration website https://register.netapp.com

. Select “I am already registered as NetApp Customer” and choose _Cloud
Insights_ as the Product Line. Select your Billing Provider (NetApp or
AWS) and provide your Serial Number and your NetApp Subscription Name or
AWS Customer ID by referring to the “Help > Support” menu within the Cloud
Insights user interface:
+
image:SupportPage_SN_Section-NA.png[SN_Screen]

. Complete the Existing Customer Registration form and click *Submit*.
+
image:ExistingCustomerRegExample.png[existing customer form]

. If no errors occur, user will be directed to a “Registration Submitted
Successfully” page. The email address associated with the NSS SSO username
used for registration will receive an email within a couple minutes
stating “your product is now eligible for support”.

. This is a onetime registration for the Cloud Insights NetApp serial
number.

=== Option 2: Steps for a new NetApp customer with no pre-existing NetApp
Support Site (NSS) SSO account

.Steps

. Navigate to the NetApp registration website https://register.netapp.com

. Select “I am not a registered NetApp Customer” and complete the required
information in example form below:

image:NewCustomerRegExample.png[new customer form]

. Select _Cloud Insights_ as the Product Line. Select your Billing
```

```
Provider (NetApp or AWS) and provide your Serial Number and your NetApp
Subscription Name or AWS Customer ID by referring to the “Help > Support”
menu within the Cloud Insights user interface:
+
image:SupportPage_SN_Section-NA.png[SN_Screen]

. If no errors occur, user will be directed to a “Registration Submitted
Successfully” page. The email address associated with the NSS SSO username
used for registration will receive an email within a few hours stating
“your product is now eligible for support”.

. As a new NetApp customer, you will also need to create a NetApp Support
Site (NSS) user account for future registrations and access to support
portal for technical support chat and web ticketing. This link is located
at https://mysupport.netapp.com/eservice/public/now.do. You can provide
your newly registered Cloud Insights serial number to expedite the
process.

. This is a one-time registration for the Cloud Insights NetApp serial
number.

== Obtaining Support Information

NetApp provides support for Cloud Insights in a variety of ways. Extensive
free self-support options are available 24x7, such as knowledgebase (KB)
articles or the NetApp community. For users who are subscribed to any of
the Cloud Insights Editions (Basic*, Standard, Premium), technical support
is available via phone or web ticketing. A NetApp Support Site (NSS) SSO
account is required for web ticket along with case management.

*Support is available with Basic Edition as long as all your NetApp
storage systems are covered at least at the Premium Support level.

=== Self-Service Support:

These support options are available in Trial mode and are available for
free 24x7:

*
*link:https://mysupport.netapp.com/site/search?q=cloud%20insights&offset=0
&searchType=Manual&autocorrect=true&origin=CI_Suppport_KB&filter=%28conten
t_type%3D%3D%22knowledgebase%22;product%3D%3D%22Cloud%20Insights%22%29[Kno
wledgebase]*
+
Clicking the links in this section takes you to the NetApp Knowledgebase,
where you can search through relevant articles, how-to's, and more.
```

```
////
link:https://kb.netapp.com/app/browse/a_status/published/channelRecordID/H
OW_TO/currentSelectedID/RN_PRODUCT_473/isProductSelected/true/isRecommenda
tionAllowed/true/pageSize/10/productRecordID/RN_PRODUCT_473/sortColumn/pub
lishDate/sortDirection/DESC/truncate/200/type/browse[How-to's],
link:https://kb.netapp.com/app/browse/a_status/published/channelRecordID/F
AQ/currentSelectedID/RN_PRODUCT_473/isProductSelected/true/isRecommendatio
nAllowed/true/pageSize/10/productRecordID/RN_PRODUCT_473/sortColumn/publis
hDate/sortDirection/DESC/truncate/200/type/browse[FAQ's], or
link:https://kb.netapp.com/app/browse/a_status/published/channelRecordID/B
REAK_FIX/currentSelectedID/RN_PRODUCT_473/isProductSelected/true/isRecomme
ndationAllowed/true/pageSize/10/productRecordID/RN_PRODUCT_473/sortColumn/
publishDate/sortDirection/DESC/truncate/200/type/browse[Break Fix]
information related to Cloud Insights.

////

* *link:https://docs.netapp.com/us-en/cloudinsights/[Documentation]*
+
Clicking on the Documentation link takes you to this documentation center.

*
*link:https://mysupport.netapp.com/site/search?q=cloud%20insights&offset=0
&searchType=Manual&autocorrect=true&origin=CI_Support_Community&filter=%28
content_type%3D%3D%22community%22;product%3D%3D%22Cloud%20Insights%22%29[C
ommunity]*
+
Clicking on the community link takes you to the NetApp Cloud Insights
community, where you can connect with peers and experts.

There is also a link to provide xref:{relative_path}mailto:ng-
cloudinsights-customerfeedback@netapp.com[*Feedback*] to help us improve
Cloud Insights.


=== Subscription Support

In addition to the self-support options above, if you have a Cloud
Insights subscription or paid support for monitored NetApp products or
services, you can work with a NetApp Support Engineer to resolve your
problem.

NOTE: You must register in order to <<Activating support entitlement and
accessing support,activate support>> for NetApp Cloud products. To
register, go to NetApp's link:https://register.netapp.com[Cloud Data
Services Support Registration].
```

```
It is highly recommended that you check the box to allow a NetApp Support
Engineer access to your Cloud Insights environment during your support
session. This will allow the engineer to troubleshoot the problem and help
you resolve it quickly. When your issue is resolved or your support
session has ended, you can un-check the box.

You can request support by any of the following methods. You must have an
active Cloud Insights subscription to use these support options:

* link:https://www.netapp.com/us/contact-us/support.aspx[*Phone*]
*
link:https://mysupport.netapp.com/portal?_nfpb=true&_st=initialPage=true&_
pageLabel=submitcase[*Support Ticket*]
* *Chat* - You will be connected with NetApp support personnel for
assistance (weekdays only). Chat is available in the *Help > Live Chat*
menu option in the upper right of any Cloud Insights screen.


You can also request sales support by clicking on the
link:https://www.netapp.com/us/forms/sales-inquiry/cloud-insights-sales-
inquiries.aspx[*Contact Sales*] link.

Your Cloud Insights serial number is visible within the service from the
*Help > Support* menu. If you are experiencing issues accessing the
service and have registered a serial number with NetApp previously, you
can also view your list of Cloud Insights serial numbers from the NetApp
Support Site as follows:

*   Login to mysupport.netapp.com
*   From the Products > My Products menu tab, use Product Family “SaaS
Cloud Insights” to locate all your registered serial numbers:

image:Support_View_SN.png[View Support SN]

== Cloud Insights Data Collector Support Matrix

You can view or download information and details about supported Data
Collectors in the
xref:{relative_path}reference_data_collector_support_matrix.html[*Cloud
Insights Data Collector Support Matrix*, role="external"].

=== Learning Center

Regardless of your subscription, *Help > Support* links to several NetApp
University course offerings to help you get the most out of Cloud
Insights. Check them out!
```

```
= Data Collector Reference - Infrastructure

:leveloffset: +1


[[IDf10b5f428939dec54ffa2eb33acbca1b]]
= Vendor-Specific Reference
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The topics in this section provide vendor-specific reference information.
In most cases, configuring a data collector is straightforward. In some
cases, you may need additional information or commands to properly
configure the data collector.

Click on a *vendor* in the menu to the left to see information for their
data collectors.



[[ID6f55bb51576e8727d36368ffebb19f53]]
= Configuring the Amazon EC2 data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Amazon EC2 data collector to acquire inventory and
performance data from EC2 instances.


== Requirements

In order to collect data from Amazon EC2 devices, you must have the
```

```
following information:

* You must have one of the following:
** The *IAM Role* for your Amazon EC2 cloud account, if using IAM Role
Authentication. IAM Role only applies if your acquisition unit is
installed on an AWS instance.
** The *IAM Access Key* ID and Secret Access Key for your Amazon EC2 cloud
account, if using IAM Access Key authentication.
* You must have the "list organization" privilege
* Port 443 HTTPS
* EC2 Instances can be reported as a Virtual Machine, or (less naturally)
a Host. EBS Volumes can be reported as both a VirtualDisk used by the VM,
as well as a DataStore providing the Capacity for the VirtualDisk.

Access keys consist of an access key ID (for example,
AKIAIOSFODNN7EXAMPLE) and a secret access key (for example,
wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY). You use access keys to sign
programmatic requests that you make to EC2 if you use the Amazon EC2 SDKs,
REST, or Query API operations. These keys are provided with your contract
from Amazon.


== Configuration

Enter data into the data collector fields according to the table below:

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|AWS Region|Choose AWS region
|IAM Role|For use only when acquired on an AU in AWS. See below for more
information on xref:{relative_path}task_dc_amazon_ec2.html#iam-roles[IAM
Roles].
|AWS IAM Access Key ID|Enter AWS IAM Access Key ID. Required if you do not
use IAM Role.
|AWS IAM Secret Access Key|Enter AWS IAM Secret Access Key. Required if
you do not use IAM Role.
|I understand AWS bills me for API requests|Check this to verify your
understanding that AWS bills you for API requests made by Cloud Insights
polling.
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Include Extra Regions| Specify additional regions to include in polling.
|Cross Account Role|Role for accessing resources in different AWS
accounts.
|Inventory Poll Interval (min)|The default is 60
|Choose 'Exclude' or 'Include' to Apply to Filter VMs by Tags|Specify
whether to include or exclude VM's by Tags when collecting data. If
‘Include’ is selected, the Tag Key field can not be empty.
|Tag Keys and Values on which to Filter VMs|Click *+ Filter Tag* to choose
which VMs (and associated disks) to include/exclude by filtering for keys
and values that match keys and values of tags on the VM. Tag Key is
required, Tag Value is optional. When Tag Value is empty, the VM is
filtered as long as it matches the Tag Key.
//|HTTP connection and socket timeout (sec)|The default is 300
//|Include AWS tags|Check to enable support for AWS tags in Cloud Insights
annotations.
|Performance Poll Interval (sec)|The default is 1800
|CloudWatch Agent Metrics Namespace
|Namespace in EC2/EBS from which to collect data. Note that if the names
of the default metrics in this namespace are changed, Cloud Insights may
not be able to collect that renamed data. It is recommended to leave the
default metric names.

|===

== IAM Access Key

Access keys are long-term credentials for an IAM user or the AWS account
root user. Access keys are used to sign programmatic requests to the AWS
CLI or AWS API (directly or using the AWS SDK).

Access keys consist of two parts: an access key ID and a secret access
key. When you use _IAM Access Key_ authentication (as opposed to _IAM
Role_ authentication), you must use both the access key ID and secret
access key together for authentication of requests. For more information,
see the Amazon documentation on
link:https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_acces
s-keys.html[Access Keys].


== IAM Role

When using _IAM Role_ authentication (as opposed to IAM Access Key
authentication), you must ensure that the role you create or specify has
the appropriate permissions needed to access your resources.

```

```
For example, if you create an IAM role named _InstanceEc2ReadOnly_, you
must set up the policy to grant EC2 read-only list access permission to
all EC2 resources for this IAM role. Additionally, you must grant STS
(Security Token Service) access so that this role is allowed to assume
roles cross accounts.

After you create an IAM role, you can attach it when you create a new EC2
instance or any existing EC2 instance.

After you attach the IAM role _InstanceEc2ReadOnly_ to an EC2 instance,
you will be able to retrieve the temporary credential through instance
metadata by IAM role name and use it to access AWS resources by any
application running on this EC2 instance.

For more information see the Amazon documentaiton on
link:https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles.html[IAM
Roles].

Note: IAM role can be used only when the Acquisition Unit is running in an
AWS instance.

== Mapping Amazon tags to Cloud Insights annotations

The Amazon EC2 data collector includes an option that allows you to
populate Cloud Insights annotations with tags configured on EC2. The
annotations must be named exactly as the EC2 tags. Cloud Insights will
always populate same-named text-type annotations, and will make a "best
attempt" to populate annotations of other types (number, boolean, etc). If
your annotation is of a different type and the data collector fails to
populate it, it may be necessary to remove the annotation and re-create it
as a text type.

Note that AWS is case-sensitive, while Cloud Insights is case-insensitive.
So if you create an annotation named "OWNER" in Cloud Insights, and tags
named "OWNER", "Owner", and "owner" in EC2, all of the EC2 variations of
"owner" will map to Cloud Insight's "OWNER" annotation.

////
.Related Information

* https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_access-
keys.html[Managing Access Keys for IAM Users^]
////

== Include Extra Regions

In the AWS Data Collector *Advanced Configuration* section, you can set
```

```
the *Include extra regions* field to include additional regions, separated
by comma or semi-colon. By default, this field is set to *_us-.*_*, which
collects on all US AWS regions.  To collect on _all_ regions, set this
field to  *_.*_*.
If the *Include extra regions* field is empty, the data collector will
collect on assets specified in the *AWS Region* field as specified in the
*Configuration* section.

== Collecting from AWS Child Accounts

Cloud Insights supports collection of child accounts for AWS within a
single AWS data collector. Configuration for this collection is performed
in the AWS environment:

* You must configure each child account to have an AWS Role that allows
the main account ID to access EC2 details from the children account.
* Each child account must have the role name configured as the same
string.
* Enter this role name string into the Cloud Insights AWS Data Collector
*Advanced Configuration* section, in the *Cross account role* field.

Best Practice: It is highly recommended to assign the AWS predefined
_AmazonEC2ReadOnlyAccess_ policy to the EC2 main account. Also, the user
configured in the data source should have at least the predefined
_AWSOrganizationsReadOnlyAccess_ policy assigned, in order to query AWS.

Please see the following for information on configuring your environment
to allow Cloud Insights to collect from AWS child accounts:

link:https://docs.aws.amazon.com/IAM/latest/UserGuide/tutorial_cross-
account-with-roles.html[Tutorial: Delegate Access Across AWS Accounts
Using IAM Roles]

link:https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_common-
scenarios_aws-accounts.html[AWS Setup: Providing Access to an IAM User in
Another AWS Account That You Own]

link:https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_create_for-
user.html[Creating a Role to Delegate Permissions to an IAM User]



== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID2c387bf0f3b5f0edaac716826249fea9]]
= Amazon FSx for NetApp ONTAP data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector acquires inventory and performance data from Amazon
FSx for NetApp ONTAP. This data collector will be made available
incrementally throughout the Cloud Insights service regions. Contact your
sales person if you do not see the Icon for this collector in your Cloud
Insights Environment.

NOTE: This Cloud Insights collector requires an ONTAP user with a
_Filesystem-Scoped_ role. Please review the AWS
link:https://docs.aws.amazon.com/fsx/latest/ONTAPGuide/roles-and-
users.html[Roles and Rules] documentation for available options. At this
time AWS supports only one kind of user role with Filesystem Scope, which
is _fsxadmin_. This is the appropriate role to be used for the Cloud
Insights collector. The user should also have all three of these
applications assigned to it: http, ontapi, ssh.

== Terminology

Cloud Insights acquires inventory and performance data from the FSx-NetApp
data collector. For each asset type acquired, the most common terminology
used for the asset is shown. When viewing or troubleshooting this data
collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Cluster|Storage
|LUN|Volume
|Volume|Internal Volume
|===
== FSx-NetApp Terminology

The following terms apply to objects or references that you might find on
FSx-NetApp storage asset landing pages. Many of these terms apply to other
data collectors as well.

=== Storage

* Model – A comma-delimited list of the unique, discrete model names
within this cluster.
* Vendor – AWS
* Serial number – The array serial number.
* IP – generally will be the IP(s) or hostname(s) as configured in the
data source.
//* Microcode version – firmware.
* Raw Capacity – base 2 summation of all the SSD storage assigned to the
FSx filesystem.
* Latency – a representation of what the host facing workloads are
experiencing, across both reads and writes. Ideally, Cloud Insights is
sourcing this value directly, but this is often not the case. In lieu of
the array offering this up, Cloud Insights is generally performing an
IOPs-weighted calculation derived from the individual internal volumes’
statistics.
* Throughput – aggregated from internal volumes.
Management – this may contain a hyperlink for the management interface of
the device. Created programmatically by the Cloud Insights data source as
part of inventory reporting.

=== Storage Pool

* Storage – what storage array this pool lives on. Mandatory.
* Type – a descriptive value from a list of an enumerated list of
possibilities. Most commonly will be “Aggregate” or “RAID Group””.
//* Node – if this storage array’s architecture is such that pools belong
to a specific storage node, its name will be seen here as a hyperlink to
its own landing page.
* Capacity – the values here are the logical used, usable capacity and the
logical total capacity, and the percentage used across these.
* IOPS – the sum IOPs of all the volumes allocated on this storage pool.
* Throughput – the sum throughput of all the volumes allocated on this
storage pool.

== Requirements

The following are requirements to configure and use this data collector:
```

```
* You must have access to an account with the "fsxadmin" role, with three
applications assigned to it - ssh, ontapi, http
* Account details include username and password.
* Port requirements: 443


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|NetApp Management IP |IP address or fully-qualified domain name of the
NetApp cluster
|User Name |User name for NetApp cluster
|Password |Password for NetApp cluster
|===


== Advanced Metrics

This data collector collects the following advanced metrics from the FSx
for NetApp ONTAP storage:

* fpolicy
* nfsv3
* nfsv3:node
* nfsv4
* nfsv4_1
* nfsv4_1:node
* nfsv4:node
* policy_group
* qtree
* volume
* workload_volume


Note that FSx CLI and API commands retrieve some capacity values that
Cloud Insights ZAPI doesn't collect, so certain capacity values (such as
those for storage pools) may be different in Cloud Insights than they are
on the FSx itself.

== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
```

```
|===
|Problem:|Try this:

|Receive 401 HTTP response or 13003 ZAPI error code and ZAPI returns
“Insufficient privileges” or “not authorized for this command”| Check
username and password, and user privileges/permissions.

|ZAPI returns "cluster role is not cluster_mgmt LIF"|AU needs to talk to
cluster management IP. Check the IP and change to a different IP if
necessary

|ZAPI command fails after retry| AU has communication problem with the
cluster. Check network, port number, and IP address. User should also try
to run a command from command line from the AU machine.

|AU failed to connect to ZAPI via HTTP| Check whether ZAPI port accepts
plaintext. If AU tries to send plaintext to an SSL socket, the
communication fails.

|Communication fails with SSLException|AU is attempting to send SSL to a
plaintext port on a filer. Check whether the ZAPI port accepts SSL, or use
a different port.

|Additional Connection errors:

ZAPI response has error code 13001, “database  is not open”

ZAPI error code is 60 and response contains “API did not finish on time”

ZAPI response contains “initialize_session() returned NULL environment”

ZAPI error code is 14007 and response contains “Node is not healthy”

|Check network, port number, and IP address. User should also try to run a
command from command line from the AU machine.
|===



Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].
```

```
[[ID9914c95b38c03dab796103c5bd0cd831]]
= Configuring the Azure compute data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Azure compute data collector to acquire inventory
and performance data from Azure compute instances.

== Requirements

You need the following information to configure this data collector.

* Port requirement: 443 HTTPS
* Azure OAuth 2.0 Redirect URI (login.microsoftonline.com)
* Azure Management Rest IP (management.azure.com)
* Azure Resource Manager IP (management.core.windows.net)
* Azure Service Principal Application (Client) ID (Reader role required)
* Azure service principal authentication key (user password)
* You need to set up an Azure account for Cloud Insights discovery.
+
Once the account is properly configured and you register the application
in Azure, you will have the credentials required to discover the Azure
instance with Cloud Insights. The following link describes how to set up
the account for discovery.
https://docs.microsoft.com/en-us/azure/active-directory/develop/howto-
create-service-principal-portal

== Configuration

Enter data into the data collector fields according to the table below:

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Azure Service Principal Application (Client) ID (Reader role
required)|Sign-in ID to Azure. Requires Reader Role access.
|Azure tenant ID|Microsoft tenant ID
|Azure Service Principal Authentication Key|Login authentication key
|I understand Microsoft bills me for API requests|Check this to verify
```

```
your understanding that Microsoft bills you for API requests made by
Insight polling.
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Inventory Poll Interval (min)|The default is 60
//|HTTP connection and socket timeout (sec)|The default is 300

|Choose 'Exclude' or 'Include' to Apply to Filter VMs by Tags|Specify
whether to include or exclude VM's by Tags when collecting data. If
‘Include’ is selected, the Tag Key field can not be empty.
|Tag Keys and Values on which to Filter VMs|Click *+ Filter Tag* to choose
which VMs (and associated disks) to include/exclude by filtering for keys
and values that match keys and values of tags on the VM. Tag Key is
required, Tag Value is optional. When Tag Value is empty, the VM is
filtered as long as it matches the Tag Key.

|Performance Poll Interval (sec)|The default is 300
|===



== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





= Broadcom

:leveloffset: +1



[[ID834b8f3fdd1104b5b55315e04ea96a29]]
= Brocade Network Advisor data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
```

```
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Brocade Network Advisor data collector to acquire
inventory and performance data from Brocade switches.

== Terminology

Cloud Insights acquires the following inventory information from the
Brocade Network Advisor data collector. For each asset type acquired by
Cloud Insights, the most common terminology used for this asset is shown.
When viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term

|Switch|Switch
|Port|Port
|Virtual Fabric, Physical Fabric|Fabric
|Logical Switch|Logical Switch
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

The following are required to configure this data collector:

* The Cloud Insights Acquisition Unit will initate connections to TCP port
443 on the BNA server. BNA server must be running version 14.2.1 or
higher.
* Brocade Network Advisor Server IP address
* User name and password to an administrator account
* Port requirement: HTTP/HTTPS 443

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Brocade Network Advisor Server IP|IP address of the Network Advisor
Server
```

```
|User Name|User name for the switch
|User Name|Administrator user name
|Password|Administrator password
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Connection Type|HTTPS (default port 443) or HTTP (default port 80)
|Override Connection Port |If blank, use the default port in the
Connection Type field, otherwise enter the connection port to use
|Password|Password for the switch
|Inventory poll interval (min) |The default is 40
//|Connection timeout (sec)|The default is 60
|Report Access Gateway|Check to include devices in Access Gateway mode
|Performance Poll Interval (sec)|The default is 1800
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Receive a message that more than 1 node is logged into the Access Gateway
port, or data collector fails to discover Access Gateway device.| Check
that the NPV device is operating correctly and that all connected WWNs are
expected. Do not directly acquire the NPV device. Instead, acquisition of
the core fabric switch will collect the NPV device data.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID9d772d4dfe46012ec4c47182fe5a2a78]]
= Brocade FC Switch data collector
:toc: macro
```

```
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Brocade FC Switch (SSH) data source to discover
inventory for Brocade or rebranded switch devices running Factored
Operating System (FOS) firmware 4.2 and later. Devices in both FC switch
and Access Gateway modes are supported.

== Terminology

Cloud Insights acquires the following inventory information from the
Brocade FC Switch data collector. For each asset type acquired by Cloud
Insights, the most common terminology used for this asset is shown. When
viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term

|Switch|Switch
|Port|Port
|Virtual Fabric, Physical Fabric|Fabric
|Zone|Zone
|Logical Switch|Logical Switch
|Virtual Volume|Volume
|LSAN Zone|IVR Zone
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* The Cloud Insights Acquisition Unit (AU) will initiate connections to
TCP Port 22 on Brocade switches to collect inventory data. The AU will
also initiate connections to UDP port 161 for collection of performance
data.
* There must be IP connectivity to all switches in the fabric. If you
select the Discover all switches in the fabric check box, Cloud Insights
```

```
identifies all the switches in the fabric; however, it needs IP
connectivity to these additional switches to discover them.
* The same account is needed globally across all switches in the fabric.
You can use PuTTY (open source terminal emulator) to confirm access.
* Ports 161 and 162 must be open to all switches in the fabric for SNMP
performance polling.
* SNMP read-only Community String

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Switch IP|IP address or fully-qualified domain name of the EFC Server
|User Name|User name for the switch
|Password|Password for the switch
|SNMP | SNMP version
|SNMP Community String|SNMP read-only community string used to access the
switch
|SNMP User Name|SNMP user name
|SNMP Password|SNMP password
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Fabric name|Fabric name to be reported by the data collector. Leave blank
to report the fabric name as WWN.
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 15.
|Excluded Devices|Comma-separated list of device IDs to exclude from
polling
//|Timeout (sec)|Connection timeout. The default is 30.
//|Banner Wait Timeout (sec)|SSHAdmin Domains Active    Select if using
Admin Domainsbanner wait timeout. The default is 5 seconds.
|Admin Domains Active|Select if using Admin Domains
|Retrieve MPR Data|Select to acquire routing data from your multiprotocol
router.
|Enable Trapping|Select to enable acquisition upon receiving an SNMP trap
from the device. If you select enable trapping, you must also activate
SNMP.
|Minimum Time Between Traps (sec)|Minimum time between acquisition
attempts triggered by traps. The default is 10.
|Discover all switches in the fabric|Select to discover all switches in
```

```
the fabric
|Choose Favoring HBA vs. Zone Aliases|Choose whether to favor HBA or zone
aliases
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300.
|SNMP Auth Protocol|SNMP authentication protocol (SNMP v3 only)
|SNMP Privacy Password|SNMP privacy password (SNMP v3 only)
|SNMP Retries|Number of SNMP retry attempts
//|SNMP Timeout (ms)|SNMP timeout. The default is 5000.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===

|Problem:|Try this:

|The inventory acquisition of the Brocade datasource fails with the error:

<date> <time> ERROR
[com.onaro.sanscreen.acquisition.framework.datasource.BaseDataSource]
Error 2 out of 2: <datasource name> [Internal error] - Unable to generate
the model for device <IP>. Error detecting prompt ([Device name <name>]:
Unable to generate the model for device <IP>. Error detecting prompt)
|The issue may be caused when the Brocade switch takes too long to return
with a prompt, exceeding the default timeout of 5 seconds.
In the data collector's Advanced Configuration settings in Cloud Insights,
try increasing the  _SSH Banner Wait Timeout (sec)_ to a higher value.

|Error: “Cloud Insights received Invalid Chassis Role” |Check that the
user configured in this data source has been granted the chassis role
permission.
|Error: "Mismatched Chassis IP Address" |Change the data source
configuration to use chassis IP address.
|Receive a message that more than 1 node is logged into the Access Gateway
port| Check that the NPV device is operating correctly and that all
connected WWNs are expected. Do not directly acquire the NPV device.
Instead, acquisition of the core fabric switch will collect the NPV device
data.

|Performance collection fails with "Timed out during sending SNMP
```

```
request".
|Depending on query variables and switch configuration, some queries may
exceed the default timeout.
link:https://kb.netapp.com/Cloud/BlueXP/Cloud_Insights/Cloud_Insight_Broca
de_data_source_fails_performance_collection_with_a_timeout_due_to_default_
SNMP_configuration[Learn More].


|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[IDde9a712b1706d0b5a1dfde05dc14d2c0]]
= Brocade FOS REST Data Collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Brocade FOS REST collector to discover inventory
and performance for Brocade switch devices running FabricOS (FOS) firmware
8.2 and later.

By default, this collector will attempt to discover all the FOS devices
that are a part of all the fabrics the switch is part of.

== Terminology

Cloud Insights acquires the following inventory information from the
Brocade FOS REST data collector. For each asset type acquired by Cloud
Insights, the most common terminology used for this asset is shown. When
viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term
```

```
|Switch|Switch
|Port|Port
|Virtual Fabric, Physical Fabric|Fabric
|Zone|Zone
|Logical Switch|Logical Switch
|Virtual Volume|Volume
|LSAN Zone|IVR Zone
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* There must be TCP connectivity to all switches in the fabric. This data
collector type will seamlessly try both HTTP and HTTPS for each device in
the fabric. If you select the _Discover all switches in the fabric_ check
box, Cloud Insights identifies all the switches in the fabric; however, it
needs TCP connectivity to these additional switches to discover them.
* The same account is needed globally across all switches in the fabric.
You can use the device's Web interface to confirm access.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Switch IP|IP address or fully-qualified domain name of the FOS switch
|User Name|User name for the switch
|Password|Password for the switch
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Excluded Devices|Comma-separated list of device IPv4 addresses to exclude
from polling.
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 60.
|Discover all switches in the fabric|Select to discover all switches in
the fabric.
|Choose Favoring HBA vs. Zone Aliases|Choose whether to favor HBA or zone
aliases.
```

```
|Connection type| HTTP or HTTPS.|Note that this setting only changes which
protocol CI attempts to use per device first - CI will attempt the
opposite protocol automatically if the default fails
|Override TCP Port|Specify a port if not using the default.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300.

|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===

|Problem:|Try this:

|The Test feature warns me that a protocol is inaccessible

|A given Brocade FOS 8.2+ device will only want to speak on HTTP or HTTPS
- if a switch has a digital certificate installed, the switch will throw
HTTP errors if one attempts to communicate to it with unencrypted HTTP
versus HTTPS. The test feature attempts communication with both HTTP and
HTTPS - if the Test tells you that one protocol passes, you can safely
save the collector and not worry that the other protocol was unsuccessful
- the collector will attempt both protocols during collection, and only
fail if neither works.

|Error: “Cloud Insights received Invalid Chassis Role” |Check that the
user configured in this data source has been granted the chassis role
permission.
|Error: "Mismatched Chassis IP Address" |Change the data source
configuration to use chassis IP address.
|Receive a message that more than 1 node is logged into the Access Gateway
port| Check that the NPV device is operating correctly and that all
connected WWNs are expected. Do not directly acquire the NPV device.
Instead, acquisition of the core fabric switch will collect the NPV device
data.

|Performance collection fails with "Timed out during sending SNMP
request".
|Depending on query variables and switch configuration, some queries may
exceed the default timeout.
link:https://kb.netapp.com/Cloud/BlueXP/Cloud_Insights/Cloud_Insight_Broca
```

```
de_data_source_fails_performance_collection_with_a_timeout_due_to_default_
SNMP_configuration[Learn More].



|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




:leveloffset: -1



[[ID99d561bfb646b6d65907bbdecf5d263c]]
= Cisco MDS Fabric Switches data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Cisco MDS Fabric Switches data collector to
discover inventory for Cisco MDS Fabric Switches as well as a variety of
Cisco Nexus FCoE switches on which the FC service is enabled.

