



Monitoring

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Monitoring

Monitoring using Cloud Insights for VMs in Red Hat OpenShift Virtualization

Author: Banu Sundhar, NetApp

This section of the reference document provides details for integrating NetApp Cloud Insights with a Red Hat OpenShift Cluster to monitor OpenShift Virtualization VMs.

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. For more information about NetApp Cloud Insights, refer to the [Cloud Insights documentation](#).

To start using Cloud Insights, you must sign up on the NetApp BlueXP portal. For details, refer to the [Cloud Insights Onboarding](#)

Cloud Insights has several features that enable you to quickly and easily find data, troubleshoot issues, and provide insights into your environment. You can find data easily with powerful queries, you can visualize data in dashboards, and send email alerts for data thresholds you set. Refer to the [video tutorials](#) to help you understand these features.

For Cloud Insights to start collecting data you need the following

Data Collectors

There are 3 types of Data Collectors:

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

Data Collectors discover information from the data sources, such as ONTAP storage device (infrastructure data collector). The information gathered is used for analysis, validation, monitoring, and troubleshooting.

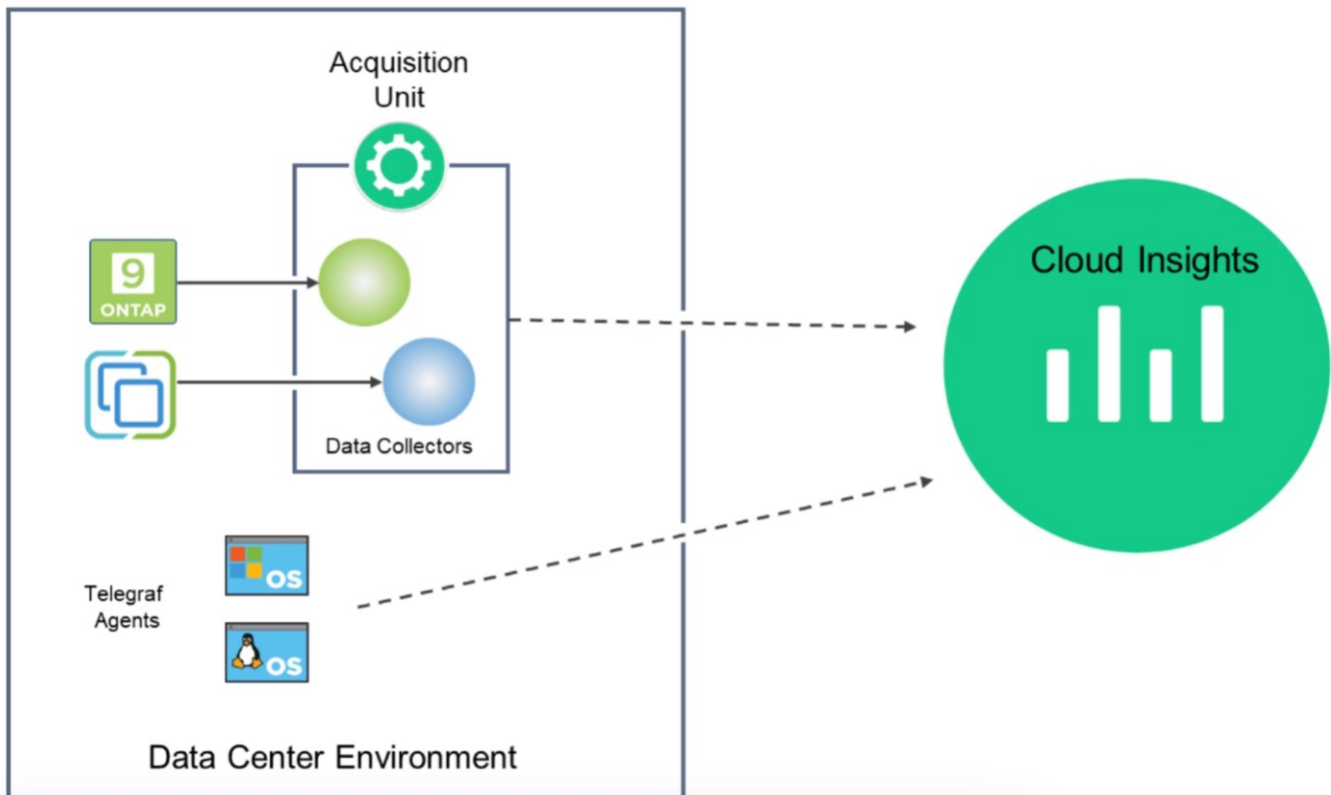
Acquisition Unit

If you are using an infrastructure Data Collector, you also need an Acquisition Unit to inject data into Cloud Insights. An Acquisition Unit is 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.

Telegraf Agents

Cloud Insights also supports 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.

Cloud Insights Architecture



Integration with Cloud Insights for VMs in Red Hat OpenShift Virtualization

To start collecting data for VMs in OpenShift Virtualization you will need to install:

1. A Kubernetes monitoring operator and data collector to collect Kubernetes data
For complete instructions, refer to the [documentation](#).
2. An acquisition unit to collect data from ONTAP storage that provides persistent storage for the VM disks
For complete instructions, refer to the [documentation](#).
3. A data collector for ONTAP
For complete instructions, refer to the [documentation](#)