Additionally, you can discover many models of Cisco devices running in NPV
mode with this data collector.

== Terminology

Cloud Insights acquires the following inventory information from the Cisco
FC Switch data collector. For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term
```

```
|Switch|Switch
|Port|Port
|VSAN|Fabric
|Zone|Zone
|Logical Switch|Logical Switch
|Name Server Entry|Name Server Entry
|Inter-VSAN Routing (IVR) Zone|IVR Zone
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* An IP address of one switch in the fabric or individual switches
* Chassis discovery, to enable fabric discovery
* If using SNMP V2, read-only community string
* Port 161 is used to access the device

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Cisco Switch IP|IP address or fully-qualified domain name of the switch
|SNMP Version|Select V1, V2, or V3. V2 or later is required for
performance acquisition.
|SNMP Community String|SNMP read-only community string used to access the
switch (not applicable for SNMP v3)
|User Name|User name for the switch (SNMP v3 only)
|Password|Password used for the switch (SNMPv3 only)
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls (default
40 minutes)
|SNMP Auth Protocol|SNMP authentication protocol (SNMPv3 only)
|SNMP Privacy Protocol|SNMP privacy protocol (SNMPv3 only)
|SNMP Privacy Password|SNMP Privacy Password
|SNMP Retries|Number of SNMP retry attempts
|SNMP Timeout (ms)|SNMP timeout (default 5000 ms)
|Enable Trapping|Select to enable trapping. If you enable trapping, you
```

```
must also activate SNMP notifications.
|Minimum Time Between Traps (sec)|Minimum time between acquisition
attempts triggered by traps (default 10 seconds)
|Discover All Fabric Switches|Select to discover all switches in the
fabric
|Excluded Devices|Comma-separated list of device IPs to exclude from
polling
|Included Devices|Comma-separated list of device IPs to include in polling
|Check Device Type|Select to accept only those devices that explicitly
advertise themselves as Cisco devices
|First Alias Type|Provide a first preference for resolution of the alias.
Choose from the following:

*Device Alais*
This is a user-friendly name for a port WWN (pWWN) that can be used in all
configuration commands, as required. All switches in the Cisco MDS 9000
Family support Distributed Device Alias Services (device aliases).

*None*
Do not report any alias.

*Port Description*
A description to help identify the port in a list of ports.

*Zone Alias (all)*
A user-friendly name for a port that can be used only for the active
configuration. This is the default.
|Second Alias Type|Provide a second preference for resolution of the alias
|Third Alias Type|Provide a third preference for resolution of the alias
|Enable SANTap Proxy Mode Support|Select if your Cisco switch is using
SANTap in proxy mode. If you are using EMC RecoverPoint, then you are
probably using SANTap.
|Performance Poll Interval (sec)|Interval between performance polls
(default 300 seconds)
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Failed to discover chassis - no switches have been discovered
|•  Ping the device with the IP configured
```

```
•   Login to the device using Cisco Device Manager GUI
•   Login to the device using CLI
•   Try to run SNMP walk
|Error: Device is not a Cisco MDS switch
|•  Make sure the data source IP configured for the device is correct
•   Login to the device using Cisco Device Manager GUI
•   Login to the device using CLI
|Error: Cloud Insights is not able to obtain the switch’s WWN. |This may
not be a FC or FCoE switch, and as such may not be supported. Make sure
the IP/FQDN configured in the datasource is truly a FC/FCoE switch.
|Error: Found more than one nodes logged into NPV switch port
|Disable direct acquisition of the NPV switch
|Error: Could not connect to the switch
|•  Make sure the device is UP
•   Check the IP address and listening port
•   Ping the device
•   Login to the device using Cisco Device Manager GUI
•   Login to the device using CLI
•   Run SNMP walk
|===

=== Performance
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Performance acquisition not supported by SNMP v1
|•  Edit Data Source and disable Switch Performance
•   Modify Data Source and switch configuration to use SNMP v2 or higher
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDb620847bdb9ce38d237939a7913e8edd]]
= Cohesity SmartFiles data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
```

```
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This REST API-based collector will acquire a Cohesity cluster, discovering
the “Views” (as Cloud Insights Internal Volumes), the various nodes, as
well as collecting performance metrics.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Cohesity Cluster IP|IP address of the Cohesity cluster
|User Name|User name for the Cohesity cluster
|Password|Password used for the Cohesity cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|TCP Port|Port used for TCP communication with the Cohesity cluster
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 60 minutes.
|Performance Poll Interval (min)|Interval between performance polls. The
default is 900 seconds.
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



= Dell

:leveloffset: +1



[[IDbfb5b8f844eb9d360c742bb44887aabd]]
= Dell EMC XC Series data collector
:toc: macro
:hardbreaks:
```

```
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to discover inventory and
performance information for the Dell EMC XC Series storage arrays.

////
== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term

|Disk|Disk
|Disk Folder|Disk Group
|Storage Center|Storage
|Controller|Storage Node
|Storage Type|Storage Pool
|Volume|Volume
|Fiber Channel I/O Port|Port
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* Administrator credentials for the Dell EMC XC Enterprise Manager server
* IP address of the XC Enterprise Manager server
////

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Prism External IP Address|IP address of the XC server
```

```
|User Name|User name for the XC server
|Password|Password used for the XC server
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|TCP Port|Port used for TCP communication with the XC server
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 60 minutes.
|Performance Poll Interval (min)|Interval between performance polls. The
default is 300 seconds.
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



:leveloffset: -1


= Dell EMC

:leveloffset: +1


[[IDfe579555d0b33858ad5d417d8168738a]]
= DELL EMC Data Domain data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector gathers inventory and performance information from
DELL EMC Data Domain deduplication storage systems. To configure this data
collector, there are specific configuration instructions and usage
```

```
recommendations you must follow.

== Terminology

Cloud Insights acquires the following inventory information from the Data
Domain data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk|Disk
|Array|Storage
|FC Port|Port
|File System|Internal Volume
|Quota|Quota
|NFS and CIFS share|FileShare
|===

Note: These are common terminology mappings only and might not represent
every case for this data colletor.

== Requirements

You need the following information to configure this data collector:

* IP address of the Data Domain device
* Read-only user name and password to the Data Domain storage
* SSH port 22

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|IP address|The IP address or fully-qualified domain name of the Data
Domain storage array
|User name|The user name for the Data Domain storage array
|Password|The password for the Data Domain storage array
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 20.
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 180.
|SSH Port|SSH service port
|===



== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID9e4a5deeefbc9e5d53956e2821afc1e7]]
= Configuring the EMC ECS data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector acquires inventory and performance data from EMC ECS
storage systems. For configuration, the data collector requires an IP
address or hostname of the ECS cluster and a username and password.

NOTE: Dell EMC ECS is metered at a different Raw TB to Managed Unit rate.
Every 40 TB of unformatted ECS capacity is charged as 1
xref:{relative_path}concept_subscribing_to_cloud_insights.html#pricing[Man
aged Unit (MU)].

== Terminology

Cloud Insights acquires the following inventory information from the ECS
data collector. For each asset type acquired, the most common terminology
used for this asset is shown. When viewing or troubleshooting this data
collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Cluster|Storage
|Tenant|Storage Pool
|Bucket|Internal Volume
|Disk|Disk
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* An IP address or hostname of the ECS cluster
* A username and password for the ECS system
* Port 4443 (HTTPS).  Requires outbound connectivity to TCP port 4443 on
the ECS system.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|ECS Host|IP address or fully-qualified domain name of the ECS system
|ECS Host Port| Port used for communication with ECS Host
|ECS User ID|User ID for ECS
|Password|Password used for ECS
|===


== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|The default is 360 minutes.
|===


== Troubleshooting


Some things to try if you encounter problems with this data collector:

==== Inventory

[cols=2*, options="header", cols"50,50"]
```

```
|===
|Problem:|Try this:
|Error: User authentication failed.
|Make sure your credentials for this device are correct.
|===

==== Performance

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:

|Error: No enough data collected.
|•  Check collection timestamp in log file and modify polling interval
accordingly
•   Wait for longer time


|Error: Performance polling interval is too big.
|Check collection timestamp in log file ${logfile} and modify polling
interval accordingly


|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDbba2e5f5dfde9f33c740bd279bfb711a]]
= Dell EMC PowerScale data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Dell EMC PowerScale (previously Isilon) SSH data
collector to acquire inventory and performance data from PowerScale scale-
out NAS storage.
```

```
== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Drive|Disk
|Cluster|Storage
|Node|Storage Node
|File System|Internal Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

You need the following information to configure this data collector:

* Administrator permissions to the PowerScale storage
* IP address of the PowerScale cluster
* SSH access to port 22

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|IP address|The IP address or fully-qualified domain name of the
PowerScale cluster
|User Name|User name for the PowerScale cluster
|Password|Password used for the PowerScale cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 20.
|Performance Poll Interval (sec)|Interval between performance polls. The
```

```
default is 300.
//|SSH Process Wait Timeout|SSH process timeout period. The default is 60.
|SSH Port|SSH service port. The default is 22.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Invalid login credentials" with error messages “Commands not enabled for
role-based administration require root user access”
|* Verify that the user has permissions to run the following commands on
the device:
  > isi version osrelease
  > isi status -q
  > isi status -n
  > isi devices -d %s
  > isi license
* Verify credentials used in the wizard are matching device credentials
|"Internal Error" with error messages “Command <Your command> run failed
with permission: <Your current permission>. Sudo command run permission
issue”
|Verify that the user has sudo permissions to run the following command on
the device
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID28f30f0d1b6e5b77b425e29d1f672437]]
= Dell EMC Isilon / PowerScale REST data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
```

```
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Dell EMC Isilon / PowerScale REST data collector
to acquire inventory and performance data from Dell EMC Isilon or
PowerScale storage. This collector supports arrays running OneFS 8.0.0+.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Drive|Disk
|Cluster|Storage
|Node|Storage Node
|OneFS File System|Internal Volume
|OneFS File System|Storage Pool
|Qtree|Qtree
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

You need the following information to configure this data collector:

* A user account and password. This account does NOT need to be
admin/root, but you MUST grant a substantial number of read only
privileges to your service account - see table below
* IP address / Fully Qualified Domain Name of the Dell EMC Isilon /
PowerScale cluster
* HTTPS access to port 8080
* Isilon / PowerScale cluster running OneFS 8.0.0 or higher

[cols=3*, options="header", cols"33,33,33"]
|===
|Privilege Name|Description|r(read) or rw (read+write)
|ISI_PRIV_LOGIN_PAPI|Platform API|r
|ISI_PRIV_SYS_TIME|Time|r
|ISI_PRIV_AUTH|Auth|r
```

```
|ISI_PRIV_ROLE|Privilege|r
|ISI_PRIV_DEVICES|Devices|r
|ISI_PRIV_EVENT|Event|r
|ISI_PRIV_HDFS|HDFS|r
|ISI_PRIV_NDMP|NDMP|r
|ISI_PRIV_NETWORK|Network|r
|ISI_PRIV_NFS|NFS|r
|ISI_PRIV_PAPI_CONFIG|Configure Platform API|r
|ISI_PRIV_QUOTA|Quota|r
|ISI_PRIV_SMARTPOOLS|SmartPools|r
|ISI_PRIV_SMB|SMB|r
|ISI_PRIV_STATISTICS|Statistics|r
|ISI_PRIV_SWIFT|Swift|r
|ISI_PRIV_JOB_ENGINE|Job Engine|r
|===

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Isilon IP address|The IP address or fully-qualified domain name of the
Isilon storage
|User Name|User name for the Isilon
|Password|Password used for the Isilon
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|HTTPS Port|The default is 8080.
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 20.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300.
//|SSH Process Wait Timeout|SSH process timeout period. The default is 60.

|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Invalid login credentials" with error messages “Commands not enabled for
role-based administration require root user access”
|* Verify that the user has permissions to run the following commands on
the device:
  > isi version osrelease
  > isi status -q
  > isi status -n
  > isi devices -d %s
  > isi license
* Verify credentials used in the wizard are matching device credentials
|"Internal Error" with error messages “Command <Your command> run failed
with permission: <Your current permission>. Sudo command run permission
issue”
|Verify that the user has sudo permissions to run the following command on
the device
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[ID6d3827c2b20cbb0c1b01455c6ea00c3a]]
= Dell EMC PowerStore data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The EMC PowerStore data collector gathers inventory information from EMC
PowerStore storage. For configuration, the data collector requires the IP
address of the storage processors and a read-only user name and password.

The EMC PowerStore data collector gathers the volume-to-volume replication
relationships that PowerStore coordinates across other storage arrays.
Cloud Insights shows a storage array for each PowerStore cluster, and
collects inventory data for nodes and storage ports on that cluster. No
```

```
storage pool or volume data is collected.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|host|host
|host_volume_mapping|host_volume_mapping
|hardware (it has Drives under "extra_details" object): Drives|Disk
|Appliance|StoragePool
|Cluster|Storage Array
|Node|StorageNode
|fc_port|Port
|volume|Volume
|InternalVolume|file_system
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.


== Requirements

The following information is required to configure this data collector:

* IP address or fully-qualified domain name of storage processor
* Read-only user name and password

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|PowerStore gateway(s)|IP addresses or fully-qualified domain names of
PowerStore storage
|User Name|User name for PowerStore
|Password|Password used for PowerStore
|===

== Advanced configuration
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|HTTPS Port|Default is 443
|Inventory Poll Interval (minutes)|Interval between inventory polls. The
default is 60 minutes.
|===

Cloud Insight's PowerStore performance collection makes use of
PowerStore's 5-minute granularity source data. As such, Cloud Insights
polls for that data every five minutes, and this is not configurable.

== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID7e6c65221f5ed468368dbeaf6447b33b]]
= Dell EMC RecoverPoint data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The EMC RecoverPoint data collector's primary use case is to discover
volume-to-volume replication relationships that the RecoverPoint storage
appliance facilitates. This collector will also discover the Recoverpoint
appliance itself. Please note that Dell/EMC sells a VMware backup solution
for VMs--"RecoverPoint for VMs"--which is not supported by this collector

For configuration, the data collector requires the IP address of the
storage processors and a read-only user name and password.


The EMC RecoverPoint data collector gathers the volume-to-volume
replication relationships that RecoverPoint coordinates across other
storage arrays. Cloud Insights shows a storage array for each RecoverPoint
```

```
cluster, and collects inventory data for nodes and storage ports on that
cluster. No storage pool or volume data is collected.

== Requirements

The following information is required to configure this data collector:

* IP address or fully-qualified domain name of storage processor
* Read-only user name and password
* REST API access via port 443


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Address of RecoverPoint|IP address or fully-qualified domain name of
RecoverPoint cluster
|User Name|User name for the RecoverPoint cluster
|Password|Password used for the RecoverPoint cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|TCP Port|TCP Port used to connect to Recoverpoint cluster
|Inventory Poll Interval (minutes)|Interval between inventory polls. The
default is 20 minutes.
|Excluded Clusters|Comma-separated list of cluster IDs or names to exclude
when polling.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].
```

```
[[ID290615de6b4d768fae49082af2144c0e]]
= DELL EMC ScaleIO / PowerFlex data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The ScaleIO/PowerFlex data collector collects inventory information from
ScaleIO & PowerFlex storage. For configuration, this data collector
requires the ScaleIO/PowerFlex gateway address and an admin user name and
password.

== Terminology

Cloud Insights acquires the following inventory information from the
ScaleIO/PowerFlex data collector. For each asset type acquired by Cloud
Insights, the most common terminology used for this asset is shown. When
viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|MDM (Meta Data Manager) Cluster|Storage
|SDS (ScaleIO/PowerFlex Data Server)|Storage Node
|Storage Pool|Storage Pool
|Volume|Volume
|Device|Disk
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* Read-only access to the Admin user account
* Port requirement: HTTPS Port 443



== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|ScaleIO/PowerFlex  Gateway(s)|IP addresses or FQDNs of ScaleIO/PowerFlex
gateways, separated by comma (,) or semicolon (;)
|User Name|Admin user name used to log in to the ScaleIO/PowerFlex device
|Password|Password used to log in to the ScaleIO/PowerFlex device
|===

== Advanced configuration

Click the Inventory check box to enable inventory collection.

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|HTTPS port|443
|Inventory poll interval (min)|The default is 60.
|Connection Timeout (sec)|The default is 60.
|===



== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDf9a5a99904924aa497c9dc1452edc334]]
= Configuring the EMC Unity data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The DELL EMC Unity (formerly VNXe) data collector provides inventory
support for VNXe unified storage arrays. Cloud Insights currently supports
iSCSI and NAS protocols.

== Requirements

* The Unity data collector is CLI based; you must install the Unisphere
```

```
for Unity CLI, (uemcli.exe) onto the acquisition unit where your VNXe data
collector resides.
* uemcli.exe uses HTTPS as the transport protocol, so the acquisition unit
will need to be able to initiate HTTPS connections to the Unity.
* IP address or fully-qualified domain name of the Unity device
* You must have at least a read-only user for use by the data collector.
//* IP address of the managing Solutions enabler server.
* HTTPS on Port 443 is required
* The EMC Unity data collector provides NAS and iSCSI support for
inventory; fibre channel volumes will be discovered, but Cloud Insights
does not report on FC mapping, masking, or storage ports.

== Terminology

Cloud Insights acquires the following inventory information from the Unity
data collector. For each asset type acquired by Cloud Insights, the most
common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:



[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk|Disk
|Storage Array|Storage
|Processor|Storage Node
|Storage Pool|Storage Pool
|General iSCSI Block info, VMware VMFS|Share
|Replication Remote System|Synchronization
|iSCSI Node|iSCSI Target Node
|iSCSI Initiator|iSCSI Target Initiator
|===
Note: These are common terminology mappings only and might not represent
every case for this data source.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Unity Storage|IP address or fully-qualified domain name of the Unity
device
|User Name |User name for the Unity device
|Password |Password for the Unity device
|Full Path to the Executable UEMCLI|Full path to the folder containing the
```

```
_uemcli.exe_ executable
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Interval between inventory polls. The
default is 40 minutes
|Unity CLI Port |Port used for the Unity CLI
//|Inventory External Process Timeout (sec) |The default is 1800.
|Performance poll interval (sec)|The default is 300.
|===

== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Failed to execute external utility" with error messages “Failed to find
Unisphere executable uemcli”
|* Verify correct IP address, username, and password
* Confirm that Unisphere CLI is installed on the Cloud Insights
Acquisition Unit
* Confirm that Unisphere CLI installation directory is correct in the
datasource configuration
* Confirm that the IP of the VNXe is correct in the configuration of the
datasource. From the Cloud Insights Acquisition Unit, open a CMD and
change to to the configured installation directory: ${INSTALLDIR. Try to
make a connection with the VNXe device by typing: uemcli -d <Your IP> -u
<Your ID> /sys/general show
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDe0c9b3293bba10b8a2d196ed90897693]]
=  Dell EMC VMAX and PowerMax Family of Devices data collector
```

```
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights discovers EMC VMAX and PowerMax storage arrays by using
Solutions Enabler symcli commands in conjunction with an existing
Solutions Enabler server in your environment. The existing Solutions
Enabler server has connectivity to the VMAX/PowerMax storage array through
access to gatekeeper volumes.

== Requirements

Before configuring this data collector, you should ensure that Cloud
Insights has TCP connectivity to port 2707 on the existing Solutions
Enabler server. Cloud Insights discovers all the Symmetrix arrays that are
"Local" to this server, as seen in "symcfg list" output from that server.

* The EMC Solutions Enabler (CLI) with SMI-S provider application must be
installed on the Acquisition Unit server and the version must match or be
earlier than the version running on the Solutions Enabler Server.
* A properly configured {installdir}\EMC\SYMAPI\config\netcnfg file is
required. This file defines service names for Solutions Enabler servers,
as well as the access method (SECURE / NOSECURE /ANY).
* If you require read/write latency at the storage node level, the SMI-S
Provider must communicate with a running instance of the UNISPHERE for
VMAX application.
* IP address of the managing Solutions Enabler server
* Administrator permissions on the Solutions Enabler (SE) Server
* Read-only user name and password to the SE software

* The UNISPHERE for VMAX application must be running and collecting
statistics for the EMC VMAX and PowerMax sstorage arrays that are managed
by the SMI-S Provider installation
* Access validation for performance: In a web browser on your Acquisition
Unit, go to _\https://<SMI-S Hostname or IP>:5989/ecomconfig_ where "SMI-S
Hostname or IP" is the IP address or hostname of your SMI-S server. This
URL is for an administrative portal for the EMC SMI-S (aka "ECOM") service
- you will receive a login popup.

* Permissions must be declared in the Solutions Enabler server's daemon
configuration file, usually found here: _/var/symapi/config/daemon_users_
```

```
+
Here is an example file with the proper cisys permissions.

 root@cernciaukc101:/root
 14:11:25 # tail /var/symapi/config/daemon_users
 ###
 ###     Refer to the storrdfd(3) man page for additional details.
 ###
 ###     As noted above, only authorized users can perform stordaemon
control
 ###     operations (e.g., shutdown).
 ##########################################################################
#######
 # smith         storrdfd
 cisys storapid <all>

== Terminology

Cloud Insights acquires the following inventory information from the EMC
VMAX/PowerMax data source. For each asset type acquired, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk|Disk
|Disk Group|Disk Group
|Storage|Array  Storage
|Director|Storage Node
|Device Pool, Storage Resource Pool (SRP)|Storage Pool
|Device TDev|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Configuration

*Note:* If SMI-S user authentication is not enabled, the default values in
the Cloud Insights data collector are ignored.


[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
```

```
|Service Name|Service name as specified in _netcnfg_ file
|Full path to CLI|Full path to the folder containing the Symmetrix CLI
|SMI-S Host IP Address| IP address of the SMI-S host
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 40 minutes.
|Choose 'Exclude' or 'Include' to specify a list|Specify whether to
include or exclude the array list below when collecting data.
|Inventory Filter Device List|Comma-separated list of device IDs to
include or exclude
|Connection Caching|Choose connection caching method:

* LOCAL means that the Cloud  Insights Acquisition service is running on
the Solutions Enabler server, which has Fibre Channel connectivity to the
Symmetrix arrays you seek to discover, and has access to gatekeeper
volumes. This might be seen in some Remote Acquisition Unit (RAU)
configurations.
* REMOTE_CACHED is the default and should be used in most cases. This uses
the NETCNFG file settings to connect using IP to the Solutions Enabler
server, which must have Fibre Channel connectivity to the Symmetrix arrays
you seek to discover, and has access to Gatekeeper volumes.
* In the event that REMOTE_CACHED options make CLI commands fail, use the
REMOTE option. Keep in mind that it will slow down the acquisition process
(possibly to hours or even days in extreme cases). The NETCNFG file
settings are still used for an IP connection to the Solutions Enabler
server that has Fibre Channel connectivity to the Symmetrix arrays being
discovered.

*Note:* This setting does not change Cloud Insights behavior with respect
to the arrays listed as REMOTE by the "symcfg list" output. Cloud Insights
gathers data only on devices shown as LOCAL by this command.

|SMI-S Protocol|Protocol used to connect to the SMI-S provider. Also
displays the default port used.
|Override SMIS-Port|If blank, use the default port in the Connection Type
field, otherwise enter the connection port to use

//|CLI Timeout (sec)|CLI process timeout (default 7200 seconds)
//|SMI-S Host IP|IP address of the SMI-S Provider Host
//|SMI-S Port|Port used by SMI-S Provider Host
```

```
//|SMI-S Namespace|Interoperability namespace that the SMI-S provider is
configured to use
|SMI-S User Name|User name for the SMI-S Provider Host
|SMI-S Password|User name for the SMI-S Provider Host
|Performance Polling Interval (sec) |Interval between performance polls
(default 1000 seconds)
|hoose 'Exclude' or 'Include' to specify a list| Specify whether to
include or exclude the array list below when collecting performance data
|Performance Filter Device List|Comma-separated list of device IDs to
include or exclude
//|RPO Polling Interval (sec)|Interval between RPO polls (default 300
seconds)
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: The feature being requested is not currently licensed
|Install the SYMAPI server license.
|Error: No devices were found
|Make sure Symmetrix devices are configured to be managed by the the
Solutions Enabler server:
  - Run symcfg list -v to see the list of configured Symmetrix devices.
|Error: A requested network service was not found in the service file
|Make sure the Solutions Enabler Service Name is defined the netcnfg file
for Solutions Enabler. This file is usually located under SYMAPI\config\
in the Solutions Enabler client installation.
|Error: The remote client/server handshake failed
|Check the most recent storsrvd.log* files on the Solutions Enabler host
we are trying to discover.
|Error: Common name in client certificate not valid
|Edit the _hosts_ file on the Solutions Enabler server so that the
Acquisition Unit's hostname resolves to the IP address as reported in the
storsrvd.log on the Solutions Enabler server.
|Error: The function could not obtain memory
|Make sure there is enough free memory available in the system to execute
Solutions Enabler
|Error: Solutions Enabler was unable to serve all data required.
|Investigate the health status and load profile of Solutions Enabler
|Error:
•   The "symcfg list -tdev" CLI command may return incorrect data when
collected with Solutions Enabler 7.x from a Solutions Enabler server 8.x.
```

```
•   The "symcfg list -srp" CLI command may return incorrect data when
collected with Solutions Enabler 8.1.0 or earlier from a Solutions Enabler
server 8.3 or later.
|Be sure you are using the same Solutions Enabler major release
|I'm seeing data collection errors with the message: "unknown code"
|You may see this message if permissions are not declared in the Solutions
Enabler server's daemon configuration file (see the <<requirements,
Requirements>> above.) This assumes your SE client version matches your SE
server version.

This error may also occur if the _cisys_ user (which executes Solutions
Enabler commands) has not been configured with the necessary daemon
permissions in the /var/symapi/config/daemon_users configuration file.

To fix this, edit the /var/symapi/config/daemon_users file and make sure
the cisys user has <all> permission specified for the storapid daemon.

Example:

 14:11:25 # tail /var/symapi/config/daemon_users
 ...
 cisys storapid <all>

|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID38d1e362aecffc2236f0d782a408c534]]
= Dell EMC VNX Block Storage (NaviCLI) data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Dell EMC VNX Block Storage (NaviSec) data
collector (formerly CLARiiON) to acquire inventory and performance data.
```

```
== Terminology

Cloud Insights acquires the following inventory information from the EMC
VNX Block Storage data collector. For each asset type acquired by Cloud
Insights, the most common terminology used for this asset is shown. When
viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk|Disk
|Storage|Storage
|Storage Processor|Storage Node
|This Pool, RAID Group|Storage Pool
|LUN|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data source.

== Requirements

The following requirements must be met in order to collect data:

* An IP address of each VNX block storage processor
* Read-only Navisphere username and password to the VNX block storage
arrays
* NaviSecCli must be installed on the Cloud Insights AU
* Access validation: Run NaviSecCLI from the Cloud Insights AU to each
array using the username and password.
* Port requirements: 80, 443
* NaviSecCLI version should correspond with the newest FLARE code on your
array
* For performance, statistics logging must be enabled.

== NaviSphere command line interface syntax

naviseccli.exe -h <IP address> -user <user> -password <password> -scope
<scope,use 0 for global scope> -port <use 443 by default> command

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field |Description
|VNX Block Storage IP Address|IP address or fully-qualified domain name of
```

```
the VNX block storage
|User Name |Name used to log into the VNX block storage device.
|Password|Password used to log into the VNX block storage device.
|CLI Path to naviseccli.exe|Full path to the folder containing the
_naviseccli.exe_ executable
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field |Description
|Inventory Poll Interval (min)|Interval between inventory polls. Default
is 40 minutes.
//|Use Secure Client |Select to use the _navseccl_ secure client (i)
|Scope|The secure client scope. The default is Global.
//|VNX block storage CLI Port|Port used for VNX block storage CLI. The
default is 443.
//|Inventory External Process Timeout (sec)|External process timeout. The
default is 1800 seconds.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300 seconds.
//|Performance External process timeout (sec)|External process timeout.
The default is 1800 seconds.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error:
•   Agent Not Running
•   Failed to find naviseccli
•   Failed to execute any command
|•  Confirm that NaviSphere CLI is installed on the Cloud Insight
Acquisition Unit
•   You have not selected the "Use secure client" option in the data
collector configuration wizard and do not have a non-secure version of
Naviphere CLI installed.
•   Confirm that NaviSphere CLI installation directory is correct in the
data collector configuration
```

```
•   Confirm that the IP of the VNX block storage is correct in the data
collector configuration:
•   From the Cloud Insights Acquisition Unit:
    -   Open a CMD.
    -   Change the directory to the configured installation directory
    -   Try to make a connection with the VNX block storage device by
typing “navicli -h {ip} getagent” (replace the {ip} with the actual IP)
|Error: 4.29 emc235848 emc241018 getall Failed to parse host alias info
|This is likely caused by a FLARE 29 corruption issue of the host
initiator database on the array itself. See EMC knowledge base articles:
emc235848, emc241018. You can also check
https://now.netapp.com/Knowledgebase/solutionarea.asp?id=kb58128
|Error: Unable to retrieve Meta LUNs. Error Executing java -jar
navicli.jar
|•  Modify the data collector configuration to use the secure client
(recommended)
•   Install navicli.jar in the CLI path to navicli.exe OR naviseccli.exe
•   Note: navicli.jar is deprecated as of EMC Navisphere version 6.26
•   The navicli.jar may be available on http://powerlink.emc.com
|Error: Storage Pools not reporting disks on Service Processor at
configured IP address
|Configure the data collector with both Service Processor IPs, separated
by a comma
|Error: Revision mismatch error
|•  This is usually caused by updating the firmware on the VNX block
storage device, but not updating the installation of NaviCLI.exe. This
also might be caused by having different devices with different firmwares,
but only one CLI installed (with a different firmware version).
•   Verify that the device and the host are both running identical
versions of the software:
    -   From the Cloud Insights Acquisition Unit, open a command line
window
    -   Change the directory to the configured installation directory
    -   Make a connection with the CLARiiON device by typing “navicli -h
${ip} getagent”
    -   Look for the version number on the first couple of lines. Example:
“Agent Rev:           6.16.2 (0.1)”
    -   Look for and compare the version on the first line. Example:
“Navisphere CLI Revision 6.07.00.04.07”
|Error: Unsupported Configuration - No Fibre Channel Ports
|The device is not configured with any Fibre Channel ports. Currently,
only FC configurations are supported.  Verify this version/firmware is
supported.
|===

Additional information may be found from the
```

```
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID0082ee8aa2954403272e9f7a829e815c]]
= DELL EMC VNX File (formerly Celerra Unified Storage System) data
collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector acquires inventory information from the VNX File
Storage System. For configuration, this data collector requires the IP
address of the storage processors and a read-only user name and password.

== Terminology

Cloud Insights acquires the following inventory information from the VNX
File data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Celerra Network Server/Celerra Storage Pool|Storage Pool
|File System|Internal Volume
|Data Mover|Controller
|File System mounted on a data mover|File Share
|CIFS and NFS Exports|Share
|Disk Volume|Backend LUN
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements
```

```
You need the following to configure this data collector:

* The IP address of the storage processor
* Read-only user name and password
* SSH port 22

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|VNX File IP Address|IP address or fully-qualified domain name of the VNX
File device
|User Name|Name used to log in to the VNX File device
|Password|Password used to log in to the VNX File device
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (minutes)|Interval between inventory polls. The
default is 20 minutes.
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 600
seconds.
//|Number of Retries|Number of inventory retry attempts. The default is 2.
//|SSH Banner Wait Timeout (sec)|SSH banner wait timeout. The default is
20 seconds.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Unable to proceed while DART update in progress
|Possible solution: Pause the data collector and wait for the DART upgrade
to complete before attempting another acquisition request.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
```

```
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[ID8d4dd5fd608263a9839d4dc9a15d6688]]
= Configuring the Dell EMC VNX Unified data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
For configuration, the Dell EMC VNX Unified (SSH) data collector requires
the IP address of the Control Station and a read-only username and
password.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===

|Vendor/Model Term|Cloud Insights Term

|Disk|Disk
|Disk Folder|Disk Group
|File system|Internal Volume
|Storage|Storage
|Storage Processor|Storage Node
|Storage Pool, RAID Group|Storage Pool
|LUN|Volume
|Data Mover|Controller
|File System mounted on a data mover|File Share
|CIFS and NFS Exports|Share
|Disk Volume|Backend LUN
|===

== Requirements
```

```
You need the following to configure the VNX (SSH) data collector:

* VNX IP address & Credentials to the Celerra Control Station.
* Read-only username and password.
* The data collector is able to run NaviCLI/NaviSecCLI commands against
the backend array utilizing the DART OS NAS heads



== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|VNX IP Address|IP address or fully-qualified domain name of the VNX
Control Station
|User Name |User name for the VNX Control Station
|Password |Password for the VNX Control Station
|===



== Advanced configiration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 40 minutes.
//|VNX SSH Process Wait Timeout|VNX SSH process timeout (default 600
seconds)
//|Celerra Command Retry Attempts|Number of Celerra command retry attempts
//|CLARiiON External Process Timeout for Inventory (sec)| CLARiiON
external process timeout for inventory. The default is 1800 seconds.)
|Performance Poll Interval (sec).|Interval between performance polls. The
default is 300 seconds.
//|CLARiiON External Process Timeout for Performance (sec).|CLARiiON
external process timeout for performance.The default is 1800 seconds.
|===




== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].
```

```
[[IDb1117375addbb8bf3b774369f365545f]]
= Configuring the EMC VPLEX data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector acquires inventory and performance data from EMC VPLEX
storage systems. For  configuration, the data collector requires an IP
address of the VPLEX server and an administrative level domain account.

NOTE: Cloud Insights' performance collection from Vplex clusters requires
that the performance archive service be operational, in order to populate
the .CSV files and logs that Cloud Insights retrieves via SCP-based file
copies. NetApp has observed that many Vplex firmware upgrade/management
station updates will leave this functionality non-operational. Customers
planning such upgrades may want to proactively ask Dell/EMC if their
planned upgrade will leave this functionality inoperable, and if so, how
can they re-enable it to minimize gaps in performance visibility? Cloud
Insight's Vplex performance code will assess on each poll whether all the
expected files exist, and if they are being properly updated; if they are
missing or stale, Cloud Insights will log performance collection failures.


== Terminology

Cloud Insightst acquires the following inventory information from the
VPLEX data collector. For each asset type acquired, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Cluster|Storage
|Engine|Storage Node
|Device, System Extent|Backend Storage Pool
|Virtual Volume|Volume
```

```
|Front-End Port, Back-End Port|Port
|Distributed Device|Storage Synchronization
|Storage View|Volume Map, Volume Mask
|Storage Volume|Backend LUN
|ITLs|Backend Path
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* An IP address of the VPLEX Management Console
* Administrative level domain account for the VPLEX server
* Port 443 (HTTPS).  Requires outbound connectivity to TCP port 443 on the
VPLEX management station.
* For performance, read-only username and password for ssh/scp access.
* For performance, port 22 is required.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|IP address of VPLEX Management Console|IP address or fully-qualified
domain name of the VPLEX Management Console
|User Name|User name for VPLEX CLI
|Password|Password used for VPLEX CLI
|Performance Remote IP Address|Performance Remote IP address of the VPLEX
Management Console
|Performance Remote User Name|Performance Remote user name of VPLEX
Management Console
|Performance Remote Password|Performance Remote Password of VPLEX
Management Console
|===


== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Communication Port|Port used for VPLEX CLI. The default is 443.
|Inventory Poll Interval (min)|The default is 20 minutes.
//|Connection timeout (sec)|The default is 60 seconds.
```

```
|Number of connection retries|The default is 3.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 600 seconds.
//|Performance SSH Process Wait Timeout (sec).| SSH process timeout. The
default is 600 seconds.
//|SSH Banner Wait Timeout (sec).|The default is 20 seconds.
|Number of Retries|The default is 2.
|===


== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: User authentication failed.
|Make sure your credentials for this device are correct.
|===

=== Performance

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: VPLEX performance for version below 5.3 is not supported.
|Upgrade VPLEX to 5.3 or above
|Error: No enough data collected.
|•  Check collection timestamp in log file and modify polling interval
accordingly
•   Wait for longer time
|Error: Perpetual Log files not being updated.
|Please contact EMC support to enable updating the perpetual log files
|Error: Performance polling interval is too big.
|Check collection timestamp in log file ${logfile} and modify polling
interval accordingly
|Error: Performance Remote IP address of VPLEX Management Console is not
configured.
|Edit the data source to set Performance Remote IP address of VPLEX
Management Console.
|Error: No performance data reported from director
|•  Check that the system performance monitors are running correctly
•   Please contact EMC support to enable updating the system performance
monitor log files
```

```
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID2e1376a470dfdbdf1fda21f911dec5e9]]
= Dell EMC XtremeIO data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The EMC XtremIO data collector acquires inventory and performance data
from the EMC XtremIO storage system.

== Requirements

To configure the EMC XtremIO (HTTP) data collector, you must have:

* The XtremIO Management Server (XMS) Host address
* An account with administrator privileges
* Access to port 443 (HTTPS)

== Terminology

Cloud Insights acquires the following inventory information from the EMC
XtremIO data collector. For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data source, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk (SSD)|Disk
|Cluster|Storage
|Controller|Storage Node
|Volume|Volume
|LUN Map|Volume Map
```

```
|Target FC Initiator|Volume Mask
|===

Note: These are common terminology mappings only and might not represent
every case for this data source.

== Requirements

* The XtremIO Management Server (XMS) Host IP address
* Administrator user name and password for the XtremIO

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|XMS Host|IP address or fully-qualified domain name of the XtremIO
Management Server
|User name|User name for the XtremIO Management Server
|Password|Password for the XtremIO Management Server
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|TCP port|TCP Port used to connect to XTremIO Management Server. The
default is 443.
|Inventory poll interval (min)|Interval between inventory polls. The
default is 60 minutes.
//|Connection timeout (sec)|Connection timeout The default is 60 seconds.
|Performance poll interval (sec)|Interval between performance polls. The
default is 300 seconds.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].
```

```
:leveloffset: -1


[[ID394489cdae380e5e9493d6bdd0840e4a]]
= Fujitsu Eternus data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Fujitsu Eternus data collector acquires inventory data using
administration-level access to the storage system.

== Terminology

Cloud Insights acquires the following inventory information from the
Fujitsu Eternus storage. For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk|Disk
|Storage|Storage
|Thin Pool, Flexible Tier Pool, Raid Group|Storage Pool
|Standard Volume, Snap Data Volume (SDV), Snap Data Pool Volume (SDPV),
Thin Provisioning Volume (TPV), Flexible Tier Volume (FTV), Wide Striping
Volume (WSV)|Volume
|Channel adapter|Controller
|===

Note: These are common terminology mappings only and might not represent
every case for this data collectior.

== Requirements

The following are required to configure this data collector:

* An IP address of the Eternus storage, which cannot be comma delimited
* SSH Administration-level user name and password
* Port 22
* Ensure that the page scroll is disabled (clienv-show-more-scroll
disable)

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|IP Address of Eternus Storage|IP address of the Eternus storage
|User Name|User name for Eternus storage
|Password|Password for the Eternus storage
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|The default is 20 minutes.
//|SSH Process Wait Timeout (sec)|SSH process timeout. The   default is
600 seconds.
|===

== Troubleshooting

Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Error retrieving data" with error messages “Error Finding Prompt CLI” or
“Error finding prompt at the end of shell results”
|Likely caused by: Storage system has page scrolling enabled.
Possible solution:
* Try to disable page scrolling by running the following command:
 set clienv-show-more -scroll disable
|"Connecting error" with error messages “Failed to instantiate an SSH
connection to storage” or “Failed to instantiate a connection to
VirtualCenter”
|Likely causes:
* Incorrect credentials.
* Incorrect IP address.
* Network problem.
* Storage may be down or unresponsive.
```

```
Possible solutions:
* Verify credentials and IP address entered.
* Try to communicate with storage using SSH Client.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDa111551265852bdb8c31e849685b5f56]]
= NetApp Google Compute data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector supports inventory and performance collection from
Google Compute cloud platform configurations. This collector will seek to
discover all the Compute resources within all the Projects within one
Google organization. If you have multiple Google organizations you want to
discover with Cloud Insights, you will want to deploy one Cloud Insights
collector per organization.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Organization ID|The organization ID you want to discover with this
collector. This field is required if your service account is able to see
more than one organization
|Choose 'Exclude' or 'Include' to filter GCP Projects by IDs| If you want
to limit what projects' resources are brought into Cloud Insights.
|Project IDs |The list of Project IDs that you want to filter in, or out
from discovery, depending on the value of the "Choose 'Exclude"...."
value. The default list is empty
|Client ID |Client ID for the Google Cloud Platform configuration
|Copy and paste the contents of your Google Credential File here|Copy your
```

```
Google credentials for the Cloud Platform account to this field
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Default is 60 minutes

|Choose 'Exclude' or 'Include' to Apply to Filter VMs by Labels|Specify
whether to include or exclude VM's by Labels when collecting data. If
‘Include’ is selected, the Label Key field can not be empty.
|Label Keys and Values on which to Filter VMs|Click *+ Filter Label* to
choose which VMs (and associated disks) to include/exclude by filtering
for keys and values that match keys and values of labels on the VM. Label
Key is required, Label Value is optional. When Label Value is empty, the
VM is filtered as long as it matches the Label Key.

|Performance Poll Interval (sec)|Default is 1800 seconds

|===



== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





= HP Enterprise

:leveloffset: +1



[[ID8fd6376d4fada350187f8cd06733511a]]
= HP Enterprise Alletra 9000 / Primera Storage data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
```

```
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the HP Enterprise Alletra 9000 / HP Enterprise Primera
(previously 3PAR)  data collector to discover inventory and performance.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Physical Disk|Disk
|Storage System|Storage
|Controller Node|Storage Node
|Common Provisioning Group|Storage Pool
|Virtual Volume|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

The following are required to configure this data colletor:

* IP address or FQDN of the InServ cluster
* For inventory, read-only user name and password to the StoreServ Server
* For performance, read-write user name and password to the StoreServ
Server
* Port requirements: 22 (inventory collection), 5988 or 5989 (performance
collection) [Note: Performance is supported for StoreServ OS 3.x+]
* For performance collection confirm that SMI-S is enabled by logging into
the array via SSH.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Storage IP address|Storage IP address or fully-qualified domain name of
the StoreServ cluster
```

```
|User Name|User name for the StoreServ Server
|Password|Password used for the StoreServ Server
//|SMI-S Host IP address|IP address of the SMI-S Provider Host
|SMI-S User Name|User name for the SMI-S Provider Host
|SMI-S Password|Password used for the SMI-S Provider Host
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 40 minutes.
//|Excluded Devices|Comma-separated list of device IPs to exclude
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 60
seconds.
//|Number of SSH Retries|Number of SSH retry attempts
//|SSH Banner Wait Timeout (sec)|SSH banner wait timeout. The default is
20 seconds.
|SMI-S Connectivity|Protocol used to connect to the SMI-S provider
|Override SMI-S Default Port|If blank, use the default port from SMI-S
Connectivity, otherwise enter the connection port to use
//|SMI-S Password|Password used for the SMI-S Provider Host
//|SMI-S namespace|SMI-S namespace. The default path is root/PG_InterOp.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300 seconds.
//|Number of SMI-S Connection Retries|Number of SMI-S connection retry
attempts
|===

== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

////
error: "Cache server is waiting for the system manager"
Customer can take action.  What can customer do about this scenario?
////

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"showsys" command doesn't return any result.
|Run "showsys" and "showversion -a" from the command line and check if the
```

```
version is supported by the array.
|===

=== Performance

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Failed to connect or login. Provider initialization failed.
|An all-numeric array name can cause problems with SMI-S server. Try
changing the array name.
|SMI-S user configured does not have any domain
|Grant appropriate domain privileges to the configured SMI-S user

|Cloud Insights states that it cannot connect/login to SMI-S service.
|Confirm there is no firewall between the CI AU and the array that would
block the CI AU from making TCP connections to 5988 or 5989.
Once that is done, and if you have confirmed there is no firewall, you
should SSH to the array, and use the “showcim” command to confirm.

Verify that:

* Service is enabled
* HTTPS is enabled
*   HTTPS port should be 5989

If those all are so, you can try to “stopcim” and then a  “startcim” to
restart the CIM (i.e. SMI-S service).


|===


Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID2a209f90c9deb914343890a6cef04307]]
= HP Enterprise Command View data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The HP Enterprise Command View Advanced Edition data collector supports
discovering XP and P9500 arrays via Command View Advanced Edition (CVAE)
server. Cloud Insights communicates with CVAE using the standard Command
View API to collect inventory and performance data.

== Terminology

Cloud Insights acquires the following inventory information from the HP
Enterprise Command View data collector. For each asset type acquired by
Cloud Insights, the most common terminology used for this asset is shown.
When viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|PDEV|Disk
|Journal Pool|Disk Group
|Storage Array|Storage
|Port Controller|Storage Node
|Array Group, DP Pool|Storage Pool
|Logical Unit, LDEV|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Inventory requirements

You must have the following in order to collect inventory data:

* IP address of the CVAE server
* Read-only user name and password for the CVAE software and peer
privileges
* Port requirement: 2001

== Performance requirements

The following requirements must be met in order to collect performance
data:

* HDS USP, USP V, and VSP performance
```

```
** Performance Monitor must be licensed.
** Monitoring switch must be enabled.
** The Export Tool (Export.exe) must be copied to the Cloud Insights AU
and extracted to a location. On CI Linux AUs, ensure "cisys" has read and
execute permissions.
** The Export Tool version must match the microcode version of the target
array.

* AMS performance:
** Performance Monitor must be licensed.
** The Storage Navigator Modular 2 (SNM2) CLI utility be installed on the
Cloud Insights AU.

* Network requirements
** The Export Tools are Java based, and use RMI to speak to the array.
These tools may not be firewall-friendly as they may dynamically negotiate
source and destination TCP ports on each invocation. Also, different model
array's Export Tools may behave differently across the network - consult
HPE for your model's requirements

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Command View Server |IP address or fully-qualified domain name of the
Command View server
|User Name |User name for the Command View server.
|Password|Password used for the Command View server.
|Devices - VSP G1000 (R800), VSP (R700), HUS VM (HM700) and USP storages
|Device list for VSP G1000 (R800), VSP (R700), HUS VM (HM700) and USP
storages. Each storage requires:

* Array's IP: IP address of the storage
* User Name: User name for the storage
* Password: Password for the storage
* Folder Containing Export Utility JAR Files

|SNM2Devices - WMS/SMS/AMS Storages|Device list for WMS/SMS/AMS storages.
Each storage requires:

* Array's IP: IP address of the storage
* Storage Navigator CLI Path: SNM2 CLI path
* Account Authentication Valid: Select to choose valid account
authentication
* User Name: User name for the storage
* Password: Password for the storage
|Choose Tuning Manager for Performance |Override other performance options
|Tuning Manager Host|IP address or fully-qualified domain name of tuning
manager
|Tuning Manager Port|Port used for Tuning Manager
|Tuning Manager Username|User name for Tuning Manager
|Tuning Manager Password|Password for Tuning Manager
|===
Note: In HDS USP, USP V, and VSP, any disk can belong to more than one
array group.

== Advanced configuration

|===
|Field|Description
|Command View Server Port |Port used for the Command View Server
|HTTPs Enabled|Select to enable HTTPs
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 40.
|Choose 'Exclude' or 'Include' to specify a list|Specify whether to
include or exclude the array list below when collecting data.
|Exclude or Include Devices|Comma-separated list of device ID's or array
names to include or exclude
|Query Host Manager|Select to query host manager
//|HTTP Timeout (sec)|HTTP connection timeout The default is 60.
|Performance Polling Interval (sec)|Interval between performance polls.
The default is 300.
//|Export timeout in seconds|Export utility timeout. The default is 300.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: User does not have enough permission
|Use a different user account that has more privilege or increase the
privilege of user account configured in the data collector
|Error: Storages list is empty. Either devices are not configured or the
user does not have enough permission
|*  Use DeviceManager to check if the devices are configured.
* Use a different user account that has more privilege, or increase the
```

```
privilege of the  user account
|Error: HDS storage array was not refreshed for some days
|Investigate why this array is not being refreshed in HP CommandView AE.
|===

=== Performance
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error:
* Error executing export utility
* Error executing external command
|* Confirm that Export Utility is installed on the Cloud Insights
Acquisition Unit
* Confirm that Export Utility location is correct in the data collector
configuration
* Confirm that the IP of the USP/R600 array is correct in the
configuration of the data collector
* Confirm that the User name and password are correct in the configuration
of the data collector
* Confirm that Export Utility version is compatible with storage array
micro code version
* From the Cloud Insights Acquisition Unit, open a CMD prompt and do the
following:
- Change the directory to the configured installation directory
- Try to make a connection with the configured storage array by executing
batch file runWin.bat
|Error: Export tool login failed for target IP
|* Confirm that username/password is correct
* Create a user ID mainly for this HDS data collector
* Confirm that no other data collectors are configured to acquire this
array
|Error: Export tools logged "Unable to get time range for monitoring".
|* Confirm performance monitoring is enabled on the array.
* Try invoking the export tools outside of Cloud Insights to confirm the
problem lies outside of Cloud Insights.
|Error:
* Configuration error: Storage Array not supported by Export Utility
* Configuration error: Storage Array not supported by Storage Navigator
Modular CLI
|* Configure only supported storage arrays.
* Use “Filter Device List” to exclude unsupported storage arrays.
|Error:
* Error executing external command
* Configuration error: Storage Array not reported by Inventory
* Configuration error:export folder does not contains jar files
```

```
|* Check Export utility location.
* Check if Storage Array in question is configured in Command View server
* Set Performance poll interval as multiple of 60 seconds.
|Error:
* Error Storage navigator CLI
* Error executing auperform command
* Error executing external command
|* Confirm that Storage Navigator Modular CLI is installed on the Cloud
Insights Acquisition Unit
* Confirm that Storage Navigator Modular CLI location is correct in the
data collector configuration
* Confirm that the IP of the WMS/SMS/SMS array is correct in the
configuration of the data collector
* Confirm that Storage Navigator Modular CLI version is compatible with
micro code version of storage array configured in the data collector
* From the Cloud Insights Acquisition Unit, open a CMD prompt and do the
following:
- Change the directory to the configured installation directory
- Try to make a connection with the configured storage array by executing
following command “auunitref.exe”
|Error: Configuration error: Storage Array not reported by Inventory
|Check if Storage Array in question is configured in Command View server
|Error:
* No Array is registered with the Storage Navigator Modular 2 CLI
* Array is not registered with the Storage Navigator Modular 2 CLI
* Configuration error: Storage Array not registered with StorageNavigator
Modular CLI
|* Open Command prompt and change directory to the configured path
* Run the command “set=STONAVM_HOME=.”
* Run the command “auunitref”
* Confirm that the command output contains details of the array with IP
* If the output does not contain the array details then register the array
with Storage Navigator CLI:
    - Open Command prompt and change directory to the configured path
    - Run the command “set=STONAVM_HOME=.”
    - Run command “auunitaddauto -ip ${ip}”. Replace ${ip} with real IP
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[IDa1c3c01da6ffbbb44ff71aa9832142a3]]
```

```
= HPE Alletra 6000 data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The HP Enterprise Alletra 6000 (previously Nimble) data collector supports
inventory and performance data for Alletra 6000 storage arrays.

== Terminology

Cloud Insights acquires the following inventory information from this
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Array|Storage
|Disk|Disk
|Volume|Volume
|Pool|Storage Pool
|Initiator|Storage Host Alias
|Controller|Storage Node
|Fibre Channel Interface|Controller
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

You must have the following in order to collect inventory and
configuration data from the storage array:

* The array must be installed and configured, and reachable from the
client through its fully qualified domain name (FQDN) or array management
IP address.
* The array must be running NimbleOS 2.3.x or later.
* You must have a valid user name and password to the array with at least
"Operator" level role. The "Guest" role does not have sufficient access to
```

```
understand initiator configurations.
* Port 5392 must be open on the array.

You must have the following in order to collect performance data from the
storage array:

* The array must be running NimbleOS 4.0.0 or later
* The array must have volumes configured. The only performance API
NimbleOS has is for volumes, and any statistics Cloud Insights reports are
derived from the statistics on volumes

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Array Management IP Address|Fully qualified domain name (FQDN) or array
management IP address.
|User Name|User name for the array
|Password|Password for the array
|===



== Advanced configuration

|===
|Field|Description
|Port|Port used by Nimble REST API. The default is 5392.
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 60 minutes.
|===

Note: The default performance poll interval is 300 seconds and can not be
changed. This is the only interval supported by HPE Alletra 6000.





:leveloffset: -1



= Hitachi Data Systems

:leveloffset: +1



[[IDe0b5755cbc12b6116f116f82ee4abe9b]]
```

```
= Hitachi Vantara Command Suite data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Hitachi Vantara Command Suite data collector supports the HiCommand
Device Manager server. Cloud Insights communicates with the HiCommand
Device Manager server using the standard HiCommand API.

== Terminology

Cloud Insights acquires the following inventory information from the
Hitachi Vantara Command Suite data collector. For each asset type acquired
by Cloud Insights, the most common terminology used for this asset is
shown. When viewing or troubleshooting this data collector, keep the
following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|PDEV|Disk
|Journal Pool|Disk Group
|Storage Array|Storage
|Port Controller|Storage Node
|Array Group, HDS Pool|Storage Pool
|Logical Unit, LDEV|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

=== Storage

The following terms apply to objects or references that you might find on
HDS storage asset landing pages. Many of these terms apply to other data
collectors as well.

* Name – comes directly from HDS HiCommand Device Manager’s “name”
attribute via the GetStorageArray XML API call
* Model - comes directly from HDS HiCommand Device Manager’s “arrayType”
attribute via the GetStorageArray XML API call
```

```
* Vendor - HDS
* Family - comes directly from HDS HiCommand Device Manager’s
“arrayFamily” attribute via the GetStorageArray XML API call
* IP – this is the management IP address of the array, not an exhaustive
list of all IP addresses on the array
* Raw Capacity – a base2 value representing the sum of the total capacity
of all disks in this system, regardless of disk role.

=== Storage Pool

The following terms apply to objects or references that you might find on
HDS storage pool asset landing pages. Many of these terms apply to other
data collectors as well.

* Type: The value here will be one of:
** RESERVED – if this pool is dedicated for purposes other than data
volumes, i.e, journaling, snapshots
** Thin Provisioning – if this is a HDP pool
** Raid Group – you will not likely see these for a few reasons:
+
Cloud Insights takes a strong stance to avoid double counting capacity at
all costs. On HDS, one typically needs to build Raid Groups from disks,
create pool volumes on those Raid Groups, and construct pools (often HDP,
but could be special purpose) from those pool volumes. If Cloud Insights
reported both the underlying Raid Groups as is, as well as the Pools, the
sum of their raw capacity would vastly exceed the sum of the disks.
+
Instead, Cloud Insights’ HDS Command Suite data collector arbitrarily
shrinks the size of Raid Groups by the capacity of pool volumes. This may
result in Cloud Insights not reporting the Raid Group at all.
Additionally, any resulting Raid Groups are flagged in a way such that
they are not visible in the Cloud Insights WebUI, but they do flow into
the Cloud Insights Data Warehouse (DWH). The purpose of these decisions is
to avoid UI clutter for things that most users do not care about – if your
HDS array has Raid Groups with 50MB free, you probably cannot use that
free space for any meaningful outcome.

* Node - N/A, as HDS pools are not tied to any one specific node
* Redundancy - the RAID level of the pool. Possibly multiple values for a
HDP pool comprised of multiple RAID types
* Capacity % - the percent used of the pool for data usage, with the used
GB and total logical GB size of the pool
* Over-committed Capacity - a derived value, stating “the logical capacity
of this pool is oversubscribed by this percentage by virtue of the sum of
the logical volumes exceeding the logical capacity of the pool by this
percentage”
```

```
* Snapshot - shows the capacity reserved for snapshot usage on this pool

=== Storage Node

The following terms apply to objects or references that you might find on
HDS storage node asset landing pages. Many of these terms apply to other
data collectors as well.

* Name – The name of the Front-end director (FED) or Channel Adapter on
monolithic arrays, or the name of the controller on a modular array. A
given HDS array will have 2 or more Storage Nodes
* Volumes – The Volume table will show any volume mapped to any port owned
by this storage node


== Inventory Requirements

You must have the following in order to collect inventory data:

* IP address of the HiCommand Device Manager server
* Read-only user name and password for the HiCommand Device Manager
software and peer privileges
* Port requirements: 2001 (http) or 2443 (https)
* Log into HiCommand Device Manager software using username and password
* Verify access to HiCommand Device Manager
http://<HiCommand_Device_Manager_IP>:2001/service/StorageManager

== Performance requirements

The following requirements must be met in order to collect performance
data:

* HDS USP, USP V, and VSP performance
** Performance Monitor must be licensed.
** Monitoring switch must be enabled.
** The Export Tool (Export.exe) must be copied to the Cloud Insights AU.
** The Export Tool version must match the microcode version of the target
array.