Additionally, if you are using StorageGrid for VM backups, you need a data collector for the StorageGRID as well.

Sample Monitoring capabilities for VMs in Red Hat OpenShift Virtualization

This section discusses monitoring using Cloud Insights for VMs in Red Hat OpenShift Virtualization.

Monitoring based on events and creating Alerts

Here is a sample where the namespace that contains a VM in OpenShift Virtualization is monitored based on

events. In this example, a monitor is created based on **logs.kubernetes.event** for the specified namespace in the cluster.

Edit log monitor

Filter/Advanced Query and Group by in section 1 must not be empty. If alert resolution is based on log entry, section 3 filter/advanced query also must not be empty.

1 Select the log to monitor

Log Source: logs.kubernetes.event

Filter By: kubernetes_cluster: ocp-cluster4, involvedobject.namespace: virtual-machines-demo

Group By: reason

27 Items found

timestamp ↓	type	source	message
04/19/2024 10:31:18 AM	logs.kubernetes.event	kubernetes_cluster:ocp-cluster4;namespace:cloudinights-monitoring;pod_name:netapp-ci-event-exporter-777c8d84c4-sk7t9;	VirtualMachineInstance started.
04/19/2024 10:31:18 AM	logs.kubernetes.event	kubernetes_cluster:ocp-cluster4;namespace:cloudinights-monitoring;pod_name:netapp-ci-event-exporter-777c8d84c4-sk7t9;	VirtualMachineInstance defined.

2 Define alert behavior

Create an alert at severity **Warning** when the conditions above occur **1** time

This query provides all the events for the virtual machine in the namespace. (There is only one virtual machine in the namespace). An advanced query can also be constructed to filter based on the event where the reason is “failed” or “FailedMount” These events are typically created when there is an issue in creating a PV or mounting the PV to a pod indicating issues in the dynamic provisioner for creating persistent volumes for the VM.

While creating the Alert Monitor as shown above, you can also configure notification to recipients. You can also provide corrective actions or additional information that can be useful to resolve the error. In the above example, additional information could be to look into the Trident backend configuration and storage class definitions for resolving the issue.

Change Analytics

With Change Analytics, you can get a view of what changed in the state of your cluster including who made that change which can help in troubleshooting issues.