* AMS performance:
** NetApp strongly recommends creating a dedicated service account on AMS
arrays for Cloud Insights to use to retrieve performance data. Storage
Navigator only allows a user account one concurrent login to the array.
Having Cloud Insights use the same user account as management scripts or
HiCommand may result in Cloud Insights, management scripts, or HiCommand
being unable to communicate to the array due to the one concurrent user
account login limit
```

```
** Performance Monitor must be licensed.
** The Storage Navigator Modular 2 (SNM2) CLI utility needs to be
installed on the Cloud Insights AU.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|HiCommand Server |IP address or fully-qualified domain name of the
HiCommand Device Manager server
|User Name |User name for the HiCommand Device Manager server.
|Password|Password used for the HiCommand Device Manager server.
|Devices - VSP G1000 (R800), VSP (R700), HUS VM (HM700) and USP storages
|Device list for VSP G1000 (R800), VSP (R700), HUS VM (HM700) and USP
storages. Each storage requires:

* Array's IP: IP address of the storage
* User Name: User name for the storage
* Password: Password for the storage
* Folder Containing Export Utility JAR Files

|SNM2Devices - WMS/SMS/AMS Storages|Device list for WMS/SMS/AMS storages.
Each storage requires:

* Array's IP: IP address of the storage
* Storage Navigator CLI Path: SNM2 CLI path
* Account Authentication Valid: Select to choose valid account
authentication
* User Name: User name for the storage
* Password: Password for the storage

|Choose Tuning Manager for Performance|Override other performance options
|Tuning Manager Host|IP address or fully-qualified domain name of tuning
manager
|Override Tuning Manager Port|If blank, use the default port in the Choose
Tuning Manager for Performance field, otherwise enter the port to use
|Tuning Manager Username|User name for Tuning Manager
|Tuning Manager Password|Password for Tuning Manager
|===
Note: In HDS USP, USP V, and VSP, any disk can belong to more than one
array group.

== Advanced configuration

|===
|Field|Description
|Connection Type|HTTPS or HTTP, also displays the default port
|HiCommand Server Port |Port used for the HiCommand Device Manager
//|HTTPs Enabled|Select to enable HTTPs
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 40.
|Choose 'Exclude' or 'Include' to specify a list|Specify whether to
include or exclude the array list below when collecting data.
|Filter device List|Comma-separated list of device serial numbers to
include or exclude
//|Query Host Manager|Select to query host manager
//|HTTP Timeout (sec)|HTTP connection timeout The default is 60.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300.
|Export timeout in seconds|Export utility timeout. The default is 300.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: User does not have enough permission
|Use a different user account that has more privilege or increase the
privilege of user account configured in the data collector
|Error: Storages list is empty. Either devices are not configured or the
user does not have enough permission
|*  Use DeviceManager to check if the devices are configured.
* Use a different user account that has more privilege, or increase the
privilege of the  user account
|Error: HDS storage array was not refreshed for some days
|Investigate why this array is not being refreshed in HDS HiCommand.
|===

=== Performance
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error:
* Error executing export utility
* Error executing external command
|* Confirm that Export Utility is installed on the Cloud Insights
```

```
Acquisition Unit
* Confirm that Export Utility location is correct in the data collector
configuration
* Confirm that the IP of the USP/R600 array is correct in the
configuration of the data collector
* Confirm that the User name and password are correct in the configuration
of the data collector
* Confirm that Export Utility version is compatible with storage array
micro code version
* From the Cloud Insights Acquisition Unit, open a CMD prompt and do the
following:
- Change the directory to the configured installation directory
- Try to make a connection with the configured storage array by executing
batch file runWin.bat
|Error: Export tool login failed for target IP
|* Confirm that username/password is correct
* Create a user ID mainly for this HDS data collector
* Confirm that no other data collectors are configured to acquire this
array
|Error: Export tools logged "Unable to get time range for monitoring".
|* Confirm performance monitoring is enabled on the array.
* Try invoking the export tools outside of Cloud Insights to confirm the
problem lies outside of Cloud Insights.
|Error:
* Configuration error: Storage Array not supported by Export Utility
* Configuration error: Storage Array not supported by Storage Navigator
Modular CLI
|* Configure only supported storage arrays.
* Use “Filter Device List” to exclude unsupported storage arrays.
|Error:
* Error executing external command
* Configuration error: Storage Array not reported by Inventory
* Configuration error:export folder does not contains jar files
|* Check Export utility location.
* Check if Storage Array in question is configured in HiCommand server
* Set Performance poll interval as multiple of 60 seconds.
|Error:
* Error Storage navigator CLI
* Error executing auperform command
* Error executing external command
|* Confirm that Storage Navigator Modular CLI is installed on the Cloud
Insights Acquisition Unit
* Confirm that Storage Navigator Modular CLI location is correct in the
data collector configuration
* Confirm that the IP of the WMS/SMS/SMS array is correct in the
configuration of the data collector
```

```
* Confirm that Storage Navigator Modular CLI version is compatible with
micro code version of storage array configured in the data collector
* From the Cloud Insights Acquisition Unit, open a CMD prompt and do the
following:
- Change the directory to the configured installation directory
- Try to make a connection with the configured storage array by executing
following command “auunitref.exe”
|Error: Configuration error: Storage Array not reported by Inventory
|Check if Storage Array in question is configured in HiCommand server
|Error:
* No Array is registered with the Storage Navigator Modular 2 CLI
* Array is not registered with the Storage Navigator Modular 2 CLI
* Configuration error: Storage Array not registered with StorageNavigator
Modular CLI
|* Open Command prompt and change directory to the configured path
* Run the command “set=STONAVM_HOME=.”
* Run the command “auunitref”
* Confirm that the command output contains details of the array with IP
* If the output does not contain the array details then register the array
with Storage Navigator CLI:
    - Open Command prompt and change directory to the configured path
    - Run the command “set=STONAVM_HOME=.”
    - Run command “auunitaddauto -ip ${ip}”. Replace ${ip} with real IP
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID93da16b799a62ad6fdbfaa67f352ba33]]
= Configuring the Hitachi Vantara NAS data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Hitachi Vantara NAS data collector is an inventory and configuration
data collector that  supports discovery of HDS NAS clusters. Cloud
```

```
Insights supports discovering NFS and CIFS shares, file systems (Internal
Volumes), and spans (Storage Pools).

== Terminology

Cloud Insights acquires the following inventory information from the HNAS
data collector. For each asset type acquired by Cloud Insights, the most
common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Tier|Disk Group
|Cluster|Storage
|Node|Storage Node
|Span|Storage Pool
|System Drive|Backend Lun
|Files System|Internal Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* Device IP address
* Port 22, SSH protocol
* Username and password - privilege level: Supervisor
* Note: This data collector is SSH based, so the AU that hosts it must be
able to initiate  SSH sessions to TCP 22 on the HNAS itself, or the
Systems Management Unit (SMU) that the cluster is connected to.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|HNAS Host|IP address or fully-qualified domain name of HNAS Management
Host
|User Name|User name for HNAS CLI
|Password|Password used for HNAS CLI
|===

== Advanced configuration
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 30 minutes.
//|SSH Banner Wait Timeout (sec)|SSH banner wait timeout. The default is
15 seconds.
//|SSH Command Timeout (sec)|SSH command timeout. The default is 30
seconds.
|===

== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Error connecting" with error messages “Error setting up shell
channel:”or “Error opening shell channel”
|Likely caused by network connectivity issues or SSH is misconfigured.
Confirm connection with alternate SSH client
|"Timeout" or “Error retrieving data" with error messages “Command: XXX
has timed out."
|* Try the command with alternate SSH client
* Increase timeout
|"Error connecting " or “Invalid login credentials" with error messages
“Could not communicate with the device:"
|* Check IP address
* Check user name and password
* Confirm connection with alternate SSH client
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[IDec1c0ccdb532f25cebc30e9acebbb2b9]]
= Hitachi Ops Center data collector
:toc: macro
:hardbreaks:
```

```
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector uses Hitachi Ops Center's integrated suite of
applications to access inventory and performance data of multiple storage
devices. For inventory and capacity discovery, your Ops Center
installation must include both the "Common Services" and "Administrator"
components. For performance collection, you must additionally have
"Analyzer" deployed.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Storage Systems|Storage
|Volume|Volume
|Parity Groups|Storage Pool(RAID), Disk Groups
|Disk|Disk
|Storage Pool|Storage Pool(Thin, SNAP)
|External Parity Groups|Storage Pool(Backend), Disk Groups
|Port|Storage Node → Controller Node → Port
|Host Groups|Volume Mapping and Masking
|Volume Pairs|Storage Synchronization
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Inventory Requirements

You must have the following in order to collect inventory data:

* IP address or hostname of the Ops Center server hosting the "Common
Services" component
* Root/sysadmin user account and password that exist on all servers
hosting Ops Center components. HDS did not implement REST API support for
```

```
usage by LDAP/SSO users until Ops Center 10.8+


== Performance requirements

The following requirements must be met in order to collect performance
data:

The HDS Ops Center "Analyzer" module must be installed
Storage arrays must be feeding the Ops Center "Analyzer" module



== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Hitachi Ops Center IP Address |IP address or fully-qualified domain name
of the Ops Center server hosting the "Common Services" component
|User Name |User name for the Ops Center server.
|Password|Password used for the Ops Center server.
|===

== Advanced configuration

|===
|Field|Description
|Connection Type|HTTPS (port 443) is the default
|Override TCP Port |Specify the port to use if not the default
|Inventory Poll Interval (min)| Interval between inventory polls. The
default is 40.
|Choose 'Exclude' or 'Include' to specify a list|Specify whether to
include or exclude the array list below when collecting data.
|Filter device List|Comma-separated list of device serial numbers to
include or exclude
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300.
|===

////
== Troubleshooting
Some things to try if you encounter problems with this data collector:

==== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Error message seen showing a IP/hostname and port number the
collector is not set to use
|This will be indicative that the collector is able to speak to Common
Services, learns where Administrator and Analyzer are,
| and is subsequently having difficulty to speak to them. If a HTTP 40x
error is observed, this likely means you are attempting to use a non
root/sysadmin account
| If a HTTP 5xx error is observed, that is likely a problem with the Ops
Center module in question
|===


////

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




:leveloffset: -1


[[ID2b21d6f120be407b177b385e9f54f4d5]]
= Infinidat InfiniBox data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Infinidat InfiniBox (HTTP) data collector is used to collect inventory
information from the Infinidat InfiniBox storage system.

== Terminology

Cloud Insights acquires the following inventory information from the
Infinidat InfiniBox data collector. For each asset type acquired by Cloud
Insights, the most common terminology used for this asset is shown. When
viewing or troubleshooting this data collector, keep the following
terminology in mind:
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Storage Pool|Storage Pool
|Node|Controller
|Filesystem|Internal Volume
|Filesystem|File Share
|Filesystem Exports|Share
|===

== Requirements

The following are requirements when configuring this data collector.

* IP address or FQDN of InfiniBox management Node
* Admin userid and password
* Port 443 via REST API



== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|InfiniBox Host|IP address or fully-qualified domain name of the InfiniBox
Management Node
|User Name|User name for InfiniBox Management Node
|Password|Password for the InfiniBox Management Node
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|TCP Port|TCP Port used to connect to InfiniBox Server. The  default is
443.
|Inventory Poll Interval|Interval between inventory polls. The default is
60 minutes.
//|Connection Timeout|Connection timeout. The default is 60 seconds.
|===


== Troubleshooting
```

```
Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID4ac369f4967fa1f162b16d107ce6156e]]
= Huawei OceanStor data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Huawei OceanStor (REST/HTTPS) data collector to
discover inventory and performance for Huawei OceanStor and OceanStor
Dorado storage.

== Terminology

Cloud Insights acquires the following inventory and performance
information from the Huawei OceanStor. For each asset type acquired by
Cloud Insights, the most common terminology used for this asset is shown.
When viewing or troubleshooting this data collector, keep the following
terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Storage Pool|Storage Pool
|File System|Internal Volume
|Controller|Storage Node
|FC Port (Mapped)|Volume Map
|Host FC Initiator (Mapped)|Volume Mask
|NFS/CIFS Share|Share
|iSCSI Link Target|iSCSI Target Node
|iSCSI Link Initiator|iSCSI Initiator Node
|Disk|Disk
|LUN|Volume
|===

== Requirements
```

```
The following requirements are required to configure this data collector:

* Device IP address
* Credentials to access OceanStor device manager
* Port 8088 must be available

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|OceanStor Host IP Address|IP address or fully-qualified domain name of
the OceanStor Device Manager
|User Name|Name used to log into the OceanStor Device Manager
|Password|Password used to log into the OceanStor Device Manager
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|TCP Port|TCP Port used to connect to OceanStor Device Manager. The
default is 8088.
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 60 minutes.
//|Connection Timeout (sec)|Connection timeout. The default is 60 seconds.
|Performance poll interval (sec).| The default is 300 seconds.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




= IBM

:leveloffset: +1
```

```
[[ID8d7e8cabfa8abb2411ed8ee468219d9a]]
= IBM Cleversafe data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to discover inventory and
performance data for IBM Cleversafe storage systems.

NOTE: IBM Cleversafe is metered at a different Raw TB to Managed Unit
rate. Every 40 TB of unformatted IBM Cleversafe capacity is charged as 1
xref:{relative_path}concept_subscribing_to_cloud_insights.html#pricing[Man
aged Unit (MU)].

== Terminology

Cloud Insights acquires the following inventory information from the IBM
Cleversafe data collector. For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term |Cloud Insights Term
|Storage Pool|Storage Pool
|Container|Internal Volume
|Container|File Share
|NFS Share|Share
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* The external data services IP address for the cluster
* Administrator user name and password
* Port 9440

== Configuration
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Manager IP or host name|IP address or hostname of management node
|User name|Username for the user account with super user or system
administrator role
|Password|Password for the user account with super user or system
administrator role
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Inventory poll interval (min)|Interval between inventory polls.
|HTTP Connection Timeout (sec)|HTTP timeout in seconds.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID42024e87118c3f81742507638b4096f3]]
= IBM CS data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to discover inventory and
performance data for IBM CS storage systems.

== Terminology

Cloud Insights acquires the following inventory information from the IBM
```

```
CS data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term |Cloud Insights Term
|Storage Pool|Storage Pool
|Container|Internal Volume
|Container|File Share
|NFS Share|Share
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* The external data services IP address for the cluster
* Administrator user name and password
* Port 9440

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Prism External IP Address|The external data services IP address for the
cluster
|User name|User name for the Admin account
|Password|Password for the Admin account
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|TCP port|TCP Port used to connect to the IBM CS array. The default is
9440.
|Inventory poll interval (min)|Interval between inventory polls. The
default is 60 minutes.
//|Connection timeout (sec)|Connection timeout The default is 60 seconds.
|Performance poll interval(sec)|Interval between performance polls. The
default is 300 seconds.
```

```
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID09e887e2e21cc0c2b0ac1cc9914ce141]]
= IBM System Storage DS8000 Series data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The IBM DS (CLI) data collector supports inventory and performance data
acquisition for DS6xxx and DS8xxx devices.

DS3xxx, DS4xxx, and DS5xxx devices are supported by the
xref:{relative_path}task_dc_na_eseries.html[NetApp E-Series data
collector]. You should refer to the Cloud Insights support matrix for
supported models and firmware versions.

== Terminology

Cloud Insights acquires the following inventory information from the IBM
DS data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:


[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Disk Drive Module|Disk
|Storage Image|Storage
|Extent Pool|Storage Node
```

```
|Fixed Block Volume|Volume
|Host FC Initiator (Mapped)|Volume Mask
|===

Note: These are common terminology mappings only and might not represent
every case for this data collecor.

== Requirements

You need the following to configure this data collector:

* IP address of each DS array
* Read-only username and password on each DS array
* Third-party software installed on the Cloud Insights AU: IBM _dscli_
* Access validation: Run _dscli_ commands using the username and password
* Port requirements: 80, 443, & 1750

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|DS Storage|IP address or fully-qualified domain name of the DS device
|User Name |User name for the DS CLI
|Password |Password for the DS CLI
|_dscli_ executable path |Full path to the _dscli_ executable
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Interval between inventory polls (min).
The default is 40.
|Storage Display Name| Name of the IBM DS storage array
|Inventory Exclude Devices|Comma-separated list of device serial numbers
to exclude from inventory collection
|Performance Poll Interval (sec)|The default is 300.
|Performance Filter Type|Include: Data collected only from devices on
list. Exclude: No data from these devices is collected
|Performance Filter Device List|Comma-separated list of device IDs to
include or exclude from performance collection
|===


== Troubleshooting
```

```
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error containing: CMUC00192E, CMUC00191E or CMUC00190E
|* Verify credentials and IP address entered.
* Try to communicate with the array through web management console
https://${ip}:8452/DS8000/Console.  Replace the ${ip} with data collector
configured IP.
|Error:
* Cannot run program
* Error executing command
|* From Cloud Insights Acquisition Unit Open a CMD
* Open CLI.CFG file in CLI's home dir/lib and check property JAVA_INSTALL,
edit the value to match your environment
* Display Java version installed on this machine, typing: "java -version"
* Ping the IP address of the IBM Storage device specified in CLI command
issued.
* If all the above worked fine then manually run a CLI command
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID9e8d865a8947a0ec27b93dca173699ea]]
= Configuring the IBM PowerVM data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The IBM PowerVM (SSH) data collector is used to collect information about
virtual partitions running on IBM POWER hardware instances managed by a
```

```
hardware management console (HMC).

== Terminology

Cloud Insights acquires inventory information from the virtual partitions
running on IBM POWER hardware instances. For each asset type acquired, the
most common terminology used for the asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|hdisk |Virtual Disk
|Managed System|Host
|LPAR, VIO Server|Virtual Machine
|Volume Group|Data Store
|Physical Volume|LUN
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

The following requirements must be met to configure and use this data
collector:

* IP address of the Hardware Management Console (HMC)
* User name and password that provide access to Hardware Management
Console (HMC) through SSH
* Port requirement SSH-22
* View permission on all management systems and logical partition security
domains
+
The user must also have View permission on HMC configurations and the
ability to collect VPD information for the HMC console security grouping.
The user must also be allowed Virtual IO Server Command access under the
Logical Partition security grouping. It is a best practice to start from a
role of an operator and then remove all roles. Read-only users on the HMC
do not have privileges to run proxied commands on AIX hosts.

* IBM best practice is to have the devices monitored by two or more HMCs.
Be aware that this may cause OnCommand Insight to report duplicated
devices, therefore it is highly recommended to add redundant devices to
the "Exclude Devices" list in the Advanced Configuration for this data
```

```
collector.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Hardware Management Console (HMC) IP Address|IP address or fully-
qualified domain name of the PowerVM Hardware Management Console
|HMC User|User name for the Hardware Management Console
|Password|Password used for the Hardware Management Console
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 20 minutes.
|SSH Port|Port used for SSH to the PowerVM
|Password|Password used for the Hardware Management Console
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 600
seconds.
|Number of Retries|Number of inventory retry attempts
|Exclude Devices|Comma-separated list of device IDs or display names to
exclude
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID5a330644772d4419d9d88d91b30e4315]]
= Configuring the IBM SAN Volume Controller data collector
:toc: macro
:hardbreaks:
:toclevels: 2
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The IBM SAN Volume Controller (SVC) data collector collects inventory and
performance data using SSH, supporting a variety of devices that run the
SVC operating system.

The list of supported devices includes models such as the SVC, the v7000,
the v5000, and the v3700. Refer to the Cloud Insights support matrix for
supported models and firmware versions.

== Terminology

Cloud Insights acquires the following inventory information from the IBM
SVC data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Drive|Disk
|Cluster|Storage
|Node|Storage Node
|Mdisk Group|Storage Pool
|Vdisk|Volume
|Mdisk|Backend LUNs and paths
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

=== Inventory Requirements
* IP address of each SVC cluster
* Port 22 available
* Read-only user name and password

=== Performance Requirements
* SVC Console, which is mandatory for any SVC cluster and required for the
SVC discovery foundation package.
* Credentials will require administrative access level only for copying
performance files from cluster nodes to the config node.
```

```
* Enable data collection by connecting to the SVC cluster by SSH and
running: _svctask startstats -interval 1_
+
Note: Alternatively, enable data collection using the SVC management user
interface.

////
* IP address of each SVC cluster
* Port 22 available
* Public and private key pair that you either generate with Cloud Insights
or reuse a keypair already in use on your SVC
+
If you are reusing an existing keypair, you must convert them from Putty
format to OpenSSH format.

* Public key installed on the SVC cluster
* Private key needs to be identified in the Acquisition Unit.
* Access validation: Open ssh session to the SVC cluster using the private
key

//Note: No third-party software needs to be installed.

== Performance Requirements

* SVC Console, which is mandatory for any SVC cluster and required for the
SVC discovery foundation package.
* Administrative access level required only for copying performance files
from cluster nodes to the config node.
+
Note: Because this access level is not required for the SVC foundation
discovery package, the SVC foundation user might not work successfully.

//* A private and public SSH key must be generated for this user, and the
private key stored so that it is accessible from the Acquisition Unit. If
the SVC foundation user has the proper permissions, then the same user and
key works. The same SSH key can be used for inventory and performance
data.
* Enable data collection by connecting to the SVC cluster by SSH and
running: _svctask startstats -interval 1_
+
Note: Alternatively, enable data collection using the SVC  management user
interface.

* Port Requirement: 22
////
```

```
== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Cluster IP Addresses |IP addresses or fully-qualified domain names of the
SVC storage
//|'Password' or 'OpenSSH Key File'|Credential type used to connect to the
device via SSH
|Inventory User Name|User name for the SVC CLI
|Inventory Password|Password for the SVC CLI
//|Full Path to Inventory Private Key|Full path to the Inventory private
key file
//|Performance User Name|User name for the SVC CLI for performance
collection
//|Performance User|Name    User name for the SVC CLI for performance
collection
//|Full Path to Performance Private Key|Full path to the Performance
private key file
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 40 minutes.
//|Exclude Devices|Comma-separated list of device IDs to exclude from
inventory collection
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 200
seconds.
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300 seconds.
//|Performance Exclude Devices|Comma-separated list of device IDs to
exclude from performance collection
//|Performance SSH Process Wait Timeout (sec)|SSH process timeout. The
default is 200 seconds.
//|Performance User|Name    User name for the SVC CLI for performance
collection
|To clean up dumped stats files|Select this checkbox to clean up dumped
stats files
|===


== Troubleshooting
```

```
Some things to try if you encounter problems with this data collector:

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: "The command cannot be initiated because it was not run on the
configuration node."
|The command must be executed on the configuration node.
|===

Some things to try if you encounter problems with this data collector:

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: "The command cannot be initiated because it was not run on the
configuration node."
|The command must be executed on the configuration node.
|===

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID711dfdaa052c8ff4613c30e05448b416]]
= Configuring the IBM XIV/A9000 data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
IBM XIV and A9000 (CLI) data collector uses the XIV command-line interface
to collect inventory data while performance collection is accomplished by
making SMI-S calls to the XIV/A9000 array, which runs a SMI-S provider on
port 7778.

== Terminology

[cols=2*, options="header", cols"50,50"]
```

```
|===
|Vendor/Model Term | Cloud Insights Term
|Disk|Disk
|Storage System|Storage
|Storage Pool|Storage Pool
|Volume|Volume
|===

== Requirements

The following requirements must be met to configure and use this data
collector:

* Port requirement: TCP port 7778
* Read-only user name and password
* The XIV CLI must be installed on the AU

== Performance requirements

The following are requirements for performance collection:

* SMI-S Agent 1.4 or higher

* SMI-S compatible CIMService running on array.  Most XIV arrays have a
CIMServer installed by default.

* User login must be provided for the CIMServer.  The login must have full
read access to the array configuration and properties.

* SMI-S namespace.  Default is root/ibm.  This is configurable in the
CIMServer.

* Port Requirements: 5988 for HTTP, 5989 for HTTPS.

*  Refer to the following link on how to create an account for SMI-S
performance collection:
http://publib.boulder.ibm.com/infocenter/tivihelp/v4r1/index.jsp?topic=%2F
com.ibm.tpc_V41.doc%2Ffqz0_t_adding_cim_agent.html

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|XIV IP address|IP address or fully-qualified domain name of the XIV
storage
|User Name |User name for the XIV storage
```

```
|Password|Password for the XIV storage
|Full Path to XIV CLI Directory|Full path to the folder containing the XIV
CLI
|SMI-S Host IP Address|IP address of the SMI-S host
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 40 minutes.
//|CLI Process Wait Timeout (sec)|CLI process timeout.  The default is
7200000 ms.
//|SMI-S Host IP|IP address of the SMI-S Provider Host
//|SMI-S Port|Port used by SMI-S Provider Host
|SMI-S Protocol|Protocol used to connect to the SMI-S provider. Also
displays the default port.
|Override SMI-S Port|If blank, use the default port in the Connection Type
field, otherwise enter the connection port to use
//|SMI-S Namespace|SMI-S namespace
|Username|User name for the SMI-S Provider Host
|Password|Password for the SMI-S Provider Host
|Performance Poll Interval (sec)|Interval between performance polls.  The
default is 300 seconds.
//|Number of SMI-S Connection Retries|Number of SMI-S connection retry
attempts.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





:leveloffset: -1



[[IDd6eeb0721ffe4460a0ee68a55a674a51]]
= Lenovo data collector
```

```
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Lenovo data collector to discover inventory and
performance data for Lenovo HX storage systems.

////
== Terminology

Cloud Insights acquires the following inventory information from the
Lenovo data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Storage Pool|Storage Pool
|Nutanix Container|Internal Volume
|Nutanix Container|File Share
|NFS Share|Share
|===
////

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* Prism External IP Address
* Administrator user name and password
* TCP Port requirement: 9440

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Prism External IP Address|The external data services IP address for the
```

```
cluster
|User name|User name for the Admin account
|Password|Password for the Admin account
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|TCP port|TCP Port used to connect to array. The default is 9440.
|Inventory poll interval (min)|Interval between inventory polls. The
default is 60 minutes.
//|Connection timeout (sec)|Connection timeout The default is 60 seconds.
|Performance poll interval (sec)|Interval between performance polls. The
default is 300 seconds.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




= Microsoft

:leveloffset: +1


[[IDda03135a518b1e2121a57a766c1e1a10]]
= Configuring the Azure NetApp Files data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Azure NetApp Files data collector to acquire
inventory and performance data.
```

```
== Requirements

You need the following information to configure this data collector.

* Port requirement: 443 HTTPS
* Azure Management Rest IP (management.azure.com)
* Azure service principal client ID (user account)
* Azure service principal authentication key (user password)
* You need to set up an Azure account for Cloud Insights discovery.
+
Once the account is properly configured and you register the application
in Azure, you will have the credentials required to discover the Azure
instance with Cloud Insights. The following link describes how to set up
the account for discovery:

https://docs.microsoft.com/en-us/azure/active-directory/develop/howto-
create-service-principal-portal

== Configuration

Enter data into the data collector fields according to the table below:

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Azure Service Principal Client ID|Sign-in ID to Azure
|Azure Tenant ID|Azure Tenant ID
|Azure Service Principal Authentication Key|Login authentication key
|I understand Microsoft bills me for API requests|Check this to verify
your understanding that Microsoft bills you for API requests made by
Insight polling.
|===

== Advanced Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Inventory Poll Interval (min)|The default is 60
//|HTTP connection and socket timeout (sec)|The default is 300

//|Choose 'Exclude' or 'Include' to Apply to Filter VMs by Tags|Specify
whether to include or exclude VM's by Tags when collecting data. If
‘Include’ is selected, the Tag Key field can not be empty.
//|Tag Keys and Values on which to Filter VMs|Click *+ Filter Tag* to
```

```
choose which VMs (and associated disks) to include/exclude by filtering
for keys and values that match keys and values of tags on the VM. Tag Key
is required, Tag Value is optional. When Tag Value is empty, the VM is
filtered as long as it matches the Tag Key.
//|Performance Poll Interval (sec)|The default is 300
|===



== Troubleshooting

* The credentials used by your ANF data collector must not have access to
any Azure subscriptions that contain ANF volumes.
* If Reader access causes performance collection to fail, try granting
contributor access on a resource group level.

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDc7514bd3b84716786ca613375b144b50]]
= Microsoft Hyper-V data collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The Microsoft Hyper-V data collector acquires inventory and performance
data from the virtualized server computing environment. This data
collector can discover a standalone Hyper-V host, or an entire cluster -
create one collector per standalone host or cluster.

== Terminology

Cloud Insights acquires the following inventory information from the
Microsoft Hyper-V (WMI). For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term|Cloud Insights Term
|Virtual Hard Disk|Virtual Disk
|Host|Host
|Virtual Machine|Virtual Machine
|Cluster Shared Volumes (CSV), Partition Volume|Data Store
|Internet SCSI Device, Multi Path SCSI LUN|LUN
|Fiber Channel Port|Port
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

The following are required to configure this data collector:

* The Hyper-V requires port 5985 opened for data collection and remote
access/management.
* IP address or FQDN of cluster or standalone hypervisor. Using the
floating cluster hostname or IP is likely the most reliable approach
versus pointing the collector at just one specific node in a cluster.
* Administrative-level user account that works on all the hypervisors in
the cluster.
* WinRM needs to be enabled and listening on all hypervisors
* Port requirements: Port 135 via WMI & Dynamic TCP ports assigned 1024-
65535 for Windows 2003 and older and 49152-65535 for Windows 2008.
* DNS resolution must succeed, even if the data collector is pointed at
only an IP address
* Each Hyper-V hypervisor must have “Resource Metering” turned on for
every VM, on every host. This allows each hypervisor to have more data
available for Cloud Insights on each guest. If this is not set, fewer
performance metrics are acquired for each guest. More information on
Resource metering can be found in the Microsoft documentation:
+
link:https://docs.microsoft.com/en-us/previous-versions/windows/it-
pro/windows-server-2012-R2-and-2012/hh831661(v=ws.11)[Hyper-V Resource
Metering Overview]
+
link:https://docs.microsoft.com/en-us/powershell/module/hyper-v/enable-
vmresourcemetering?view=win10-ps[Enable-VMResourceMetering]

NOTE: The Hyper-V data collector requires a Windows Acquisition Unit.

////
```

```
Best Practice: It is highly recommended for each Hyper-V hypervisor to
have “Resource Metering” turned on for every VM, on every host. This
allows each hypervisor to have more data available for Cloud Insights on
each guest. If this is not set, fewer performance metrics are acquired for
each guest. More information on Resource metering can be found in the
link:https://docs.microsoft.com/en-us/previous-versions/windows/it-
pro/windows-server-2012-R2-and-2012/hh831661(v=ws.11)[Microsoft
documentation].
////

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Cluster IP address or floating cluster FQDN|The IP address or fully-
qualified domain name for the the cluster, or a standalone, non-clustered
hypervisor
|User Name|Administrator user name for the hypervisor
|Password|Password for the hypervisor
|DNS domain suffix|The hostname suffix that combines with the simple
hostname to render the FQDN of a hypervisor
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|The default is 20 minutes.
//|Connection Timeout (ms)|The default is 60000 ms.
|===


== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




:leveloffset: -1
```

```
= NetApp

:leveloffset: +1


[[ID59533b9a61330dbafaece5779d6daff3]]
= NetApp Cloud Connection for ONTAP 9.9+ data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector creates a cloud connection to support data collection
from ONTAP 9.9+ CVO, AFF, and FAS systems.

NOTE: This data collector is no longer available to install in Cloud
Insights as of April 4, 2023, and will be removed from all Cloud Insights
installations in July 2023. For information on transitioning to AU-based
data collection, see the
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights/How_to_transition_from_NetApp_Cloud_Connection_to_AU_based_data_
collector[Knowledgebase^].

////
NOTE: This data collector is
xref:{relative_path}task_getting_started_with_cloud_insights.html#useful-
definitions[deprecated] as of January 1, 2023, and is no longer available
as of April 2023. For information on transitioning to AU-based data
collection, see the
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights/How_to_transition_from_NetApp_Cloud_Connection_to_AU_based_data_
collector[Knowledgebase^].
////

////
== Configuration

Cloud Insights collects data from ONTAP 9.9+ using a *cloud connection*,
eliminating the need to install an external acquisition unit, simplifying
troubleshooting, maintenance, and initial deployment. Configuration of the
cloud connection for the ONTAP 9.9+ data collector requires you to copy a
*Pairing Code* to the ONTAP System Manager, which will then establish a
```

```
connection to your Cloud Insights environment. After the connection is
established, the data collected is the same as it would be if it was
collected through an acquisition unit.

This data collector supports ONTAP 9.9+ CVO, AFF, and FAS systems.

image:Cloud_Agent_DC.png[Cloud Agent Data Collector Configuration]

Follow these steps to configure the connection:

* Generate a unique token which will be used to establish the connection
to the ONTAP system.

* Copy the Pairing Code, which includes the token. You can view the
pairing code by clicking on _[+] Reveal Code Snippet_.
+
Once you copy the pairing code, the data collector configuration screen
will reveal a step 6, prompting you to wait for the connection to be
established. Nothing more needs to be done on this screen until the
connection is established.
+
image:Cloud_Agent_Step_Waiting.png[Waiting for connection]

* In a new browser tab, log into the ONTAP System Manager and navigate to
_Cluster > Settings > Cloud Connections_.

* Click _Add Cloud Connection_ and paste the pairing code.

* Return to the Cloud Insights browser tab and wait for the connection to
be established. Once it is established, a _Complete_ button is revealed.

* Click _Complete_.


// The Cloud Connection data collector acquires EMS (Event Monitoring
System) logs from ONTAP.


== Troubleshooting

Some things to try if you encounter problems with this data collector:

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|I'm seeing the following error while trying to connect to Azure CVO: "The
certificate signing request to broker/manager CA service was not
```

```
completed."
|Verify that your Cloud manager proxy settings are set to the Cloud
Manager private IP. Cloud Manager installation may set a different proxy.
Once the proxy is set to the correct IP and you reference the proxy in the
Cloud Connector dialog, the connection to Cloud Insights should connect
successfully.

|===



Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].
////



[[IDd518645fd62916ca57bd1b8c03c2dd99]]
= NetApp Cloud Volumes ONTAP data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector supports inventory collection from Cloud Volumes ONTAP
configurations.


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|NetApp Management IP Address |IP address for Cloud Volumens ONTAP
|User Name | User name for Cloud Volumes ONTAP
|Password| Password for the above user
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
```

```
|===
|Field|Description
|Connection Type | HTTPS recommended. Also shows default port.
|Override Communication Port | Port to use if not default.
|Inventory Poll Interval (min) |Default is 60 minutes.
|Inventory Concurrent Thread Count|Number of concurrent threads.
|Force TLS for HTTPS |Force TLS over HTTPS
|Automatically Lookup Netgroups|Automatically Lookup Netgroups
|Netgroup Expansion |Select Shell or File
|HTTP read timeout seconds |Default is 30 seconds
|Force responses as UTF-8 |Force responses as UTF-8

|Performance Poll Interval (min) |Default is 900 seconds.
|Performance Concurrent Thread Count|Number of concurrent threads.
|Advanced Counter Data Collection  |Check this to have Cloud Insights
collect the advanced metrics from the list below.
|===



== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[IDdb838af8d4c0192eb4f802447f1370a0]]
= NetApp Cloud Volumes Services for AWS data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector supports inventory collection from NetApp Cloud
Volumes Services for AWS configurations.



== Configuration

[cols=2*, options="header", cols"50,50"]
```

```
|===
|Field|Description
|Cloud Volumes Region |Region of the NetApp Cloud Volumes Services for AWS
|API Key |Cloud Volumes API key
|Secret Key |Cloud Volumes secret key
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Default is 60 minutes
|===



== Troubleshooting

Some things to try if you encounter problems with this data collector:

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|I received an error similar to this one:
'Failed to execute request: Connect to <AWS region endpoint>:8080 [<AWS
region endpoint>/AWS region endpoint IP>] failed: connect timed out: GET
https://<AWS Region Endpoint FQDN>:8080/v1/Storage/IPRanges HTTP/1.1'
|The xref:{relative_path}task_configure_acquisition_unit.html#proxy-
configuration-2[proxy] used by Cloud Insights to communicate with the
Acquisition Unit does not communicate between Cloud Insights and the Data
Collector itself. Here are a few things you can try:

Ensure that the acquisition unit is able to resolve the fqdn and reach the
required port.
Confirm that a proxy is not required to reach the specified endpoint in
the error message.
Curl can be used to test the communication between the acquisition unit
and the endpoint. Make sure that you are *not* using a Proxy for this
test.

Example:

root@acquisitionunit# curl -s -H accept:application/json -H "Content-type:
application/json" -H api-key:<api key used in the data collector
credentials -H secret-key:<secret key used in the data collector
credentials> -X GET https://<AWS Regional
```

```
Endpoint>:8080/v1/Storage/IPRanges

See this
link:https://kb.netapp.com/Advice_and_Troubleshooting/Cloud_Services/Cloud
_Insights/Cloud_Insights_fails_discovery_for_Cloud_Volumes_Service_for_AWS
[NetApp KB article].
|===

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID905962d0c629ffcada0f0982e4559b16]]
= NetApp ONTAP Data Management Software data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
This data collector acquires inventory and performance data from storage
systems running ONTAP using read-only API calls from an ONTAP account.
This data collector also creates a record in the cluster application
registry to accelerate support.

== Terminology

Cloud Insights acquires inventory and performance data from the ONTAP data
collector. For each asset type acquired, the most common terminology used
for the asset is shown. When viewing or troubleshooting this data
collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk|Disk
|Raid Group|Disk Group
|Cluster|Storage
|Node|Storage Node
|Aggregate|Storage Pool
```

```
|LUN|Volume
|Volume|Internal Volume
|===

== ONTAP Data Management Terminology

The following terms apply to objects or references that you might find on
ONTAP Data Management storage asset landing pages. Many of these terms
apply to other data collectors as well.

=== Storage

* Model – A comma-delimited list of the unique, discrete node model names
within this cluster. If all the nodes in the clusters are the same model
type, just one model name will appear.
* Vendor – same Vendor name you would see if you were configuring a new
data source.
* Serial number – The array serial number. On cluster architecture storage
systems like ONTAP Data Management, this serial number may be less useful
than the individual “Storage Nodes” serial numbers.
* IP – generally will be the IP(s) or hostname(s) as configured in the
data source.
* Microcode version – firmware.
* Raw Capacity – base 2 summation of all the physical disks in the system,
regardless of their role.
* Latency – a representation of what the host facing workloads are
experiencing, across both reads and writes. Ideally, Cloud Insights is
sourcing this value directly, but this is often not the case. In lieu of
the array offering this up, Cloud Insights is generally performing an
IOPs-weighted calculation derived from the individual internal volumes’
statistics.
* Throughput – aggregated from internal volumes.
Management – this may contain a hyperlink for the management interface of
the device. Created programmatically by the Cloud Insights data source as
part of inventory reporting.

=== Storage Pool

* Storage – what storage array this pool lives on. Mandatory.
* Type – a descriptive value from a list of an enumerated list of
possibilities. Most commonly will be “Aggregate” or “RAID Group””.
* Node – if this storage array’s architecture is such that pools belong to
a specific storage node, its name will be seen here as a hyperlink to its
own landing page.
* Uses Flash Pool – Yes/No value – does this SATA/SAS based pool have SSDs
used for caching acceleration?
```

```
* Redundancy - RAID level or protection scheme. RAID_DP is dual parity,
RAID_TP is triple parity.
* Capacity - the values here are the logical used, usable capacity and the
logical total capacity, and the percentage used across these.
* Over-committed capacity - If by using efficiency technologies you have
allocated a sum total of volume or internal volume capacities larger than
the logical capacity of the storage pool, the percentage value here will
be greater than 0%.
* Snapshot - snapshot capacities used and total, if your storage pool
architecture dedicates part of its capacity to segments areas exclusively
for snapshots. ONTAP in MetroCluster configurations are likely to exhibit
this, while other ONTAP configurations are less so.
* Utilization - a percentage value showing the highest disk busy
percentage of any disk contributing capacity to this storage pool. Disk
utilization does not necessarily have a strong correlation with array
performance - utilization may be high due to disk rebuilds, deduplication
activities, etc in the absence of host driven workloads. Also, many
arrays’ replication implementations may drive disk utilization while not
showing as internal volume or volume workload.
* IOPS - the sum IOPs of all the disks contributing capacity to this
storage pool.
Throughput - the sum throughput of all the disks contributing capacity to
this storage pool.

=== Storage Node

* Storage - what storage array this node is part of. Mandatory.
* HA Partner - on platforms where a node will fail over to one and only
one other node, it will generally be seen here.
* State - health of the node. Only available when the array is healthy
enough to be inventoried by a data source.
* Model - model name of the node.
* Version - version name of the device.
* Serial number - The node serial number.
* Memory - base 2 memory if available.
* Utilization - On ONTAP, this is a controller stress index from a
proprietary algorithm. With every performance poll, a number between 0 and
100% will be reported that is the higher of either WAFL disk contention,
or average CPU utilization. If you observe sustained values > 50%, that is
indicative of undersizing - potentially a controller/node not large enough
or not enough spinning disks to absorb the write workload.
* IOPS - Derived directly from ONTAP ZAPI calls on the node object.
* Latency - Derived directly from ONTAP ZAPI calls on the node object.
* Throughput - Derived directly from ONTAP ZAPI calls on the node object.
* Processors - CPU count.
```

```
== Requirements

The following are requirements to configure and use this data collector:

* You must have access to an Administrator account configured for read-
only API calls.
* Account details include username and password.
* Port requirements: 80 or 443

* Account permissions:
** Read only role name to ontapi application to the default Vserver
** You may require additional optional write permissions. See the Note
About Permissions below.
* ONTAP License requirements:
** FCP license and mapped/masked volumes required for fibre-channel
discovery

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|NetApp Management IP |IP address or fully-qualified domain name of the
NetApp cluster
|User Name |User name for NetApp cluster
|Password |Password for NetApp cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Connection type|Choose HTTP (default port 80) or HTTPS (default port
443). The default is HTTPS
|Override Communication Port|Specify a different port if you do not want
to use the default
|Inventory Poll Interval (min) |Default is 60 minutes.
//|Inventory concurrent thread count|Thread count for parallel foundation
queries
|For TLS for HTTPS|Only allow TLS as protocol when using HTTPS
|Automatically Lookup Netgroups|Enable the automatic netgroup lookups for
export policy rules
|Netgroup Expansion|Netgroup Expansion Strategy. Choose _file_ or _shell_.
The default is _shell_.
```

```
|HTTP read timeout seconds|Default is 30
|Force responses as UTF-8|Forces data collector code to interpret
responses from the CLI as being in UTF-8
//|Foundation model writing timeout|Max time before aborting when writing
the model to disk. -1 Disables the feature. 0 is for testing only.
|Performance Poll Interval (sec)|Default is 900 seconds.
//|Performance Concurrent thread count|Thread count for parallel
performance queries
//|Performance model writing timeout|Max time before aborting when writing
the model to disk. -1 Disables the feature. 0 is for testing only.

|Advanced Counter Data Collection|Enable ONTAP integration. Select this to
include ONTAP Advanced Counter data in polls. Choose the desired counters
from the list.

//|<TBD: New Micro Poll> | Default is 60 seconds

|Cluster Switch Metrics|Allow Cloud Insights to collect cluster switch
data. Note that in addition to enabling this on the Cloud Insights side,
you must also configure the ONTAP system to provide
link:https://docs.netapp.com/us-en/ontap-cli-98/system-switch-ethernet-
create.html[switch information], and ensure the correct <<a-note-about-
permissions, permissions>> are set, in order to allow the switch data to
be sent to Cloud Insights. See "A Note About Permissions" below.

|===


== ONTAP Power Metrics

Several ONTAP models provide power metrics for Cloud Insights that can be
used for monitoring or alerting. The lists of supported and unsupported
models below are not comprehensive but should provide some guidance; in
general, if a model is in the same family as one on the list, the support
should be the same.

Supported Models:

A200
A220
A250
A300
A320
A400
A700
A700s
```

```
A800
A900
C190
FAS2240-4
FAS2552
FAS2650
FAS2720
FAS2750
FAS8200
FAS8300
FAS8700
FAS9000

Unsupported Models:

FAS2620
FAS3250
FAS3270
FAS500f
FAS6280
FAS/AFF 8020
FAS/AFF 8040
FAS/AFF 8060
FAS/AFF 8080



== A Note About Permissions

Since a number of Cloud Insights' ONTAP dashboards rely on advanced ONTAP
counters, you must enable *Advanced Counter Data Collection* in the data
collector Advanced Configuration section.

You should also ensure that write permission to the ONTAP API is enabled.
This typically requires an account at the cluster level with the necessary
permissions.

To create a local account for Cloud Insights at the cluster level, log in
to ONTAP with the Cluster management Administrator username/password, and
execute the following commands on the ONTAP server:

. Before you begin, you must be signed in to ONTAP with an _Administrator_
account, and _diagnostic-level commands_ must be enabled.

. Create a read-only role using the following commands.

 security login role create -role ci_readonly -cmddirname DEFAULT -access
```

```
readonly
 security login role create -role ci_readonly -cmddirname security -access
readonly
 security login role create -role ci_readonly -access all -cmddirname
{cluster application-record create}

. Create the read-only user using the following command. Once you have
executed the create command, you will be prompted to enter a password for
this user.

 security login create -username ci_user -application ontapi
-authentication-method password -role ci_readonly

If AD/LDAP account is used, the command should be

 security login create -user-or-group-name DOMAIN\aduser/adgroup
-application ontapi -authentication-method domain -role ci_readonly

If you are collecting cluster switch data:

 security login rest-role create -role ci_readonly -api
/api/network/ethernet -access readonly


The resulting role and user login will look something like the following.
Your actual output may vary:

 Role Command/ Access
 Vserver Name Directory Query Level
 ---------- ------------- --------- ------------------ --------
 cluster1 ci_readonly DEFAULT read only
 cluster1 ci_readonly security readonly

 cluster1::security login> show
 Vserver: cluster1
 Authentication Acct
 UserName    Application   Method      Role Name      Locked
 ---------   -------      ----------- -------------- --------
 ci_user     ontapi      password    ci_readonly   no

NOTE: If ONTAP access control is not set correctly, then Cloud Insights
REST calls may fail, resulting in gaps in data for the device.  For
example, if you have enabled it on the Cloud Insights collector but have
not configured the permissions on the ONTAP, acquisition will fail.
Additionally, if the role is previously defined on the ONTAP and you are
adding the Rest API abilities, ensure that _http_ is added to the role.
```

```
== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:

|Receive 401 HTTP response or 13003 ZAPI error code and ZAPI returns
“Insufficient privileges” or “not authorized for this command”| Check
username and password, and user privileges/permissions.

|Cluster version is < 8.1| Cluster minimum supported version is 8.1.
Upgrade to minimum supported version.

|ZAPI returns "cluster role is not cluster_mgmt LIF"|AU needs to talk to
cluster management IP. Check the IP and change to a different IP if
necessary

|Error: “7 Mode filers are not supported”| This can happen if you use this
data collector to discover 7 mode filer. Change IP to point to cdot
cluster instead.

|ZAPI command fails after retry| AU has communication problem with the
cluster. Check network, port number, and IP address. User should also try
to run a command from command line from the AU machine.

|AU failed to connect to ZAPI via HTTP| Check whether ZAPI port accepts
plaintext. If AU tries to send plaintext to an SSL socket, the
communication fails.

|Communication fails with SSLException|AU is attempting to send SSL to a
plaintext port on a filer. Check whether the ZAPI port accepts SSL, or use
a different port.

|Additional Connection errors:

ZAPI response has error code 13001, “database  is not open”

ZAPI error code is 60 and response contains “API did not finish on time”

ZAPI response contains “initialize_session() returned NULL environment”

ZAPI error code is 14007 and response contains “Node is not healthy”
```

```
|Check network, port number, and IP address. User should also try to run a
command from command line from the AU machine.
|===

=== Performance
[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|“Failed to collect performance from ZAPI” error|This is usually due to
perf stat not running. Try the following command on each node:

> _system node systemshell -node * -command “spmctl -h cmd –stop; spmctl
-h cmd –exec”_
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID9eeaf6444336c6a509e848c7c60981a3]]
= NetApp Data ONTAP operating in 7-Mode data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
For storage systems using Data ONTAP software operating in 7-Mode, you use
the 7-mode data collector, which uses the CLI to obtain capacity and
performance data.

== Terminology

Cloud Insights acquires the following inventory information from the
NetApp 7-mode data collector. For each asset type acquired, the most
common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:
```

```
NOTE: This data collector is
xref:{relative_path}task_getting_started_with_cloud_insights.html#useful-
definitions[deprecated].

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk|Disk
|Raid Group|Disk Group
|Filer|Storage
|Filer|Storage Node
|Aggregate|Storage Pool
|LUN|Volume
|Volume|Internal Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

You need the following to configure and use this data collector:

* IP addresses of the FAS storage controller and partner.
* Port 443
* A custom admin level username and password for controller and partner
controller with the following role capabilities for 7-Mode:
** "api-*": Use this to allow OnCommand Insight to execute all NetApp
storage API commands.
** "login-http-admin": Use this to allow OnCommand Insight to connect to
the NetApp storage via HTTP.
** "security-api-vfiler": Use this to allow OnCommand Insight to execute
NetApp storage API commands to retrieve vFiler unit information.
** "cli-options": Use this to read storage system options.
** "cli-lun": Access these commands for managing LUNs. Displays the status
(LUN path, size, online/offline state, and shared state) of the given LUN
or class of LUNs.
** "cli-df": Use this to display free disk space.
** "cli-ifconfig": Use this to display interfaces and IP addresses.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Address of storage system|IP address or fully-qualified domain name for
```

```
the NetApp storage system
|User Name|User name for the NetApp storage system
|Password|Password for the NetApp storage system
|Address of HA Partner in Cluster|IP address or fully-qualified domain
name for the HA Partner
|User Name of HA Partner in Cluster|User name for the HA partner
|Password of HA Partner Filer in Cluster|Password for the  HA Partner
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min)|Interval between inventory polls. The
default is 20 minutes.
|Connection Type |HTTPS or HTTP, also displays the default port
|Override Connection Port |If blank, use the default port in the
Connection Type field, otherwise enter the connection port to use
|Performance Poll Interval (sec)|Interval between performance polls. The
default is 300 seconds.
|===

== Storage systems connection

As an alternative to using the default administrative user for this data
collector, you can configure a user with administrative rights directly on
the NetApp storage systems so that this data collector can acquire data
from NetApp storage systems.

Connecting to NetApp storage systems requires that the user, who is
specified when acquiring the main pfiler (on which the storage system
exist), meet the following conditions:

* The user must be on vfiler0 (root filer/pfiler).
+
Storage systems are acquired when acquiring the main pfiler.

* The following commands define the user role capabilities:
** "api-*": Use this to allow Cloud Insights to execute all NetApp storage
API commands.
+
This command is required to use the ZAPI.

** "login-http-admin": Use this to allow Cloud Insights to connect to the
NetApp storage via HTTP. This command is required to use the ZAPI.
```

```
** "security-api-vfiler": Use this to allow Cloud Insights to execute
NetApp storage API commands to retrieve vFiler unit information.

** "cli-options": For "options" command and used for partner IP and
enabled licenses.

** "cli-lun": Access these command for managing LUNs. Displays the status
(LUN path, size, online/offline state, and shared state) of the given LUN
or class of LUNs.
** "cli-df": For "df -s", "df -r", "df -A -r" commands and used to display
free space.
** "cli-ifconfig": For "ifconfig -a" command and used for getting filer IP
address.
** "cli-rdfile": For "rdfile /etc/netgroup" command and used for getting
netgroups.
** "cli-date": For "date" command and used to get full date for getting
Snapshot copies.
** "cli-snap": For "snap list" command and used for getting Snapshot
copies.

If cli-date or cli-snap permissions are not provided, acquisition can
finish, but Snapshot copies are not reported.

To acquire a 7-Mode data source successfully and generate no warnings on
the storage system, you should use one of the following command strings to
define your user roles. The second string listed here is a streamlined
version of the first:

* login-http-admin,api-*,security-api-vfile,cli-rdfile,cli-options,cli-
df,cli-lun,cli-ifconfig,cli-date,cli-snap,_

* login-http-admin,api-* ,security-api-vfile,cli-



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Receive 401 HTTP response or 13003 ZAPI error code and ZAPI returns
“Insufficient privileges” or “not authorized for this command”| Check
username and password, and user privileges/permissions.
|“Failed to execute command” error|Check whether the user has the
following permission on the device:
```

```
•   api-*
•   cli-date
•   cli-df
•   cli-ifconfig
•   cli-lun
•   cli-operations
•   cli-rdfile
•   cli-snap
•   login-http-admin
•   security-api-vfiler
Also check if the ONTAP version is supported by Cloud Insights and verify
if the credentials used match device credentials

|Cluster version is < 8.1| Cluster minimum supported version is 8.1.
Upgrade to minimum supported version.
|ZAPI returns "cluster role is not cluster_mgmt LIF"|AU needs to talk to
cluster management IP. Check the IP and change to a different IP if
necessary
|Error: “7 Mode filers are not supported”| This can happen if you use this
data collector to discover 7 mode filer. Change IP to point to cdot filer
instead.
|ZAPI command fails after retry| AU has communication problem with the
cluster. Check network, port number, and IP address. User should also try
to run a command from command line from the AU machine.
|AU failed to connect to ZAPI|Check IP/port connectivity and assert ZAPI
configuration.
|AU failed to connect to ZAPI via HTTP| Check whether ZAPI port accepts
plaintext. If AU tries to send plaintext to an SSL socket, the
communication fails.
|Communication fails with SSLException|AU is attempting to send SSL to a
plaintext port on a filer. Check whether the ZAPI port accepts SSL, or use
a different port.
|Additional Connection errors:

ZAPI response has error code 13001, “database  is not open”

ZAPI error code is 60 and response contains “API did not finish on time”

ZAPI response contains “initialize_session() returned NULL environment”

ZAPI error code is 14007 and response contains “Node is not healthy”

|Check network, port number, and IP address. User should also try to run a
command from command line from the AU machine.
|Socket timeout error with ZAPI|Check filer connectivity and/or increase
timeout.
```

```
|“C Mode clusters are not supported by the 7 Mode data source” error|Check
IP and change the IP to a 7 Mode cluster.
|“Failed to connect to vFiler” error| Check that the acquiring user
capabilities include the following at a minimum:
api-*
security-api-vfiler
login-http-admin
Confirm that filer is running minimum ONTAPI version 1.7.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].








[[ID5112e5b1f7c56a48eb408892a304da3b]]
= NetApp E-Series data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The NetApp E-Series data collector gathers inventory and performance data.
The collector supports firmware 7.x+ using the same configurations and
reporting the same data.

== Terminology

Cloud insight acquires the following inventory information from the NetApp
E-Series data collector. For each asset type acquired, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk|Disk
```

```
|Volume Group|Disk Group
|Storage Array|Storage
|Controller|Storage Node
|Volume Group|Storage Pool
|Volume|Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== E-Series Terminology (Landing Page)

The following terms apply to objects or references that you might find on
NetApp E-Series asset landing pages. Many of these terms apply to other
data collectors as well.

=== Storage

* Model - model name of the device.
* Vendor - same Vendor name you would see if you were configuring a new
datasource
* Serial number - The array serial number. On cluster architecture storage
systems like NetApp Clustered Data Ontap, this serial number may be less
useful than the individual “Storage Nodes” serial numbers
// EMC Isilon, IBM SVC
* IP - generally will be the IP(s) or hostname(s) as configured in the
data source
* Microcode version - firmware
* Raw Capacity - base 2 summation of all the physical disks in the system,
regardless of their role
* Latency - a representation of what the host facing workloads are
experiencing, across both reads and writes. Ideally, Cloud Insights is
sourcing this value directly, but this is often not the case. In lieu of
the array offering this up, Cloud Insights is generally performing an
IOPs-weighted calculation derived from the individual volumes’ statistics.
* Throughput - the array’s total host facing throughput. Ideally sourced
directly from the array, if unavailable, Cloud Insights is summing the
volumes’ throughput to derive this value
* Management - this may contain a hyperlink for the management interface
of the device. Created programmatically by the Cloud Insights datasource
as part of inventory reporting



=== Storage Pool

* Storage - what storage array this pool lives on. Mandatory
* Type - a descriptive value from a list of an enumerated list of
possibilities. Most commonly will be “Thin Provisioning” or “RAID Group”
* Node - if this storage array’s architecture is such that pools belong to
a specific storage node, its name will be seen here as a hyperlink to its
own landing page
* Uses Flash Pool - Yes/No value
* Redundancy - RAID level or protection scheme. E-Series reports “RAID 7”
for DDP pools
* Capacity - the values here are the logical used, usable capacity and the
logical total capacity, and the percentage used across these. These value
both include E-Series “preservation” capacity, resulting both in numbers
and the percentage being higher than what the E-Series own user interface
may show
* Over-committed capacity - If via efficiency technologies you have
allocated a sum total of volume or internal volume capacities larger than
the logical capacity of the storage pool, the percentage value here will
be greater than 0%.
* Snapshot - snapshot capacities used and total, if your storage pool
architecture dedicates part of its capacity to segments areas exclusively
for snapshots
* Utilization - a percentage value showing the highest disk busy
percentage of any disk contributing capacity to this storage pool. Disk
utilization does not necessarily have a strong correlation with array
performance - utilization may be high due to disk rebuilds, deduplication
activities, etc in the absence of host driven workloads. Also, many
arrays’ replication implementations may drive disk utilization while not
showing as volume workload.
* IOPS - the sum IOPs of all the disks contributing capacity to this
storage pool. If disk IOPs is not available on a given platform, this
value will be sourced from the sum of volume IOPs for all the volumes
sitting on this storage pool
* Throughput - the sum throughput of all the disks contributing capacity
to this storage pool. If disk throughput is not available on a given
platform, this value will be sourced from the sum of volume throughout for
all the volumes sitting on this storage pool


=== Storage Node

* Storage - what storage array this node is part of. Mandatory
* HA Partner - on platforms where a node will fail over to one and only
one other node, it will generally be seen here
* State - health of the node. Only available when the array is healthy
enough to be inventoried by a data source
* Model - model name of the node
* Version - version name of the device.
* Serial number - The node serial number
* Memory - base 2 memory if available
* Utilization - Generally a CPU utilization number, or in the case of
NetApp Ontap, a controller stress index. Utilization is not currently
available for NetApp E-Series
* IOPS - a number representing the host driven IOPs on this controller.
Ideally sourced directly from the array, if unavailable, it will be
calculated by summing all the IOPs for volumes that belong exclusively to
this node.
// Available for NetApp E-Series with OCI 7.3.10, or by installing Data
Source Service Pack 8 or higher for OCI 7.3.1+
* Latency - a number representing the typical host latency or response
time on this controller. Ideally sourced directly from the array, if
unavailable, it will be calculated by performing an IOPs weighted
calculation from volumes that belong exclusively to this node.
// Available for NetApp E-Series with OCI 7.3.10, or by installing Data
Source Service Pack 8 or higher for OCI 7.3.1+
* Throughput - a number representing the host driven throughput on this
controller. Ideally sourced directly from the array, if unavailable, it
will be calculated by summing all the throughput for volumes that belong
exclusively to this node.
// Available for NetApp E-Series with OCI 7.3.10, or by installing Data
Source Service Pack 8 or higher for OCI 7.3.1+
* Processors - CPU count


== Requirements

* The IP address of each controller on the array
* Port requirement 2463

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Comma-separated list of Array SANtricity Controller IPs| IP addresses
and/or fully-qualified domain names for the array controllers
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Default is 30 minutes
```

```
|Performance Poll Interval up to 3600 seconds|Default is 300 seconds
|===


== Troubleshooting

Additional information on this data collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDeaf72c390e9af9d0dcd8278f4263c064]]
= Configuring the NetApp HCI Management server data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The NetApp HCI Management server data collector collects NetApp HCI Host
information and requires read-only privileges on all objects within the
Management server.