The screenshot shows the NetApp Cloud Insights interface for Change Analysis. The top navigation bar includes 'Tutorial 0% Complete', 'Getting Started', and user information 'Sundhar Banu'. The main header displays 'NetApp PCS Sandbox / Kubernetes / Change Analysis' and a filter for 'Last 3 Hours'. The left sidebar contains navigation options: Observability, Kubernetes, Explore, Change Analysis (selected), Network, Collectors, Workload Security, ONTAP Essentials, and Admin. The main content area shows a 'Filter By' section with 'Kubernetes Cluster: ocp-cluster4', 'Namespace: virtual-machines-demo', and 'Workload Name: All'. Below this are 'Alerts' (0) and 'Deploys' (5) counters. A 'Timeline' section shows a horizontal axis from 8:45 AM to 11:30 AM with a 'Bucket: 6 minutes' and a 'virtual-machines-demo' workload icon. A 'Changes' table lists several deployment events:

Type	Summary	Start Time	Duration	Triggered On : name	Status
Deploy	Attributes 'metadata.finalizers-', 'metadata.finalizers[1]' changed	04/19/2024 11:40:31 AM	6 seconds	PersistentVolumeClaim: rhei9-demo-vm2	Complete
Deploy	Attributes 'metadata.finalizers-', 'metadata.finalizers[1]' changed	04/19/2024 11:40:36 AM	1 second	PersistentVolumeClaim: rhei9-demo-vm2-user-disk1	Complete
Deploy	Created new object	04/19/2024 10:30:59 AM	18 seconds	PersistentVolumeClaim: rhei9-demo-vm2-user-disk1	Complete
Deploy	Created new object	04/19/2024 10:30:59 AM	18 seconds	PersistentVolumeClaim: rhei9-demo-vm2	Complete
Deploy	Created new object	04/19/2024 10:31:00 AM	17 seconds	PodDisruptionBudget: activate-windows, kubevirt-disruption-budget	Complete

Below the table is a 'Compare to:' section with checkboxes for 'Kubernetes Infrastructure' (Nodes: 1, 115 Changes and 0 Alerts), 'Persistent Volumes (6)', and 'Kubernetes Resources' (Security: 2, 2 Changes and 0 Alerts).

In the above example, Change Analysis is configured on the OpenShift cluster for the namespace that contains an OpenShift Virtualization VM. The dashboard shows changes against the timeline. You can drill down to see what changed and the click on All Changes Diff to see the diff of the manifests. From the manifest, you can see that a new backup of the persistent disks was created.

The screenshot shows the same NetApp Cloud Insights interface, but with a 'Deploy Completed' modal window open. The modal provides detailed information for the selected deployment:

- Summary:** Start Time: 04/19/2024 11:40:31 AM, End Time: 04/19/2024 11:40:37 AM, Duration: 6 seconds.
- Triggered On:** ocp-cluster4 > virtual-machines-demo > rhei9-demo-vm2 >
- Triggered On : kind:** PersistentVolumeClaim
- Changes (2):**

Attribute Name	Previous	New
metadata.finalizers-	-	snapshot.storage.kubernetes.io/pvc-as-source-protection
metadata.finalizers[1]	snapshot.storage.kubernetes.io/pvc-as-source-protection	-
- Associated Events:**