This data collector acquires from the *NetApp HCI Management server only*.
To collect data from the storage system, you must also configure the
xref:{relative_path}task_dc_na_solidfire.html[NetApp SolidFire] data
collector.

== Terminology

Cloud Insights acquires the following inventory information from this data
collector. For each asset type acquired, the most common terminology used
for the asset is shown. When viewing or troubleshooting this data
collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Virtual disk|Disk
|Host|Host
|Virtual machine|Virtual machine
```

```
|Data store|Data store
|LUN|Volume
|Fibre channel port|Port
|===
These are common terminology mappings only and might not represent every
case for this data collector.

== Requirements

The following information is required to configure this data collector:

* IP address of the NetApp HCI Management server
* Read-only username and password for the NetApp HCI Management server
* Read only privileges on all objects in the NetApp HCI Management server.
* SDK access on the NetApp HCI Management server – normally already set
up.
//* 3rd party software installed on NetApp HCI Management server / RAU:
none
* Port requirements: http-80 https-443
* Validate access:
** Log into the NetApp HCI Management server using above username and
password
** Verify SDK enabled: telnet <vc_ip> 443

== Setup and connection

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Name|Unique name for the data collector
|Acquisition unit|Name of acquisition unit
|===

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|NetApp HCI Storage Cluster MVIP |Management Virtual IP Address
|SolidFire Management Node (mNode)|Management Node IP Address
|User name |User name used to access the NetApp HCI Management server
|Password|Password used to access the NetApp HCI Management server
|VCenter User Name|User name for VCenter
|VCenter Password|Password for VCenter
|===
== Advanced configuration

In the advanced configuration screen, check the *VM Performance* box to
collect performance data. Inventory collection is enabled by default.
The following fields can be configured:

[cols=2*,  cols"50,50"]
|===
|Field|Description
|Inventory poll interval (min) | Deafult is 20
//|Connection Timeout (ms)|Default is 60000
|Filter VMs by|Select CLUSTER, DATACENTER, or ESX HOST
|Choose 'Exclude' or 'Include' to Specify a List|Specify Whether to
Include or Exclude VMs
|Filter Device List |List of VMs to filter (comma separated, or semicolon
separated if comma is used in the value) for for Filtering by ESX_HOST,
CLUSTER, and DATACENTER Only
//or you can choose to filter by TAG
//|Number of retries | Default is 3
//|HCI Management port| Default is 8443

//|Tag Keys and Values on which to Filter VMs|Click *+ Filter Tag* to
choose which VMs (and associated disks) to include/exclude by filtering
for keys and values that match keys and values of tags on the VM. Tag Key
is required, Tag Value is optional. When Tag Value is empty, the VM is
filtered as long as it matches the Tag Key.
//Tag filtering is only available in VSphere 6.0 Beta or later.

|Performance poll interval (sec)|Default is 300
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Include list to filter VMs cannot be empty
|If Include List is selected, please list valid DataCenter, Cluster, or
Host names to filter VMs
|Error: Failed to instantiate a connection to VirtualCenter at IP
|Possible solutions:
```

```
* Verify credentials and IP address entered.
* Try to communicate with Virtual Center using Infrastructure Client.
* Try to communicate with Virtual Center using Managed Object Browser (e.g
MOB).
|Error: VirtualCenter at IP has non-conform certificate that JVM requires
|Possible solutions:

* Recommended: Re-generate certificate for Virtual Center by using
stronger (e.g. 1024-bit) RSA key.
* Not Recommended: Modify the JVM java.security configuration to leverage
the constraint jdk.certpath.disabledAlgorithms to allow 512-bit RSA key.
See JDK 7 update 40 release notes at
"http://www.oracle.com/technetwork/java/javase/7u40-relnotes-2004172.html"
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





[[ID1faa28ec2492156f31faf6588887020e]]
= NetApp SolidFire All-Flash Array data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The NetApp SolidFire All-Flash Array data collector supports inventory and
performance collection from both iSCSI and Fibre Channel SolidFire
configurations.

The SolidFire data collector utilizes the SolidFire REST API. The
acquisition unit where the data collector resides needs to be able to
initiate HTTPS connections to TCP port 443 on the SolidFire cluster
management IP address. The data collector needs credentials capable of
making REST API queries on the SolidFire cluster.

== Terminology
```

```
Cloud Insights acquires the following inventory information from the
NetApp SolidFire All-Flash Array data collector. For each asset type
acquired by Cloud Insights, the most common terminology used for this
asset is shown. When viewing or troubleshooting this data collector, keep
the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Drive|Disk
|Cluster|Storage
|Node|Storage Node
|Volume|Volume
|Fibre channel port|Port
|Volume Access Group, LUN Assignment| Volume Map
|iSCSI Session|Volume Mask
|===
Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

The following are requirements for configuring this data collector:

* Management Virtual IP Address
* Read-only username and credentials
* Port 443

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Management Virtual IP Address (MVIP) |Management Virtual IP address of
the SolidFire Cluster
|User Name |Name used to log into the SolidFire cluster
|Password |Password used to log into the SolidFire cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Connection Type |Choose connection type
```

```
|Communication Port |Port used for NetApp API
|Inventory Poll Interval (min) |Default is 20 minutes
|Performance Poll Interval (sec)|Default is 300 seconds
|===


== Troubleshooting

When SolidFire reports an error it is displayed in Cloud Insights as
follows:

_An error message was received from a SolidFire device while trying to
retrieve data. The call was <method> (<parameterString> ). The error
message from the device was (check the device manual): <message>_

Where:

•   The <method> is an HTTP method, such as GET or PUT.
•   The <parameterString> is a comma separated list of parameters that
were included in the REST call.
•   The <message> is whatever the device returned as the error message.

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDcab887c9c5a2bd1a3a4bda0d1810708c]]
= NetApp StorageGRID data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The NetApp StorageGRID data collector supports inventory and performance
collection from StorageGRID configurations.

NOTE: StorageGRID is metered at a different Raw TB to Managed Unit rate.
Every 40 TB of unformatted StorageGRID capacity is charged as 1
xref:{relative_path}concept_subscribing_to_cloud_insights.html#pricing[Man
aged Unit (MU)].

== Terminology

Cloud Insights acquires the following inventory information from the
NetApp StorageGRID collector. For each asset type acquired, the most
common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|StorageGRID|Storage
|Node|Node
|Tenant|Storage Pool
|Bucket|Internal Volume
|===
== Requirements

The following are requirements for configuring this data source:

* StorageGRID Host IP Address
* A username and password for a user that has had the Metric Query and
Tenant Access roles assigned
* Port 443

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|StorageGRID Host IP Address |Management Virtual IP address of the
StorageGRID appliance
|User Name |Name used to log into the StorageGRID appliance
|Password |Password used to log into the StorageGRID appliance
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Inventory Poll Interval (min) |Default is 60 minutes
|performance Poll Interval (sec)|Default is 900 seconds
|===
== Single Sign-On (SSO)

The link:https://docs.netapp.com/sgws-112/index.jsp[StorageGRID] firmware
versions have corresponding API versions; 3.0 API and newer versions
support single sign-on (SSO) login.

|===
|Firmware version |API version |Support single sign on (SSO)
|11.1 |2 |No
|11.2 |3.0 |Yes
|11.5 |3.3 |Yes
|===

== Troubleshooting

Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




:leveloffset: -1


[[ID54dbb9cccd5aac9b28794886e5bfb5dc]]
= Nutanix NX data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Nutanix data collector to discover inventory and
performance data for Nutanix NX storage systems.

== Terminology

Cloud Insights acquires the following inventory information from the
Nutanix data collector. For each asset type acquired by Cloud Insights,
the most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:
```

```
[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Storage Pool|Storage Pool
|Nutanix Container|Internal Volume
|Nutanix Container|File Share
|NFS Share|Share
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* The external data services IP address for the cluster
* Read-only user name and password, unless volume_groups are in use, in
which case, Admin user name and password are required
* Port requirement: HTTPS 443

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Prism External IP Address|The external data services IP address for the
cluster
|User name|User name for the Admin account
|Password|Password for the Admin account
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|TCP port|TCP Port used to connect to Nutanix array. The default is 9440.
|Inventory poll interval (min)|Interval between inventory polls. The
default is 60 minutes.
//|Connection timeout (sec)|Connection timeout The default is 60 seconds.
|Performance poll interval(sec)|Interval between performance polls. The
default is 300 seconds.
|===


== Troubleshooting
```

```
Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDf05ba047ac3c677536da9cbc1771c12e]]
= OpenStack data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The OpenStack (REST API / KVM) data collector acquires inventory data for
all OpenStack instances, and optionally, VM performance data.

== Requirements

* IP address of the OpenStack controller
* OpenStack admin role credential and sudo access to the Linux KVM
hypervisor. If you are not using the admin account or admin equivalent
privileges, you will need to use trial and error to identify the default
policies to relax for your data collector userid.
* The OpenStack Gnocchi module must be installed and configured for
performance collection. Configuring Gnocchi is done by editing the
nova.conf file for each hypervisor and then restarting the Nova Compute
service on each hypervisor. The option name changes for different releases
of OpenStack:
** Icehouse
** Juno
** Kilo
** Liberty
** Mitaka
** Newton
** Ocata
* For CPU stats, “compute_monitors=ComputeDriverCPUMonitor” needs to be
turned on in /etc/nova/nova.conf on compute nodes.
* Port requirements:
** 5000 for http and 13000 for https, for the Keystone service
** 22 for KVM SSH
** 8774 for Nova Compute Service
** 8776 for Cinder Block Service
** 8777 for Gnocchi Performance Service
** 9292 for Glance Image Service
*Note* The port binds to the specific service, and the service may run on
the controller or another host in larger environments.

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
| OpenStack Controller IP Address|IP address or fully-qualified domain
name of the OpenStack Controller
|OpenStack Administrator|User name for an OpenStack Admin
|OpenStack Password|Password used for the OpenStack Admin
|OpenStack Administrator Tenant|OpenStack Administrator Tenant name
|KVM Sudo User|KVM Sudo User name
|Choose 'Password' or 'OpenSSH Key File' to specify credential
type|Credential type used to connect to the device via SSH
|Full Path to Inventory Private Key|Full Path to Inventory Private Key
|KVM Sudo Password |KVM Sudo Password
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Enable hypervisor inventory discovery through SSH|Check this to enable
hypervisor inventory discovery through SSH
|OpenStack Admin URL port|OpenStack Admin URL port
|Use HTTPS|Check to use secure HTTP
//|HTTP Connection Timeout (sec)|Timeout for HTTP connection. The default
is 300 seconds.
|SSH Port|Port used for SSH
//|SSH Process Wait Timeout (sec)|SSH process timeout. The default is 30
seconds.
|SSH Process Retries|Number of inventory retry attempts
|Inventory Poll Interval (min)|Interval between inventory polls.  The
default is 20 minutes.
|===

== Troubleshooting
Some things to try if you encounter problems with this data collector:
```

```
=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Configuration error" with error messages start with “Policy doesn't
allow” or “You are not authorized”
| * Check ip address
* Check User name and password
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID1a10d0991a059eb3d193e5768d4dc9f4]]
= Oracle ZFS Storage Appliance data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Oracle ZFS Storage Appliance data collector to
gather inventory and performance data.

== Terminology

Cloud Insights acquires inventory information with the Oracle ZFS data
collector. For each asset type acquired by Cloud Insights, the most common
terminology used for this asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk (SSD)|Disk
|Cluster|Storage
|Controller|Storage Node
|LUN|Volume
```

```
|LUN Map|Volume Map
|Initiator,Target|Volume Mask
|Share|Internal Volume
|===

Note: These are common terminology mappings only and might not represent
every case for this data source.

== Requirements

* Host names for the ZFS Controller-1 and the ZFS Controller-2
* Administrator user name and password
* Port requirement: 215 HTTP/HTTPS

== Required Performance metrics

Oracle ZFS appliances give storage administators large amounts of
flexibility to capture performance statistics. Cloud Insights expects you
to have _each_ controller in a high availability pair configured to
capture the following metrics:

* smb2.ops[share]
* nfs3.ops[share]
* nfs4.ops[share]
* nfs4-1.ops[share]

Failure to have the controller capture any or all of these will likely
result in Cloud Insights not having, or underreporting, the workload on
the "Internal Volumes".

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|ZFS Controller-1 Hostname|Host name for storage controller 1
|ZFS Controller-2 Hostname|Host name for storage controller 2
|User name|User name for the storage system administrator user account
|Password|Password for the administrator user account
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Connection Type |HTTPS or HTTP, also displays the default port
```

```
|Override Connection Port |If blank, use the default port in the
Connection Type field, otherwise enter the connection port to use
|Inventory poll interval|The default is 60 seconds
|Performance Poll Interval (sec)|The default is 300.
|===



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Invalid login credentials"
|validate Zfs user account and password
|"Configuration error" with error message “REST Service is disabled”
|Verify REST service is enabled on this device.
|"Configuration error " with error message “User unauthorized for command”
|Likely due to certain roles (for example, 'advanced_analytics') are not
included for the configured user <userName>.
Possible Solution:
* Correct the Analytics (statistic) scope for the user ${user} with the
read only role:
- From the Configuration -> Users screen, put your mouse over the role and
double click to allow editing
-   Select "Analytics" from the Scope drop down menu. A list of the
possible properties appears.
-   Click the top most check box and it will select all three properties.
-   Click the Add button on the right side.
-   Click the Apply button at the top right of the pop-up window. The pop-
up window will close.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID22d6e8f56f59716d0d25739a47b7264f]]
= Pure Storage FlashArray data collector
:toc: macro
:hardbreaks:
```

```
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Pure Storage FlashArray data collector to gather
inventory and performance data.

== Terminology

For each asset type acquired by Cloud Insights, the most common
terminology used for the asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Drive (SSD)|Disk
|Array|Storage
|Controller|Storage Node
|Volume|Volume
|LUN Map|Volume Map
|Initiator,Target|Volume Mask
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* Storage system IP address
* User name and password for the Administrator account of the Pure storage
system.
* Port requirement: HTTP/HTTPS 80/443

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|FlashArray Host IP Address|IP address of the storage system
|User name |User name with admin privileges
|Password for the admin privileged account|Password
|===
== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Connection type|Choose HTTP or HTTPS. Also displays the default port.
|Override TCP port|If blank, use the default port in the Connection Type
field, otherwise enter the connection port to use
|Inventory poll interval (min)|The default is 60 minutes
//|Connection Timeout (sec)|The default is 60
|Performance Poll Interval (sec)|The default is 300
|===

== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|"Invalid login credentials" with error messages “Policy doesn't allow” or
“You are not authorized”
|Validate Pure user account and password via Pure http interface
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].



[[ID9bbc5fb799637b6d7ef819e74ea672d9]]
= Red Hat Virtualization data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Red Hat Virtualization data collector to gather
inventory data from virtualized Linux and Microsoft Windows workloads.
```

```
== Terminology

For each asset type acquired by Cloud Insights, the most common
terminology used for the asset is shown. When viewing or troubleshooting
this data collector, keep the following terminology in mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Disk|Virtual Disk
|Host|Host
|Virtual Machine|Virtual Machine
|Storage Domain|Data Store
|Logical Unit|LUN
|===

Note: These are common terminology mappings only and might not represent
every case for this data collector.

== Requirements

* IP address of the RHEV server over port 443 via REST API
* Read-only username and password
* RHEV Version 3.0+

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|RHEV Server IP Address|IP address of the storage system
|User name |User name with admin privileges
|Password for the admin privileged account|Password
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|HTTPS Communication Port|Port used for HTTPS communication to RHEV
|Inventory poll interval (min)|The default is 20 minutes.
//|Connection Timeout (sec)|The default is 60.
|===


== Troubleshooting
```

```
Additional information on this Data Collector may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[ID3c54d197c1ebcf19953fcb63af17f421]]
= Rubrik CDM Data Collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses the Rubrik data collector to acquire inventory and
performance data from Rubrik storage appliances.


== Terminology

Cloud Insights acquires the following inventory information from the
Rubrik data collector. For each asset type acquired by Cloud Insights, the
most common terminology used for this asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:


[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Cluster|Storage, Storage Pool
|Node|Storage Node
|Disk|Disk
|===

Note: These are common terminology mappings only and might not represent
every case for this data source.
```

```
== Requirements

The following are required to configure this data collector:

* The Cloud Insights Acquisition Unit will initiate connections to TCP
port 443 to Rubrik cluster. One collector per cluster.
* Rubrik cluster IP address.
* User name and password to the cluster.
* Port requirement: HTTPS 443


== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description

|IP|IP address of the Rubrik cluster
|User name|User name for the cluster
|Password|Password for the cluster
|===

== Advanced configuration

[cols=2*, options="header", cols"50,50"]
|===
|Inventory poll interval (min)|The default is 60
|Performance Poll Interval (sec)|The default is 300
|===


== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|I received a message that more than one storage is created.
|Check that the cluster is configured correctly, and the collector is
pointing to a single cluster.
|I received a warning that disk API returned more data
|Check with support to get additional data.
|===

Additional information may be found from the
```

```
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].




[[IDda57dfa15d453b4a43c9b4c9b517129c]]
= Configuring the VMware VSphere data collector
:toc: macro
:hardbreaks:
:toclevels: 2
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
The data collector for VMware vSphere collects ESX Host information and
requires read-only privileges on all objects within the Virtual Center.

== Terminology

Cloud Insights acquires the following inventory information from the
VMware vSphere data collector. For each asset type acquired, the most
common terminology used for the asset is shown. When viewing or
troubleshooting this data collector, keep the following terminology in
mind:

[cols=2*, options="header", cols"50,50"]
|===
|Vendor/Model Term | Cloud Insights Term
|Virtual disk|Disk
|Host|Host
|Virtual machine|Virtual machine
|Data store|Data store
|LUN|Volume
|Fibre channel port|Port
|===
These are common terminology mappings only and might not represent every
case for this data collector.

== Requirements

The following information is required to configure this data collector:

* IP address of the Virtual Center server
* Read-only username and password in Virtual Center
* We require read only privileges on all objects within Virtual Center.
* SDK access on the Virtual Center server - normally already setup.
* Port requirements: http-80 https-443
* Validate access:
** Log into Virtual Center Client using above username and password
** Verify SDK enabled: telnet <vc_ip> 443

== Setup and connection

[cols=2*, options="header", cols"50,50"]
|===
|Field | Description
|Name|Unique name for the data collector
|Acquisition unit|Name of acquisition unit
|===

== Configuration

[cols=2*, options="header", cols"50,50"]
|===
|Field|Description
|Virtual center IP Address |IP address of the Virtual Center
|User name |User name used to access the Virtual Center
|Password|Password used to access the Virtual Center
|===

== Advanced configuration

In the advanced configuration screen, check the *VM Performance* box to
collect performance data. Inventory collection is enabled by default.
The following fields can be configured:

[cols=2*,  cols"50,50"]
|===
|Field|Description
|Inventory poll interval (min)  | Default is 20
//|Connection Timeout (ms)|Default is 60000
|Filter VMs |Select CLUSTER, DATACENTER, or ESX HOST

//or you can choose to filter by TAG

|Choose 'Exclude' or 'Include' to Specify a List|Create a filter list
(CLUSTER, DATACENTER, and/or ESX_HOST)
|Number of retries | Default is 3
|Communication port| Default is 443

//|Tag Keys and Values on which to Filter VMs|Click *+ Filter Tag* to
```

```
choose which VMs (and associated disks) to include/exclude by filtering
for keys and values that match keys and values of tags on the VM. Tag Key
is required, Tag Value is optional. When Tag Value is empty, the VM is
filtered as long as it matches the Tag Key.
//Tag filtering is only available in VSphere 6.0 Beta or later.

|Filter Device List...|This list must consist of exact string matches - if
you intend to filter by ESX_HOST, you must build a comma delimited list of
the exact "names" of your ESX hosts as reported in both Cloud Insights and
vSphere. These "names" may be either IP addresses, simple hostnames, or
fully qualified domain names (FQDNs) - this is determined by how these
hosts were named when they were originally added to vSphere.

When filtering by CLUSTER, use the Cloud Insights-style cluster names as
reported by CI on hypervisors - Cloud Insights prepends the vSphere
cluster name with the vSphere datacenter name and a forward slash -
"DC1/clusterA" is the cluster name Cloud Insights would report on a
hypervisor in clusterA within data center DC1.

|Performance poll interval (sec)|Default is 300
|===



== Mapping VMware tags to Cloud Insights annotations

The VMware data collector allows you to populate Cloud Insights
annotations with tags configured on VMware. The annotations must be named
exactly as the VMware tags. Cloud Insights will always populate same-named
text-type annotations, and will make a "best attempt" to populate
annotations of other types (number, boolean, etc). If your annotation is
of a different type and the data collector fails to populate it, it may be
necessary to remove the annotation and re-create it as a text type.

Note that VMware tags may be case-sensitive, while Cloud Insights tags are
case-insensitive. So if you create an annotation named "OWNER" in Cloud
Insights, and tags named "OWNER", "Owner", and "owner" in VMware, all of
those variations of "owner" would map to Cloud Insight’s "OWNER"
annotation.

Keep the following in mind:

* Cloud Insights currently only auto-publishes support information for
NetApp devices.
* Since this support information is held in annotation form, you can query
it or use it in dashboards.
* If a user overwrites or empties the annotation value, the value is
autofilled again when Cloud Insights updates annotations, which it does
```

```
once a day.



== Troubleshooting
Some things to try if you encounter problems with this data collector:

=== Inventory

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|Error: Include list to filter VMs cannot be empty
|If Include List is selected, please list valid DataCenter, Cluster, or
Host names to filter VMs
|Error: Failed to instantiate a connection to VirtualCenter at IP
|Possible solutions:

* Verify credentials and IP address entered.
* Try to communicate with Virtual Center using VMware Infrastructure
Client.
* Try to communicate with Virtual Center using Managed Object Browser (e.g
MOB).
|Error: VirtualCenter at IP has non-conform certificate that JVM requires
|Possible solutions:

* Recommended: Re-generate certificate for Virtual Center by using
stronger (e.g. 1024-bit) RSA key.
* Not Recommended: Modify the JVM java.security configuration to leverage
the constraint jdk.certpath.disabledAlgorithms to allow 512-bit RSA key.
See JDK 7 update 40 release notes at
"http://www.oracle.com/technetwork/java/javase/7u40-relnotes-2004172.html"
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page or in
the xref:{relative_path}reference_data_collector_support_matrix.html[Data
Collector Support Matrix].





:leveloffset: -1
```

```
= Data Collector Reference - Services

:leveloffset: +1


[[ID2927ab2bae3f5ad3be64398a6cce61d7]]
= Node Data Collection
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights gathers metrics from the node on which you install an
agent.

== Installation

. From *Observability > Collectors*, choose an operating system/platform.
Note that installing any integration data collector (Kubernetes, Docker,
Apache, etc.) will also configure node data collection.
+
. Follow the instructions to configure the agent. The instructions vary
depending on the type of Operating System or Platform you are using to
collect data.

== Objects and Counters

The following objects and their counters are collected as Node metrics:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Node Filesystem

|Node UUID
Device
Path
Type

|Node IP
Node Name
Node OS
```

```
Mode

|Free
Inodes Free
Inodes Total
Inodes Used
Total
Used Total
Used

|Node Disk

|Node UUID
Disk

|Node IP
Node Name
Node OS

|IO Time Total
IOPS In Progress
Read Bytes (per sec)
Read Time Total
Reads (per sec)
Weighted IO Time Total
Write Bytes (per sec)
Write Time Total
Writes (per sec)
Current Disk Queue Length
Write Time
Read Time
IO Time

|Node CPU

|Node UUID
CPU

|Node IP
Node Name
Node OS

|System CPU Usage
User CPU Usage
Idle CPU Usage
Processor CPU Usage
```

```
Interrupt CPU Usage
DPC CPU Usage

|Node

|Node UUID

|Node IP
Node Name
Node OS

|Kernel Boot Time
Kernel Context Switches (per sec)
Kernel Entropy Available
Kernel Interrupts (per sec)
Kernel Processes Forked (per sec)
Memory Active
Memory Available Total
Memory Available
Memory Buffered
Memory Cached
Memory Commit Limit
Memory Committed As
Memory Dirty
Memory Free
Memory High Free
Memory High Total
Memory Huge Page Size
Memory Huge Pages Free
Memory Huge Pages Total
Memory Low Free
Memory Low Total
Memory Mapped
Memory Page Tables
Memory Shared
Memory Slab
Memory Swap Cached
Memory Swap Free
Memory Swap Total
Memory Total
Memory Used Total
Memory Used
Memory Vmalloc Chunk
Memory Vmalloc Total
Memory Vmalloc Used
Memory Wired
Memory Writeback Total
Memory Writeback Tmp
Memory Cache Faults
Memory Demand Zero Faults
Memory Page Faults
Memory Pages
Memory Nonpaged
Memory Paged
Memory Cache Core
Memory Standby Cache Normal
Memory Standby Cache Reserve
Memory Transition Faults
Processes Blocked
Processes Dead
Processes Idle
Processes Paging
Processes Running
Processes Sleeping
Processes Stopped
Processes Total
Processes Total Threads
Processes Unknown
Processes Zombies
Processor Queue Length
Swap Free
Swap Total
Swap Used Total
Swap Used
Swap In
Swap Out
System Uptime
System Num CPU
System Num Users
System Calls

|Node Network

|Network Interface
Node UUID

|Node Name
Node IP
Node OS

|Bytes Received
Bytes Sent
```

```
Packets Outboud Discarded
Packets Outboud Errors
Packets Received Discarded
Packets Received Errors
Packets Received
Packets Sent
|===

== Setup

Setup and Troubleshooting information can be found on the
xref:{relative_path}task_config_telegraf_agent.html[Configuring an Agent]
page.




[[IDe84898c1fe7d47ef5bd856be5e6c7dc7]]
= ActiveMQ Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from ActiveMQ.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
ActiveMQ.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
```

```
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:ActiveMQDCConfigWindows.png[ActiveMQ configuration]


== Setup

Information may be found in the http://activemq.apache.org/getting-
started.html[ActiveMQ documentation]

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|ActiveMQ Queue

|Namespace
Queue
Port
Server

|Node Name
Node IP
Node UUID

|Consumer Count
Dequeue Count
Enqueue Count
Queue Size

|ActiveMQ Subscriber
|Client ID
Connection ID
Port
Server
Namespace
| Is Active
Destination
Node Name
Node IP
Node UUID
Node OS
Selector
Subscription
|Dequeue Count
Dispatched Count
Dispatched Queue Size
Enqueue Count
Pending Queue Size

|ActiveMQ Topic
|Topic
Port
Server
Namespace
|Node Name
Node IP
Node UUID
Node OS
|Consumer Count
Dequeue Count
Enqueue Count
Size

|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID857fe755c17bc31bc55ddee376107680]]
= Apache Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
```

```
This data collector allows collection of data from Apache servers in your
environment.

.Pre-requisites

* You must have your Apache HTTP Server set up and properly running
* You must have sudo or administrator permissions on your agent host/VM
* Typically, the Apache _mod_status_ module is configured to expose a page
at the '/server-status?auto' location of the Apache server. The
_ExtendedStatus_ option must be enabled in order to collect all available
fields. For information about how to configure your server, see the Apache
module documentation:
https://httpd.apache.org/docs/2.4/mod/mod_status.html#enable

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Apache.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:ApacheDCConfigLinux.png[Apache configuration]

== Setup

Telegraf's plugin for Apache's HTTP Server relies on the 'mod_status'
module to be enabled. When this is enabled, Apache's HTTP Server will
expose an HTML endpoint that can be viewed on your browser or scraped for
extraction of status of all Apache's HTTP Server configuration.

=== Compatibility:
```

```
Configuration was developed against Apache's HTTP Server version 2.4.38.

=== Enabling mod_status:
Enabling and exposing the 'mod_status' modules involves two steps:

* Enabling module
* Exposing stats from module


=== Enabling module:
The loading of modules is controlled by the config file under
'/usr/local/apache/conf/httpd.conf'. Edit the config file and uncomment
the following lines:

 LoadModule status_module modules/mod_status.so
```

```
 Include conf/extra/httpd-info.conf


=== Exposing stats from module:

The exposing of 'mod_status' is controlled by the config file under
'/usr/local/apache2/conf/extra/httpd-info.conf'. Make sure you have the
following in that configuration file (at least, other directives will be
there):
```

Allow server status reports generated by mod_status, with the URL of http://servername/server-status

<Location /server-status>
SetHandler server-status
</Location>

#
# ExtendedStatus controls whether Apache will generate "full" status
# information (ExtendedStatus On) or just basic information (ExtendedStatus
# Off) when the "server-status" handler is called. The default is Off.
#
ExtendedStatus On

```
For detailed instructions on the 'mod_status' module, see the
link:https://httpd.apache.org/docs/2.4/mod/mod_status.html#enable[Apache
documentation]

== Objects and Counters
```

```
The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Apache

|Namespace
Server

|Node IP
Node Name
Port
Parent Server Config Generation
Parent Server MPM Generation
Server Uptime
Is Stopping

|Busy Workers
Bytes per Request
Bytes per Second
CPU Children System
CPU Children User
CPU Load
CPU System
CPU User
Asynchronous Connections Closing
Asynchronous Connections Keep Alive
Asynchronous Connections Writing
Connections Total
Duration per Request
Idle Workers
Load Average (last 1m)
Load Average (last 15m)
Load Average (last 5m)
Processes
Requests per Second
Total Accesses
Total Duration
Total KBytes
Scoreboard Closing
Scoreboard DNS Lookups
Scoreboard Finishing
Scoreboard Idle Cleanup
Scoreboard Keep Alive
Scoreboard Logging
Scoreboard Open
Scoreboard Reading
Scoreboard Sending
Scoreboard Starting
Scoreboard Waiting
|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID720d49953357b2bf3f836b70064a163a]]
= Consul Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Consul.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Consul.
+
If you haven't configured an Agent for collection, you are prompted to
xref:{relative_path}task_config_telegraf_agent.html[install an agent] in
your environment.
+
If you have an agent already configured, select the appropriate Operating
System or Platform and click *Continue*.

. Follow the instructions in the Consul Configuration screen to configure
the data collector. The instructions vary depending on the type of
Operating System or Platform you are using to collect data.

//image:ConsulDCConfigWindows.png[Consul configuration]
```

```
== Setup

Information may be found in the
link:https://www.consul.io/docs/index.html[Consul documentation].


== Objects and Counters for consul

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Consul

|Namespace
Check ID
Service Node

|Node IP
Node OS
Node UUID
Node Name
Service Name
Check Name
Service ID
Status

|Critical
Passing
Warning
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID5bd25d9ed944ea316f61e423b818ad9b]]
= Couchbase Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
```

```
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Couchbase.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Couchbase.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:CouchbaseDCConfigWindows.png[Couchbase configuration]

== Setup

Information may be found in the
link:https://docs.couchbase.com/home/index.html[Couchbase documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Couchbase Node
```

```
|Namespace
Cluster
Couchbase Node Hostname

|Node Name
Node IP

|Memory Free
Memory Total

|Couchbase Bucket

|Namespace
Bucket
Cluster

|Node Name
Node IP

|Data Used
Data Fetches
Disk Used
Item Count
Memory Used
Operations Per Second
Quota Used
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDd09fbdab98bf79ff55e3a2af1a26ddf6]]
= CouchDB Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
```

```
Cloud Insights uses this data collector to gather metrics from CouchDB.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
CouchDB.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:CouchDBDCConfigLinux.png[CouchDB configuration]

== Setup

Information may be found in the
link:http://docs.couchdb.org/en/stable/[CouchDB documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|CouchDB

|Namespace
Server

|Node Name
Node IP
```

```
|Authentication Cache Hits
Authentication Cache Miss
Database Reads
Database Writes
Databases Open
Open OS Files
Max Request Time
Min Request Time
Httpd Request Methods Copy
Httpd Request Methods Delete
Httpd Request Methods Get
Httpd Request Methods Head
Httpd Request Methods Post
Httpd Request Methods Put
Status Codes 200
Status Codes 201
Status Codes 202
Status Codes 301
Status Codes 304
Status Codes 400
Status Codes 401
Status Codes 403
Status Codes 404
Status Codes 405
Status Codes 409
Status Codes 412
Status Codes 500
|===



== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID00534640191ba34dba8046b70c9fdcac]]
= Docker Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
```

```
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Docker.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Docker.
+
If you haven't configured an Agent for collection, you are prompted to
xref:{relative_path}task_config_telegraf_agent.html[install an agent] in
your environment.
+
If you have an agent already configured, select the appropriate Operating
System or Platform and click *Continue*.

. Follow the instructions in the Docker Configuration screen to configure
the data collector. The instructions vary depending on the type of
Operating System or Platform you are using to collect data.
//The example below shows the instructions for Linux:

image:DockerDCConfigLinux.png[Docker configuration]

== Setup

The Telegraf input plugin for Docker collects metrics through a specified
UNIX socket or a TCP endpoint.

=== Compatibility
Configuration was developed against Docker version 1.12.6.

=== Setting Up

=== Accessing Docker through a UNIX socket
If the Telegraf agent is running on baremetal, add the telegraf Unix user
to the docker Unix group by running the following:

 sudo usermod -aG docker telegraf

If the Telegraf agent is running within a Kubernetes pod, expose the
Docker Unix socket by mapping the socket into the pod as a volume and then
mounting that volume to /var/run/docker.sock.  For example, add the
following to the PodSpec:

-----
```

```
volumes:
...
- name: docker-sock
hostPath:
path: /var/run/docker.sock
type: File
-----

Then, add the following to the Container:

-----
volumeMounts:
...
- name: docker-sock
mountPath: /var/run/docker.sock
-----

Note that the Cloud Insights installer provided for the Kubernetes
platform takes care of this mapping automatically.

=== Access Docker through a TCP endpoint

By default, Docker uses port 2375 for unencrypted access and port 2376 for
encrypted access.

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Docker Engine

|Namespace
Docker Engine



|Node Name
Node IP
Node UUID
Node OS
Kubernetes Cluster
Docker Version
Unit
```

```
|Memory
Containers
Containers Paused
Containers Running
Containers Stopped
CPUs
Go Routines
Images
Listener Events
Used File Descriptors
Data Available
Data Total
Data Used
Metadata Available
Metadata Total
Metadata Used
Pool Blocksize


|Docker Container

|Namespace
Container Name
Docker Engine

|Kubernetes Container Hash
Kubernetes Container Ports
Kubernetes Container Restart Count
Kubernetes Container Termination Message Path
Kubernetes Container Termination Message Policy
Kubernetes Pod Termination Grace Period
Container Image
Container Status
Container Version
Node Name
Kubernetes Container Log Path
Kubernetes Container Name
Kubernetes Docker Type
Kubernetes Pod Name
Kubernetes Pod Namespace
Kubernetes Pod UID
Kubernetes Sandbox ID
Node IP
Node UUID
Docker Version
Kubernetes IO Config Seen
Kubernetes IO Config Source
OpenShift IO SCC
Kubernetes Description
Kubernetes Display Name
OpenShift Tags
Kompose Service
Pod Template Hash
Controller Revision Hash
Pod Template Generation
License
Schema Build Date
Schema License
Schema Name
Schema URL
Schema VCS URL
Schema Vendor
Schema Version
Schema Schema Version
Maintainer
Customer Pod
Kubernetes StatefulSet Pod Name
Tenant
Webconsole
Architecture
Authoritative Source URL
Build Date
RH Build Host
RH Component
Distribution Scope
Install
Release
Run
Summary
Uninstall
VCS Ref
VCS Type
Vendor
Version
Health Status
Container ID
|Memory Active Anonymous
Memory Active File
Memory Cache
Memory Hierarchical Limit
Memory Inactive Anonymous
Memory Inactive File
Memory Limit
Memory Mapped File
Memory Max Usage
Memory Page Fault
Memory Page Major Fault
Memory Paged In
Memory Paged Out
Memory Resident Set Size
Memory Resident Set Size Huge
Memory Total Active Anonymous
Memory Total Active File
Memory Total Cache
Memory Total Inactive Anonymous
Memory Total Inactive File
Memory Total Mapped File
Memory Total Page Fault
Memory Total Page Major Fault
Memory Total Paged In
Memory Total Paged Out
Memory Total Resident Set Size
Memory Total Resident Set Size Huge
Memory Total Unevictable
Memory Unevictable
Memory Usage
Memory Usage Percent
Exit Code
OOM Killed
PID
Started At
Failing Streak


|Docker Container Block IO

|Namespace
Container Name
Device
Docker Engine

|Kubernetes Container Hash
Kubernetes Container Ports
Kubernetes Container Restart Count
Kubernetes Container Termination Message Path
Kubernetes Container Termination Message Policy
Kubernetes Pod Termination Grace Period
Container Image
Container Status
Container Version
Node Name
Kubernetes Container Log Path
Kubernetes Container Name
Kubernetes Docker Type
Kubernetes Pod Name
Kubernetes Pod Namespace
Kubernetes Pod UID
Kubernetes Sandbox ID
Node IP
Node UUID
Docker Version
Kubernetes Config Seen
Kubernetes Config Source
OpenShift SCC
Kubernetes Description
Kubernetes Display Name
OpenShift Tags
Schema Schema Version
Pod Template Hash
Controller Revision Hash
Pod Template Generation
Kompose Service
Schema Build Date
Schema License
Schema Name
Schema Vendor
Customer Pod
Kubernetes StatefulSet Pod Name
Tenant
Webconsole
Build Date
License
Vendor
Architecture
Authoritative Source URL
RH Build Host
RH Component
Distribution Scope
Install
Maintainer
Release
Run
Summary
Uninstall
```

```
VCS Ref
VCS Type
Version
Schema URL
Schema VCS URL
Schema Version
Container ID

|IO Service Bytes Recursive Async
IO Service Bytes Recursive Read
IO Service Bytes Recursive Sync
IO Service Bytes Recursive Total
IO Service Bytes Recursive Write
IO Serviced Recursive Async
IO Serviced Recursive Read
IO Serviced Recursive Sync
IO Serviced Recursive Total
IO Serviced Recursive Write


|Docker Container Network

|Namespace
Container Name
Network
Docker Engine

|Container Image
Container Status
Container Version
Node Name
Node IP
Node UUID
Node OS
K8s Cluster
Docker Version
Container ID

|RX Dropped
RX Bytes
RX Errors
RX Packets
TX Dropped
TX Bytes
TX Errors
TX Packets
```

```
|Docker Container CPU

|Namespace
Container Name
CPU
Docker Engine

|Kubernetes Container Hash
Kubernetes Container Ports
Kubernetes Container Restart Count
Kubernetes Container Termination Message Path
Kubernetes Container Termination Message Policy
Kubernetes Pod Termination Grace Period
Kubernetes Config Seen
Kubernetes Config Source
OpenShift SCC
Container Image
Container Status
Container Version
Node Name
Kubernetes Container Log Path
Kubernetes Container name
Kubernetes Docker Type
Kubernetes Pod Name
Kubernetes Pod Namespace
Kubernetes Pod UID
Kubernetes Sandbox ID
Node IP
Node UUID
Node OS
Kubernetes Cluster
Docker Version
Kubernetes Description
Kubernetes Display Name
OpenShift Tags
Schema Version
Pod Template Hash
Controller Revision Hash
Pod Template Generation
Kompose Service
Schema Build Date
Schema License
Schema Name
Schema Vendor
Customer Pod
```

```
Kubernetes StatefulSet Pod Name
Tenant
Webconsole
Build Date
License
Vendor
Architecture
Authoritative Source URL
RH Build Host
RH Component
Distribution Scope
Install
Maintainer
Release
Run
Summary
Uninstall
VCS Ref
VCS Type
Version
Schema URL
Schema VCS URL
Schema Version
Container ID

|Throttling Periods
Throttling Throttled Periods
Throttling Throttled Time
Usage In Kernel Mode
Usage In User Mode
Usage Percent
Usage System
Usage Total



|===

== Troubleshooting

[cols=2*, options="header", cols"50,50"]
|===
|Problem:|Try this:
|I do not see my Docker metrics in Cloud Insights after following the
instructions on the configuration page.
|Check the Telegraf agent logs to see if it reports the following error:
 E! Error in plugin [inputs.docker]: Got permission denied while trying to
connect to the Docker daemon socket

If it does, take the necessary steps to provide the Telegraf agent access
to the Docker Unix socket as specified above.
|===

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.




[[ID69d5405fbb149eb19c40d7c245cde45a]]
= Elasticsearch Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from
Elasticsearch.


. From *Observability > Collectors*, click *+Data Collector*. Choose
Elasticsearch.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
```

```
you are using to collect data.

image:ElasticsearchDCConfigLinux.png[Elasticsearch configuration]

== Setup
Information may be found in the
link:https://www.elastic.co/guide/index.html[Elasticsearch documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Elasticsearch Cluster

|Namespace
Cluster

|Node IP
Node Name
Cluster Status

|Master Node Count
Total Node Count
Filesystem Data Available (bytes)
Filesystem Data Free (bytes)
Filesystem Data Total (bytes)
JVM Threads
OS Allocated Proccessors
OS Available Processors
OS Mem Free (bytes)
OS Mem Free
OS Mem Total (bytes)
OS Mem Used (bytes)
OS Mem Used
Process CPU
Indices Completion Size (bytes)
Indices Count
Indices Docs Count
Indices Docs Deleted
Indices Field Data Evictions
Indices Field Data Memory Size (bytes)
Indices Query Cache Count
Indices Cache Size
Indices Segments Count
Indices Segments Doc Values Memory (bytes)
Indices Shards Index Primaries Avg
Indices Shards Index Primaries Max
Indices Shards Index Primaries Min
Indices Shards Index Replication Avg
Indices Shards Index Replication Max
Indices Shards Index Replication Min
Indices Shards Avg
Indices Shards Max
Indices Shards Primaries
Indices Shards Replication
Indices Shards Total
Indices Store Size (bytes)

|Elasticsearch Node

|Namespace
Cluster
ES Node ID
ES Node IP
ES Node

|Zone ID

|Machine Learning Enabled
Machine Learning Memory
Machine Learning Max Open Jobs
X-Pack Installed
Breakers Accounting Estimated Size (bytes)
Breakers Accounting Limit Size (bytes)
Breakers Accounting Overhead
Breakers Accounting Tripped
Breakers Field Data Estimated Size (bytes)
Breakers Field Data Limit Size (bytes)
Breakers Field Data Overhead
Breakers Field Data Tripped
Breakers In-Flight Sstimated Size (bytes)
Breakers In-Flight Limit Size (bytes)
Breakers In-Flight Overhead
Breakers In-Flight Tripped
Breakers Parent Estimated Size (bytes)
Breakers Parent Limit Size (bytes)
Breakers Parent Overhead
Breakers Parent Tripped
Breakers Request Estimated Size (bytes)
Breakers Request Limit Size (bytes)
Breakers Request Overhead
Breakers Request Tripped
Filesystem Data Available (bytes)
Filesystem Data Free (bytes)
Filesystem Data Total (bytes)
Filesystem IO Stats Devices Ops
Filesystem IO Stats Devices Read (kb)
Filesystem IO Stats Devices Read Ops
Filesystem IO Stats Devices Erite (kb)
Filesystem IO Stats Devices Write Ops
Filesystem IO Stats Total Ops
Filesystem IO Stats Total Read (kb)
Filesystem IO Stats Read Ops
Filesystem IO Stats Total Write (kb)
Filesystem IO Stats Write Ops
Filesystem Least Usage Estimate Available (bytes)
Filesystem Least Usage Estimate Total (bytes)
Filesystem Least Usage Used Disk
Filesystem Most Usage Estimate Available (bytes)
Filesystem Most Usage Estimate Total (bytes)
Filesystem Most Usage Used Disk
Filesystem Total Available (bytes)
Filesystem Total Free (bytes)
Filesystem Total (bytes)
Indices Completion Size (bytes)
Indices Docs Count
Indices Docs Deleted
Indices Field Data Evictions
Indices Field Data Memory Size (bytes)
Indices Flush Periodic
Indices Flush Total
Indices Flush Total Time
Indices Get Current
Indices Get Exists Time
Indices Get Exists Total
Indices Get Total
Indices Indexing Delete Total
Indices Indexing Index Total
Indices Indexing Noop Update Total
Indices Indexing Throttle Time
HTTP Current Open
HTTP Total Opened
JVM Buffer Pool Direct Count
JVM Classes Current Loaded Count
JVM GC Collectors Old Collection Count
JVM Mem Heap Committed (bytes)
OS CPU Load Average 15m
OS CPU
OS Mem Free (bytes)
OS Swap Free (bytes)
Process CPU
Process CPU Total
Process Max File Descriptors
Process Mem Total Virtual (bytes)
Thread Pool Analyze Active
Thread Pool Analyze Completed
Thread Pool Analyze Largest
Thread Pool Analyze Queue
Thread Pool Analyze Rejected
Thread Pool Analyze Threads
Thread Pool Fetch Shard Started Active
Thread Pool Fetch Shard Started Completed
Thread Pool Fetch Shard Started Largest
Thread Pool Fetch Shard Started Queue
Thread Pool Fetch Shard Started Rejected
Thread Pool Fetch Shard Started Shreads
Thread Pool Fetch Shard Store Active
Thread Pool Fetch Shard Store Completed
Transport RX (per sec)
Transport RX Bytes (per sec)
Transport Server Open
Transport TX (per sec)
Transport TX Bytes (per sec)
|===



== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID153ce3ee29f9380043c8501881dc2d6f]]
= Flink Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
```

```
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Flink.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Flink.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:FlinkDCConfigWindows.png[Flink configuration]

== Setup

A full Flink deployment involves the following components:

JobManager: The Flink primary system. Coordinates a series of
TaskManagers. In a High Availability setup, system will have more than one
JobManager.
TaskManager: This is where Flink operators are executed.
The Flink plugin is based on the telegraf's Jolokia plugin. As such as a
requirement to gather info from all Flink components, JMX needs to be
configured and exposed via Jolokia on all components.

=== Compatibility
Configuration was developed against Flink version 1.7.0.
```

```
=== Setting Up

==== Jolokia Agent Jar
For all individual components, a version the Jolokia agent jar file must
be downloaded. The version tested against was
link:https://jolokia.org/download.html[Jolokia agent 1.6.0].

Instructions below assume that downloaded jar file (jolokia-jvm-1.6.0-
agent.jar) is placed under location '/opt/flink/lib/'.

==== JobManager
To configure JobManager to expose the Jolokia API, you can setup the
following environment variable on your nodes then restart the JobManager:

 export FLINK_ENV_JAVA_OPTS="-javaagent:/opt/flink/lib/jolokia-jvm-1.6.0-
agent.jar=port=8778,host=0.0.0.0"

You can choose a different port for Jolokia (8778). If you have an
internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0
by your own IP. Notice this IP needs to be accessible from the telegraf
plugin.

==== TaskManager
To configure TaskManager(s) to expose the Jolokia API, you can setup the
following environment variable on your nodes then restart the TaskManager:

 export FLINK_ENV_JAVA_OPTS="-javaagent:/opt/flink/lib/jolokia-jvm-1.6.0-
agent.jar=port=8778,host=0.0.0.0"

You can choose a different port for Jolokia (8778). If you have an
internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0
by your own IP. Notice this IP needs to be accessible from the telegraf
plugin.

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Flink Task Manager

|Cluster
Namespace
Server
```

```
|Node Name
Task Manager ID
Node IP

|Network Available Memory Segments
Network Total Memory Segments
Garbage Collection PS MarkSweep Count
Garbage Collection PS MarkSweep Time
Garbage Collection PS Scavenge Count
Garbage Collection PS Scavenge Time
Heap Memory Committed
Heap Memory Init
Heap Memory Max
Heap Memory Used
Thread Count Daemon
Thread Count Peak
Thread Count
Thread Count Total Started

|Flink Job

|Cluster
Namespace
server
Job ID

|Node Name
Job Name
Node IP
Last Checkpoint External Path
Restarting Time

|Downtime
Full Restarts
Last Checkpoint Alignment Buffered
Last Checkpoint Duration
Last Checkpoint Size
Number of Completed Checkpoints
Number of Failed Checkpoints
Number of in Progress Checkpoints
Number of Checkpoints
Uptime

|Flink Job Manager
```

```
|Cluster
Namespace
Server

|Node Name
Node IP

|Garbage Collection PS MarkSweep Count
Garbage Collection PS MarkSweep Time
Garbage Collection PS Scavenge Count
Garbage Collection PS Scavenge Time
Heap Memory Committed
Heap Memory Init
Heap Memory Max
Heap Memory Used
Number Registered Task Managers
Number Running Jobs
Task Slots Available
Task Slots Total
Thread Count Daemon
Thread Count Peak
Thread Count
Thread Count Total Started

|Flink Task

|Cluster
Namespace
Job ID
Task ID

|Server
Node Name
Job Name
Sub Task Index
Task Attempt ID
Task Attempt Number
Task Name
Task Manager ID
Node IP
Current Input Watermark

|Buffers In Pool Usage
Buffers In Queue Length
Buffers Out Pool Usage
Buffers Out Queue Length
```

```
Number Buffers In Local
Number Bufffers In Local Per Second Count
Number Buffers in Local Per Second Rate
Number Buffers In Remote
Number Buffers In Remote Per Second Count
Number Buffers In Remote Per Second Rate
Number Buffers Out
Number Buffers Out Per Second Count
Number Buffers Out Per Second Rate
Number Bytes In Local
Number Bytes In Local Per Second Count
Number Bytes In Local Per Second Rate
Number Bytes In Remote
Number Bytes In Remote Per Second Count
Number Bytes In Remote Per Second Rate
Number Bytes Out
Number Bytes Out Per Second Count
Number Bytes Out Per Second Rate
Number Records In
Number Records In Per Second Count
Number Records In Per Second Rate
Number Records Out
Number Records Out Per Second Count
Number Records Out Per Second Rate

|Flink Task Operator

|Cluster
Namespace
Job ID
Operator ID
Task ID

|Server
Node Name
Job Name
Operator Name
Sub Task Index
Task Attempt ID
Task Attempt Number
Task Name
Task Manager ID
Node IP

|Current Input Watermark
Current Output Watermark
```

```
Number Records In
Number Records In Per Second Count
Number Records In Per Second Rate
Number Records Out
Number Records Out Per Second Count
Number Records Out Per Second Rate
Number Late Records Dropped
Assigned Partitions
Bytes Consumed Rate
Commit Latency Avg
Commit Latency Max
Commit Rate
Commits Failed
Commits Succeeded
Connection Close Rate
Connection Count
Connection Creation Rate
Count
Fetch Latency Avg
Fetch Latency Max
Fetch Rate
Fetch Size Avg
Fetch Size Max
Fetch Throttle Time Avg
Fetch Throttle Time Max
Heartbeat Rate
Incoming Byte Rate
IO Ratio
IO Time Avg (ns)
IO Wait Ratio
IO Wait Time Avg (ns)
Join Rate
Join Time Avg
Last Heartbeat Ago
Network IO Rate
Outgoing Byte Rate
Records Consumed Rate
Records Lag Max
Records per Request Avg
Request Rate
Request Size Avg
Request Size Max
Response Rate
Select Rate
Sync Rate
Sync Time Avg
```

```
Heartbeat Response Time Max
Join Time Max
Sync Time Max
|===





== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.




[[IDebe40bb015da730311f9b41c8487a867]]
= Hadoop Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Hadoop.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Hadoop.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.
```

```
. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:HadoopDCConfigLinux-1.png[Hadoop configuration]
image:HadoopDCConfigLinux-2.png[Hadoop configuration]

== Setup

A full Hadoop deployment involves the following components:

* NameNode: The Hadoop Distributed File System (HDFS) primary system.
Coordinates a series of DataNodes.
* Secondary NameNode: a warm failover for the main NameNode. In Hadoop the
promotion to NameNode does not occur automatically. Secondary NameNode
gathers information from NameNode to be ready to be promoted when needed.
* DataNode: Actual owner for data.
* ResourceManager: The compute primary system (Yarn). Coordinates a series
of NodeManagers.
* NodeManager: The resource for compute. Actual location for running of
applications.
* JobHistoryServer: Responsible for servicing all job history related
requests.

The Hadoop plugin is based on the telegraf's Jolokia plugin. As such as a
requirement to gather info from all Hadoop components, JMX needs to be
configured and exposed via Jolokia on all components.

=== Compatibility
Configuration was developed against Hadoop version 2.9.2.

=== Setting Up

==== Jolokia Agent Jar
For all individual components, a version the Jolokia agent jar file must
be downloaded. The version tested against was
link:https://jolokia.org/download.html[Jolokia agent 1.6.0].

Instructions below assume that downloaded jar file (jolokia-jvm-1.6.0-
agent.jar) is placed under location '/opt/hadoop/lib/'.

==== NameNode
To configure NameNode to expose the Jolokia API, you can setup the
following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export HADOOP_NAMENODE_OPTS="$HADOOP_NAMENODE_OPTS -javaagent:/opt/hadoop/lib/jolokia

-jvm-1.6.0-agent.jar=port=7800,host=0.0.0.0 -Dcom.sun.management.jmxremote
-Dcom.sun.management.jmxremote.port=8000 -Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8000 above) and Jolokia (7800). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
==== Secondary NameNode
To configure the Secondary NameNode to expose the Jolokia API, you can
setup the following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export HADOOP_SECONDARYNAMENODE_OPTS="$HADOOP_SECONDARYNAMENODE_OPTS
-javaagent:/opt/hadoop/lib/jolokia-jvm-1.6.0-agent.jar=port=7802,host=0.0.0.0
-Dcom.sun.management.jmxremote -Dcom.sun.management.jmxremote.port=8002
-Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8002 above) and Jolokia (7802). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
==== DataNode
To configure the DataNodes to expose the Jolokia API, you can setup the
following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export HADOOP_DATANODE_OPTS="$HADOOP_DATANODE_OPTS -javaagent:/opt/hadoop/lib/jolokia-jvm-1.6.0-agent.jar=port=7801,host=0.0.0.0 -Dcom.sun.management.jmxremote
-Dcom.sun.management.jmxremote.port=8001 -Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8001 above) and Jolokia (7801). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
==== ResourceManager
To configure the ResourceManager to expose the Jolokia API, you can setup
the following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export YARN_RESOURCEMANAGER_OPTS="$YARN_RESOURCEMANAGER_OPTS
-javaagent:/opt/hadoop/lib/jolokia-jvm-1.6.0-agent.jar=port=7803,host=0.0.0.0
-Dcom.sun.management.jmxremote -Dcom.sun.management.jmxremote.port=8003
-Dcom.sun.management.jmxremote.ssl=false
-Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8003 above) and Jolokia (7803). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
==== NodeManager
To configure the NodeManagers to expose the Jolokia API, you can setup the
following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export YARN_NODEMANAGER_OPTS="$YARN_NODEMANAGER_OPTS -javaagent:/opt/hadoop/lib/jolokia-jvm-1.6.0-agent.jar=port=7804,host=0.0.0.0 -Dcom.sun.management.jmxremote -Dcom.sun.management.jmxremote.port=8004 -Dcom.sun.management.jmxremote.ssl=false -Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8004 above) and Jolokia (7804). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
==== JobHistoryServer
To configure the JobHistoryServer to expose the Jolokia API, you can setup
the following in <HADOOP_HOME>/etc/hadoop/hadoop-env.sh:
```

export HADOOP_JOB_HISTORYSERVER_OPTS="$HADOOP_JOB_HISTORYSERVER_OPTS -javaagent:/opt/hadoop/lib/jolokia-jvm-1.6.0-agent.jar=port=7805,host=0.0.0.0 -Dcom.sun.management.jmxremote -Dcom.sun.management.jmxremote.port=8005 -Dcom.sun.management.jmxremote.password.file=$HADOOP_HOME/conf/jmxremote.password"
You can choose a different port for JMX (8005 above) and Jolokia (7805). If you have an internal IP to lock Jolokia onto you can replace the "catch all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from the telegraf plugin. You can use the option '-Dcom.sun.management.jmxremote.authenticate=false' if you don’t want to authenticate. Use at your own risk.