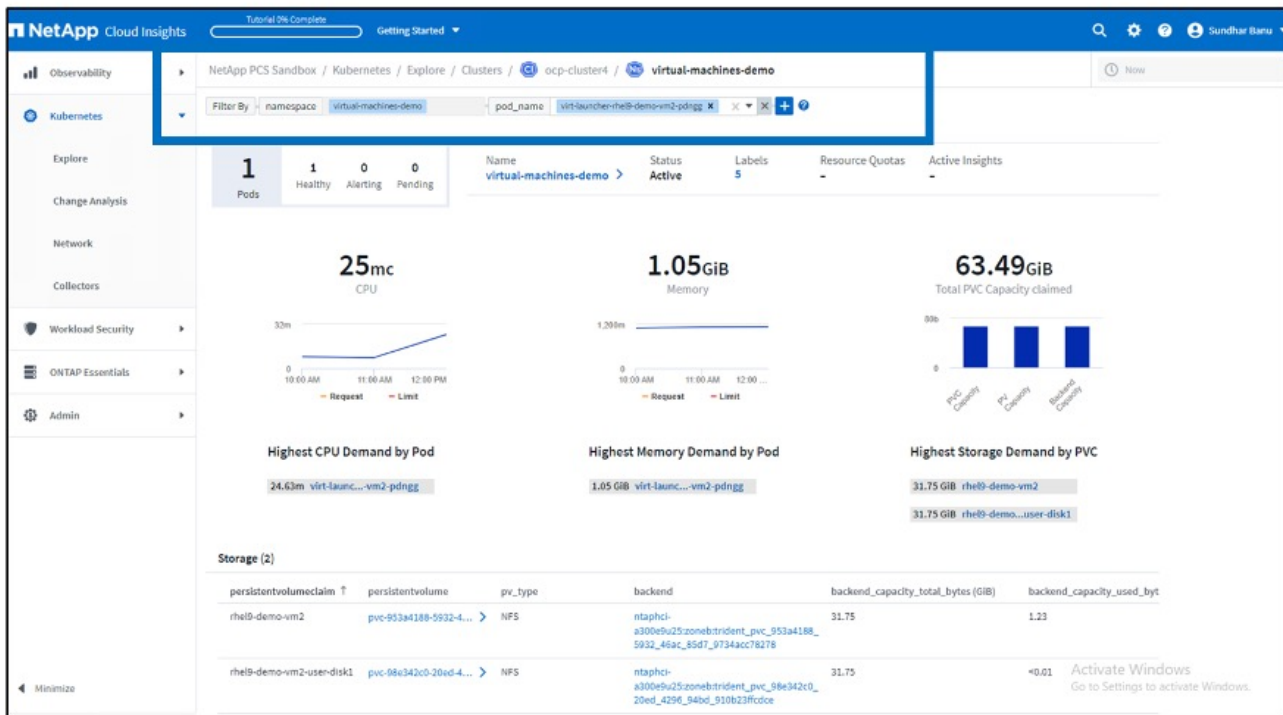
timestamp	severity	reason	involvedobject...	involvedobject...	message
04/19/2024 10:30:59 AM	Normal	Provisioning	PersistentVolumeClaim	rhei9-demo-vm2	External provisioner is provisioning volume for claim "virtual-machines-demo/rhei9-demo-vm2"
04/19/2024 10:30:59 AM	Normal	Pending	DataVolume	rhei9-demo-vm2-user-disk1	PVC rhei9-demo-vm2-user-disk1 Pending
04/19/2024	Normal	ImportSucceeded	DataVolume	rhei9-demo-vm2	Successfully

The modal also includes a 'Selected Changes (2)' section with a 'Deselect' button and an 'All Changes Diff' button.