```
== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Hadoop Secondary NameNode

|Cluster
Namespace
Server

|Node Name
Node IP
Compile Info
Version

|GC Count
```

```
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting

|Hadoop NodeManager

|Cluster
Namespace
Server

|Node Name
Node IP

|Containers Allocated
Memory Allocate
Memory Allocated Oportunistic
Virtual Cores Allocated Oportunistic
Virtual Cores Allocated
Memory Available
Virtual Cores Available
Directories Bad Local
Directories Bad Log
Cache Size Before Clean
Container Launch Duration Avg Time
Container Launch Duration Number Of Operations
Containers Completed
Containers Failed
Containers Initing
Containers Killed
Containers Launched
Containers Reiniting
ContaIners Rolled Back on Failure
Containers Running
Disk Utilization Good Local Directories
Disk Utilization Good Log Directories
Bytes Deleted Private
Bytes Deleted Public
Containers Running Opportunistic
Bytes Deleted Total
Shuffle Connections
Shuffle Output Bytes
Shuffle Outputs Failed
Shuffle Outputs Ok
GC Count
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting
```

```
|Hadoop ResourceManager

|Cluster
Namespace
Server

|Node Name
Node IP

|ApplicationMaster Launch Delay Avg
ApplicationMaster Launch Delay Number
ApplicationMaster Register Delay Avg
ApplicationMaster Register Delay Number
NodeManager Active Number
NodeManager Decomissioned Number
NodeManager Decomissioning Number
NodeManager Lost Number
NodeManager Rebooted Number
NodeManager Shutdown Number
NodeManager Healthy Number
NodeManager Memory Limit
NodeManager Virtual Cores Limit
Used Capacity
Active Applications
Active Users
Aggregate Containers Allocated
Aggregate Containers Preempted
Aggregate Containers Released
Aggregate Memory Seconds Preempted
Aggregate Node Local Containers Allocated
Aggregate Off Switch Containers Allocated
Aggregate Ack Local Containers Allocated
Aggregate Virtual Cores Seconds Preempted
Containers Allocated
Memory Allocated
Virtual Cores Allocated
Application Attempt First Container Allocation Delay Avg Time
Application Attempt First Container Allocation Delay Number
Applications Completed
Applications Failed
Applications Killed
Applications Pending
Applications Running
Applications Submitted
Memory Available
Virtual Cores Available
```

```
Containers Pending
Memory Pending
Virtual Cores Pending
Containers Reserved
Memory Reserved
Virtual Cores Reserved
Memory ApplicationMaster Used
Virtual Cores ApplicationMaster Used
Capacity Used
GC Count
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting

|Hadoop DataNode

|Cluster
Namespace
Server

|Node Name
Node IP
Cluster ID
Version
```

```
|Transceiver Count
Transmits in Progress
Cache Capacity
Cache Used
Capacity
DFS Used
Estimated Capacity Lost Total
Last Volume Failure Rate
Blocks Number Cached
Blocks Number Failed to Cache
Blocks Number Failed to Uncache
Volumes Number Failed
Capacity Remaining
GC Count
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting

|Hadoop NameNode

|Cluster
Namespace
Server
```

```
|Node Name
Node IP
Transaction ID Last Written
Time Since Last Loaded Edits
HA State
File System State
Block Pool ID
Cluster ID
Compile Info
Distinct Version Count
Version

|Block Capacity
Blocks Total
Capacity Total
Capacity Used
Capacity Used Non DFS
Blocks Corrupt
Estimated Capacity Lost Total
Blocks Excess
Heartbeats Expired
Files Total
File System Lock Queue Length
Blocks Missing
Blocks Missing Replication with Factor One
Clients Active
Data Nodes Dead
Data Nodes Decommissioning Dead
Data Nodes Decommissioning Live
Data Nodes Decomissioning
Encryption Zones Number
Data Nodes Entering Maintenance
Files Under Construction
Data Nodes Dead in Maintenance
Data Nodes Live in Maintenance
Data Nodes Live
Storages Stale
Replication Pending Timeouts
Data Node Message Pending
Blocks Pending Deletion
Blocks Pending Replication
Blocks Misreplicated Postponed
Blocks Scheduled Replication
Snapshots
Snapshottable Directories
```

```
Data Nodes Stale
Files Total
Load Total
Sync Count Total
Transactions Since Last Checkpoint
Transactions Since Last Log Roll
Blocks Underreplicated
Volume Failures Total
Sync Times Total
Objects Max
Operations Block Add
Operations Allow Snapshots
Operations Block Batched
Operations Block Queued
Operations Block Received and Deleted
Operations Report Avg Time
Operations Block Report Number
Cache Report Avg Time
Cache Report Number
Operations Create File
Operations Create Snapshots
Operations Create SymLink
Operations Delete File
Operations Delete Snapshot
Operations Disallow Snapshot
Operations File In/Out
Files Appended
Files Created
Files Deleted
Files Listing
Files Renamed
Files Truncated
File System Load Time
Operations Generate EDEK Avg Time
Operations Generate EDEK
Operations Get Additional Data Node
Blocks Get Locations
Get Edit Avg Time
Get Edit Number
Get Image Avg Time
Get Image Number
Operations Get Link Target
Operations Get Listing
Operations List Snapshottable Dir
Replication Not Scheduled Number
Put Image Avg Time
Put Image Number
Operations Rename Snapshots
Resource Check Time Avg Time
Resource Check Time Number
Safe Mode Time
Operations Snapshot Diff Report
Operations Storage Block Report
Replication Successful
Sync Avg Time
Operations Sync Number
Replication Timeout
Operations Total
Transaction Avg Time
Transaction Batchd In Sync
Transaction Number
EDEK Warmup Time Avg
EDEK Warmup Number
Block Pool Used Space
Cache Capacity
Cache Used
Capacity Free
Block Pool Used Percent
Percent Remaining
Percent Used
Threads
GC Count
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting

|Hadoop JobHistoryServer

|Cluster
Namespace
Server

|Node Name
Node IP

|GC Count
GC Copies Count
GC Marks Sweep Compact Count
GC Number Info Threshold Exceeded
GC Number Warning Threshold Exceeded
GC Time
GC Copy Time
GC Marks Sweep Compact Time
GC Total Extra Sleep Time
Logs Error Count
Logs Fatal Count
Logs Info Count
Logs Warn Count
Memory Heap Committed
Memory Heap Max
Memory Heap Used
Memory Max
Memory Non Heap Committed
Memory Non Heap Max
Memory Non Heap Used
Threads Blocked
Threads New
Threads Runnable
Threads Terminated
Threads Timed Waiting
Threads Waiting
|===



== Troubleshooting
```

```
Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID4a79e1763cf52d863c5a1d60747427ce]]
= HAProxy Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from HAProxy.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
HAProxy.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:HAProxyDCConfigLinux.png[HAProxy configuration]

== Setup

Telegraf's plugin for HAProxy relies on HAProxy Stats enablement. This is
a configuration built into HAProxy but it is not enabled out of the box.
```

```
When enabled, HAProxy will expose an HTML endpoint that can be viewed on
your browser or scraped for extraction of status of all HAProxy
configurations.

=== Compatibility:
Configuration was developed against HAProxy version 1.9.4.

=== Setting Up:

To enable stats, edit your haproxy configuration file and add the the
following lines after the 'defaults' section, using your own user/password
and/or haproxy URL:
```

```
stats enable
stats auth myuser:mypassword
stats uri /haproxy?stats
```

```
The following is a simplified example configuration file with stats
enabled:
```

```
global
daemon
maxconn 256

defaults
mode http
stats enable
stats uri /haproxy?stats
stats auth myuser:mypassword
timeout connect 5000ms
timeout client 50000ms
timeout server 50000ms

frontend http-in
bind *:80
default_backend servers

frontend http-in9080
bind *:9080
default_backend servers_2

backend servers
server server1 10.128.0.55:8080 check ssl verify none
server server2 10.128.0.56:8080 check ssl verify none

backend servers_2
server server3 10.128.0.57:8080 check ssl verify none
server server4 10.128.0.58:8080 check ssl verify none
```

```
For complete and up to date instructions, see the
link:https://cbonte.github.io/haproxy-dconv/1.8/configuration.html#4-
stats%20enable[HAProxy documentation].


== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|HAProxy Frontend

|Namespace
Address
Proxy

|Node IP
Node Name
Proxy ID
Mode
Process id
Sessions Rate Limit
Server id
Sessions Limit
Status

|Bytes In
Bytes Out
Cache Hits
Cache Lookups
Compression Bytes Bypassed
Compression Bytes In
Compression Bytes Out
Compression Responses
Connection Rate
Connection Rate Max
Connections Total
Requests Denied by Connection Rule
Requests Denied by Security Concerns
Responses Denied by Security Concerns
Requests Denied by Session Rule
Requests Errors
Responses 1xx
Responses 2xx
Responses 3xx
Responses 4xx
Responses 5xx
Responses Other
Requests Intercepted
Sessions Rate
Sessions Rate Max
Requests Rate
Requests Rate Max
Requests Total
Sessions
Sessions Max
Sessions Total
Requests Rewrites

|HAProxy Server

|Namespace
Address
Proxy
Server

|Node IP
Node Name
Check Time to Finish
Check Fall Configuration
Check Health Value
Check Rise Configuration
Check Status
Proxy ID
Last Change Time
Last Session Time
Mode
Process id
Server id
Status
Weight

|Active Servers
Backup Servers
Bytes In
Bytes Out
Check Downs
Check Fails
Client Aborts
```

```
Connections
Connection Average Time
Downtime Total
Denied Responses
Connection Errors
Response Errors
Responses 1xx
Responses 2xx
Responses 3xx
Responses 4xx
Responses 5xx
Responses Other
Server Selected Total
Queue Current
Queue Max
Queue Average Time
Sessions per Second
Sessions per Second Max
Connection Reuse
Response Time Average
Sessions
Sessions Max
Server Transfer Aborts
Sessions Total
Sessions Total Time Average
Requests Redispatches
Requests Retries
Requests Rewrites

|HAProxy Backend

|Namespace
Address
Proxy

|Node IP
Node Name
Proxy ID
Last Change Time
Last Session Time
Mode
Process id
Server id
Sessions Limit
Status
Weight
```

```
|Active Servers
Backup Servers
Bytes In
Bytes Out
Cache Hits
Cache Lookups
Check Downs
Client Aborts
Compression Bytes Bypassed
Compression Bytes In
Compression Bytes Out
Compression Responses
Connections
Connection Average Time
Downtime Total
Requests Denied by Security Concerns
Responses Denied by Security Concerns
Connection Errors
Response Errors
Responses 1xx
Responses 2xx
Responses 3xx
Responses 4xx
Responses 5xx
Responses Other
Server Selected Total
Queue Current
Queue Max
Queue Average Time
Sessions per Second
Sessions per Second Max
Requests Total
Connection Reuse
Response Time Average
Sessions
Sessions Max
Server Transfer Aborts
Sessions Total
Sessions Total Time Average
Requests Redispatches
Requests Retries
Requests Rewrites
|===

== Troubleshooting
```

```
Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDc3d4c1df6da4575c11be4f68327e8f59]]
= JVM Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from JVM.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose JVM.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:JVMDCConfigLinux.png[JVM configuration]

== Setup

Information may be found in
link:https://docs.oracle.com/javase/specs/jvms/se12/html/index.html[JVM
documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|JVM

|Namespace
JVM

|OS Architecture
OS Name
OS Version
Runtime Specification
Runtime Specification Vendor
Runtime Specification Version
Uptime
Runtime VM Name
Runtime VM Vendor
Runtime VM Version
Node Name
Node IP

|Class Loaded
Class Loaded Total
Class Unloaded
Memory Heap Committed
Memory Heap Init
Memory Heap Used Max
Memory Heap Used
Memory Non Heap Committed
Memory Non Heap Init
Memory Non Heap Max
Memory Non Heap Used
Memory Objects Pending Finalization
OS Processors Available
OS Committed Virtual Memory Size
OS Free Physical Memory Size
OS Free Swap Space Size
OS Max File Descriptor Count
OS Open File Descriptors Count
OS Processor CPU Load
OS Processor CPU Time
OS System CPU Load
OS System Load Average
OS Total Physical Memory Size
OS Total Swap Space Size
Thread Daemon Count
Thread Peak Count
Thread Count
Thread Total Started Count
Garbage Collector Copy Collection Count
Garbage Collector Copy Collection Time
Garbage Collector Mark-sweep Collection Count
Garbage Collector Mark-sweep Collection Time
Garbage Collector G1 Old Generation Collection Count
Garbage Collector G1 Old Generation Collection Time
Garbage Collector G1 Young Generation Collection Count
Garbage Collector G1 Young Generation Collection Time
Garbage Collector Concurrent Mark-sweep Collection Count
Garbage Collector Concurrent Mark-sweep Collection Time
Garbage Collector Parallel Collection Count
Garbage Collector Parallel Collection Time
Garbage Collector Parallel Scavenge Mark-sweep Collection Count
Garbage Collector Parallel Scavenge Mark-sweep Collection Time
Garbage Collector Parallel Scavenge Collection Count
Garbage Collector Parallel Scavenge Collection Time
|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.




[[ID0472d9d496fee3715d6a96496db536be]]
= Kafka Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[.lead]
Cloud Insights uses this data collector to gather metrics from Kafka.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Kafka.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:KafkaDCConfigWindows.png[Kafka configuration]

== Setup

The Kafka plugin is based on the telegraf's Jolokia plugin. As such as a
requirement to gather info from all Kafka brokers, JMX needs to be
configured and exposed via Jolokia on all components.

=== Compatibility
Configuration was developed against Kafka version 0.11.0.2.

=== Setting up
All the instructions below assume your install location for kafka is
'/opt/kafka'. You can adapt instructions below to reflect your install
location.

==== Jolokia Agent Jar
A version the Jolokia agent jar file must be
link:https://jolokia.org/download.html[downloaded]. The version tested
against was Jolokia agent 1.6.0.
```

```
Instructions below assume that the downloaded jar file (jolokia-jvm-1.6.0-
agent.jar) is placed under the location '/opt/kafka/libs/'.

==== Kafka Brokers
To configure Kafka Brokers to expose the Jolokia API, you can add the
following in <KAFKA_HOME>/bin/kafka-server-start.sh, just before the
'kafka-run-class.sh' call:
```

export JMX_PORT=9999
export RMI_HOSTNAME=`hostname -I`
export KAFKA_JMX_OPTS="-javaagent:/opt/kafka/libs/jolokia-jvm-1.6.0-agent.jar=port=8778,host=0.0.0.0
-Dcom.sun.management.jmxremote.password.file=/opt/kafka/config/jmxremote.password
-Dcom.sun.management.jmxremote.ssl=false -Djava.rmi.server.hostname=$RMI_HOSTNAME
-Dcom.sun.management.jmxremote.rmi.port=$JMX_PORT"

```
Note that example above is using 'hostname -I' to setup the 'RMI_HOSTNAME'
environment variable. In multiple IP machines, this will need to be
tweaked to gather the IP you care about for RMI connections.

You can choose a different port for JMX (9999 above) and Jolokia (8778).
If you have an internal IP to lock Jolokia onto you can replace the "catch
all" 0.0.0.0 by your own IP. Notice this IP needs to be accessible from
the telegraf plugin. You can use the option '-
Dcom.sun.management.jmxremote.authenticate=false' if you don't want to
authenticate. Use at your own risk.

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Kafka Broker

|Cluster
Namespace
Broker

|Node Name
Node IP

|Replica Manager Fetcher Max Lag
Zookeeper Client Connections
Zookeeper Client Connections (15m rate)
Zookeeper Client Connections (5m rate)
Zookeeper Client Connections (mean rate)
Zookeeper Client Connections (1m rate)
Replica Manager Partition Count
Thread Count Daemon
Thread Count Peak
Thread Count Current
Thread Count Total Started
Offline Partitions
Produce Requests Total Time (50th Percentile)
Produce Requests Total Time (75th Percentile)
Produce Requests Total Time (95th Percentile)
Produce Requests Total Time (98 Percentile)
Produce Requests Total Time (999th Percentile)
Produce Requests Total Time (99th Percentile)
Produce Requests Total Time
Produce Requests Total Time Max
Produce Requests Total Time Mean
Produce Requests Total Time Min
Produce Requests Total Time Stddev
Replica Manager ISR Shrinks
Replica Manager ISR Shrinks (15m rate)
Replica Manager ISR Shrinks (5m rate)
Replica Manager ISR Shrinks (mean rate)
Replica Manager ISR Shrinks (1m rate)
Request Handler Avg Idle
Request Handler Avg Idle (15m rate)
Request Handler Avg Idle (5m rate)
Request Handler Avg Idle (mean rate)
Request Handler Avg Idle (1m rate)
Garbage Collection G1 Old Generation Count
Garbage Collection G1 Old Generation Time
Garbage Collection G1 Young Generation Count
Garbage Collection G1 Young Generation Time
Zookeeper Read Only Connects
Zookeeper Read Only Connects (15m rate)
Zookeeper Read Only Connects (5m rate)
Zookeeper Read Only Connects (mean rate)
Zookeeper Read Only Connects (1m rate)
Network Processor Avg Idle
Requests Fetch Follower Total Time (50th percentile)
Requests Fetch Follower Total Time (75th percentile)
Requests Fetch Follower Total Time (95th percentile)
Requests Fetch Follower Total Time (98th percentile)
Requests Fetch Follower Total Time (999th percentile)
Requests Fetch Follower Total Time (99th percentile)
Requests Fetch Follower Total Time
Requests Fetch Follower Total Time Max
Requests Fetch Follower Total Time Mean
Requests Fetch Follower Total Time Min
Requests Fetch Follower Total Time Stddev
Requests Waiting in Produce Purgatory
Network Requests Fetch Consumer
Network Requests Fetch Consumer (5m rate)
Network Requests Fetch Consumer (15m rate)
Network Requests Fetch Consumer (mean rate)
Network Requests Fetch Consumer (1m rate)
Unclean Leader Elections
Unclean Leader Elections (15m rate)
Unclean Leader Elections (5m rate)
Unclean Leader Elections (mean rate)
Unclean Leader Elections (1m rate)
Active Controllers
Heap Memory Committed
Heap Memory Init
Heap Memory Max
Heap Memory Used
Zookeeper Session Expires
Zookeeper Session Expires (15m rate)
Zookeeper Session Expires (5m rate)
Zookeeper Session Expires (mean rate)
Zookeeper Session Expires (1m rate)
Zookeeper Authentication Failures
Zookeeper Authentication Failures (15m rate)
Zookeeper Authentication Failures (5m rate)
Zookeeper Authentication Failures (mean rate)
Zookeeper Authentication Failures (1m rate)
Leader Election Time (50th percentile)
Leader Election Time (75th percentile)
Leader Election Time (95th percentile)
Leader Election Time (98th percentile)
Leader Election Time (999th percentile)
Leader Election Time (99th percentile)
Leader Election Count
Leader Election Time (15m rate)
Leader Election Time (5m rate)
Leader Election Time Max
Leader Election Time Mean
Leader Election Time (mean rate)
Leader Election Time Min
Leader Election Time (1m rate)
Leader Election Time (stddev)
```

```
Network Requests Fetch Follower
Network Requests Fetch Follower (15m rate)
Network Requests Fetch Follower (5m rate)
Network Requests Fetch Follower (mean rate)
Network Requests Fetch Follower (1m rate)
Broker Topic Messages
Broker Topic Messages (15m rate)
Broker Topic Messages (5m rate)
Broker Topic Messages (mean rate)
Broker Topic Messages (1m rate)
Broker Topic Bytes In
Broker Topic Bytes In (15m rate)
Broker Topic Bytes In (5m rate)
Broker Topic Bytes In (mean rate)
Broker Topic Bytes In (1m rate)
Zookeeper Disconnects Count
Zookeeper Disconnects (15m rate)
Zookeeper Disconnects (5m rate)
Zookeeper Disconnects (mean rate)
Zookeeper Disconnects (1m rate)
Network Requests Fetch Consumer Total Time (50th percentile)
Network Requests Fetch Consumer Total Time (75th percentile)
Network Requests Fetch Consumer Total Time (95th percentile)
Network Requests Fetch Consumer Total Time (98th percentile)
Network Requests Fetch Consumer Total Time (999th percentile)
Network Requests Fetch Consumer Total Time (99th percentile)
Network Requests Fetch Consumer Total Time
Network Requests Fetch Consumer Total Time Max
Network Requests Fetch Consumer Total Time Mean
Network Requests Fetch Consumer Total Time Min
Network Requests Fetch Consumer Total Time Stddev
LeaderCount
Requests Waiting in Fetch Purgatory
Broker Topic Bytes Out
Broker Topic Bytes Out (15m rate)
Broker Topic Bytes Out (5m rate)
Broker Topic Bytes Out (mean rate)
Broker Topic Bytes Out (1m rate)
Zookeeper Authentications
Zookeeper Authentications (15m rate)
Zookeeper Authentications (5m rate)
Zookeeper Authentications (mean rate)
Zookeeper Authentications (1m rate)
Requests Produce Count
Requests Produce (15m rate)
Requests Produce (5m rate)
Requests Produce (mean rate)
Requests Produce (1m rate)
Replica Manager ISR Expands
Replica Manager ISR Expands (15m rate)
Replica Manager ISR Expands (5m rate)
Replica Manager ISR Expands (mean rate)
Replica Manager ISR Expands (1m rate)
Replica Manager Under Replicated Partitions
|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID933594a6de1603ff8a26d2d21e4d0128]]
= Kibana Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Kibana.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Kibana.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
```

```
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:KibanaDCConfigLinux.png[Kibana configuration]

== Setup

Information may be found in the
link:https://www.elastic.co/guide/index.html[Kibana documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Kibana

|Namespace
Address

|Node IP
Node Name
Version
Status

|Concurrent Connections
Heap Max
Heap Used
Requests per Second
Response Time Average
Response Time Max
Uptime
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.
```

```
[[IDf703e903ebdcf0ce4f9fd4c95ef8af49]]
= Memcached Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Memcached.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Memcached.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:MemcachedDCConfigWindows.png[Memcached configuration]

== Setup

Information may be found in the
link:https://github.com/memcached/memcached/wiki[Memcached wiki].

== Objects and Counters

The following objects and their counters are collected:
```

```
[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Memcached

|Namespace
Server

|Node IP
Node Name

|Accepting Connections
Handled Authentication Requests
Failed Authentications
Bytes Used
Bytes Read (per sec)
Bytes Written (per sec)
CAS Badval
CAS Hits
CAS Misses
Flush Reqs (per sec)
Get Reqs (per sec)
Set Reqs (per sec)
Touch Reqs (per sec)
Connection Yields (per sec)
Connection Structures
Open Connections
Current Stored Items
Decr Requests Hits (per sec)
Decr Requests Misses (per sec)
Delete Requests Hits (per sec)
Delete Requests Misses (per sec)
Items Evicted
Valid Evictions
Expired Items
Get Hits (per sec)
Get Misses (per sec)
Used Hash Bytes
Hash Is Expanding
Hash Power Level
Incr Requests Hits (per sec)
Incr Requests Misses (per sec)
Server Max Bytes
Listen Disabled Num
```

```
Reclaimed
Worker Threads Count
Total Opened Connections
Total Items Stored
Touch Hits
Touch Misses
Server Uptime
|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDdfb5ca2eddc053341b0300bf95f52889]]
= MongoDB Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from MongoDB.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
MongoDB.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
```

```
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:MongoDBDCConfigLinux.png[MongoDB configuration]

== Setup

Information may be found in the link:https://docs.mongodb.com/[MongoDB
documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|MongoDB

|Namespace
Hostname

|
|
|MongoDB Database

|Namespace
Hostname
Database name

|
|
|===



== Troubleshooting

Information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[ID620cabc86342f799681831c173d09775]]
```

```
= MySQL Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from MySQL.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
MySQL.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:MySQLDCConfigWindows.png[MySQL Configuration]

== Setup

Information may be found in the link:https://dev.mysql.com/doc/[MySQL
documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
```

```
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|MySQL

|Namespace
MySQL Server

|Node IP
Node Name

|Aborted Clients (per sec)
Aborted Connects (per sec)
RX Bytes (per sec)
TX Bytes (per sec)
Commands Admin (per sec)
Commands Alter Event
Commands Alter Function
Commands Alter Instance
Commands Alter Procedure
Commands Alter Server
Commands Alter Table
Commands Alter Tablespace
Commands Alter User
Commands Analyze
Commands Assign To Keycache
Commands Begin
Commands Binlog
Commands Call Procedure
Commands Change DB
Commands Change Master
Commands Change Repl Filter
Commands Check
Commands Checksum
Commands Commit
Commands Create DB
Commands Create Event
Commands Create Function
Commands Create Index
Commands Create Procedure
Commands Create Server
Commands Create Table
Commands Create Trigger
Commands Create UDF
Commands Create User
Commands Create View
Commands Dealloc SQL
Connection Errors Accept
Created Tmp Disk Tables
Delayed Errors
Flush Commands
Handler Commit
Innodb Buffer Pool Bytes Data
Key Blocks Not Flushed
Key Read Requests
Key Write Requests
Key Writes
Max Execution Time Exceeded
Max Used Connections
Open Files
Performance Schema Accounts Lost
Prepared Stmt Count
Qcache Free Blocks
Queries
Questions
Select Full Join
Select Full Range Join
Select Range Check
Select Scan
Table Locks Immediate
|===


== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.




[[IDf5dc21fc8190cba9efe13d65f2cf9f2b]]
= Netstat Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
```

```
Cloud Insights uses this data collector to gather Netstat metrics.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Netstat.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:NetstatDCConfigWindows.png[Windows Netstat Configuration]

== Setup

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:
|Netstat

|Node UUID

|Node IP
Node Name

|
|===

== Troubleshooting
```

```
Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDfa6a0e9840003ffb792d321d7fc438c3]]
= Nginx Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Nginx.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Nginx.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:NginxDCConfigLinux-1.png[Linux Nginx Configuration]
image:NginxDCConfigLinux-2.png[Linux Nginx Configuration]

== Setup
```

```
Nginx metric collection requires that Nginx
link:http://nginx.org/en/docs/http/ngx_http_stub_status_module.html[http_s
tub_status_module] be enabled.

Additional information may be found in the
link:http://nginx.org/en/docs/[Nginx documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Nginx

|Namespace
Server

|Node IP
Node Name
Port

|Accepts
Active
Handled
Reading
Requests
Waiting
Writing
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDa6e4923c3419a22f0ba85c774ad8728b]]
= PostgreSQL Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
```

```
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from PostgreSQL.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
PostgreSQL.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:PostgreSQLDCConfigLinux.png[PostgreSQL configuration]

== Setup

Information may be found in the
link:https://www.postgresql.org/docs/[PostgreSQL documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|PostgreSQL Server

|Namespace
```

```
Database
Server

|Node Name
Node IP

|Buffers Allocated
Buffers Backend
Buffers Backend File Sync
Buffers Checkpoint
Buffers Clean
Checkpoints Sync Time
Checkpoints Write Time
Checkpoints Requests
Checkpoints Timed
Max Written Clean

|PostgreSQL Database

|Namespace
Database
Server

|Database OID
Node Name
Node IP

|Blocks Read Time
Blocks Write Time
Blocks Hits
Blocks Reads
Conflicts
Deadlocks
Client Number
Temp Files Bytes
Temp Files Number
Rows Deleted
Rows Fetched
Rows Inserted
Rows Returned
Rows Updated
Transactions Committed
Transactions Rollbacked
|===
== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDde41269bc3f652ea999dfc31460c97dc]]
= Puppet Agent Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]

Cloud Insights uses this data collector to gather metrics from Puppet
Agent.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Puppet.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.

. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:PuppetDCConfigWindows.png[Puppet configuration]
```

```
== Setup

Information may be found in the https://puppet.com/docs[Puppet
documentation]

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:
|Puppet Agent

|Namespace
Node UUID

|Node Name
Location
Node IP
Version Configstring
Version Puppet

|Changes Total
Events Failure
Events Success
Events Total
Resources Changed
Resources Failed
Resources Failed To Restart
Resources Outofsync
Resources Restarted
Resources Scheduled
Resources Skipped
Resources Total
Time Anchor
Time Configretrieval
Time Cron
Time Exec
Time File
Time Filebucket
Time Lastrun
Time Package
Time Schedule
Time Service
Time Sshauthorizedkey
Time Total
Time User
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



[[IDbee01232e480e390a4c87d0a969ff80c]]
= Redis Data Collector
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
Cloud Insights uses this data collector to gather metrics from Redis.
Redis is an open source, in-memory data structure store used as a
database, cache, and message broker, supporting the following data
structures: strings, hashes, lists, sets, and more.

== Installation

. From *Observability > Collectors*, click *+Data Collector*. Choose
Redis.
+
Select the Operating System or Platform on which the Telegraf agent is
installed.

. If you haven't already installed an Agent for collection, or you wish to
install an Agent for a different Operating System or Platform, click _Show
Instructions_ to expand the
xref:{relative_path}task_config_telegraf_agent.html[Agent installation]
instructions.

. Select the Agent Access Key for use with this data collector. You can
add a new Agent Access Key by clicking the *+ Agent Access Key* button.
Best practice: Use a different Agent Access Key only when you want to
group data collectors, for example, by OS/Platform.
```

```
. Follow the configuration steps to configure the data collector. The
instructions vary depending on the type of Operating System or Platform
you are using to collect data.

image:RedisDCConfigWindows.png[Redis Data Collector Configuration]

== Setup

Information may be found in the link:https://redis.io/documentation[Redis
documentation].

== Objects and Counters

The following objects and their counters are collected:

[cols="<.<,<.<,<.<,<.<"]
|===
|Object:|Identifiers:|Attributes: |Datapoints:

|Redis

|Namespace
Server

|
|
|===

== Troubleshooting

Additional information may be found from the
xref:{relative_path}concept_requesting_support.html[Support] page.



:leveloffset: -1


[[ID60a4d0044acf46e6ac514daf98f5abcb]]
= Object Icon Reference
:toc: macro
:hardbreaks:
:toclevels: 1
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/
```

```
[.lead]
A quick reference for object icons used in Cloud Insights.

== Infrastructure Icons:
image:Icon_Glossary.png[Infrastructure Icon Reference]

== Kubernetes Icons:
image:K8sIconsWithLabels.png[Kubernetes Icon Reference, width=180]

== Kubernetes Network Performance Monitoring and Map Icons:
image:ServiceMap_Icons.png[Kubernetes Network Performance Monitoring and
Map, width=640]



:leveloffset: -1


[[ID870611dcda2ee7c98d95c23f5bb785f7]]
= Legal notices
:toc: macro
:hardbreaks:
:icons: font
:linkattrs:
:relative_path: ./
:imagesdir: {root_path}{relative_path}./media/

[.lead]
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== Patents

A current list of NetApp owned patents can be found at:
```

```
https://www.netapp.com/us/media/patents-page.pdf[^]

== Privacy policy

https://www.netapp.com/us/legal/privacypolicy/index.aspx[^]


== Open source

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//* xref:{relative_path}media/Notice_Cloud_Insights-2021.05.18.pdf[Notice
for Cloud Insights]


xref:{relative_path}media/Notice_Cloud_Insights-2023-04.pdf[Notice for
Cloud Insights]
xref:{relative_path}media/Notice_Cloud_Secure-2022-12-14.pdf[Notice for
Workload Security (formerly Cloud Secure)]





:leveloffset: -1

<<<
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