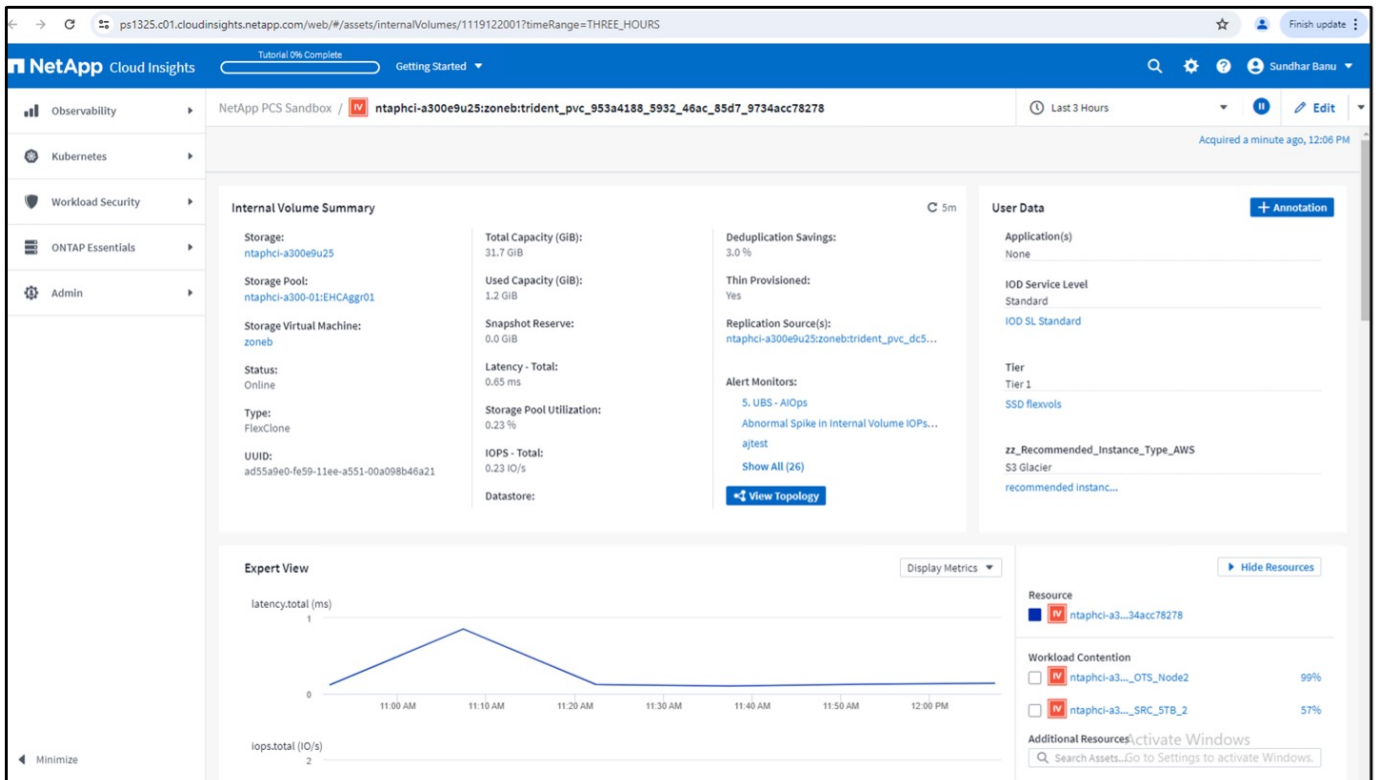
All Changes Diff			
Previous		New	
Expand 45 lines ...			
46	kind: DataVolume	46	kind: DataVolume
47	name: rhel9-demo-vm2	47	name: rhel9-demo-vm2
48	uid: dcf93b7a-71bc-409b-ad12-4916d05e0980	48	uid: dcf93b7a-71bc-409b-ad12-4916d05e0980
49	- resourceVersion: "8569671"	49	+ resourceVersion: "8619670"
50	uid: 953a4188-5932-46ac-85d7-9734acc78278	50	uid: 953a4188-5932-46ac-85d7-9734acc78278
51	spec:	51	spec:
52	accessModes:	52	accessModes:
Expand 15 lines ...			

Backend Storage Mapping

With Cloud Insights, you can easily see the backend storage of the VM disks and several statistics about the PVCs.



You can click on the links under the backend column, which will pull data directly from the backend ONTAP storage.



Another way to look at all the pod to storage mapping is creating an All Metrics query From Observability menu under Explore.

The screenshot shows the "All Metric Queries" page for "persistent disks". The query is configured with the following filters and groupings:

- Object:** kubernetes.pod_to_storage
- Filter by Attribute:** kubernetes_cluster (exp-cluster4)
- Filter by Metric:** (None)
- Group By:** kubernetes.pod_to_storage

The results table shows 6 items found, with columns for Object, persisten..., workload..., namespace, storageVirt..., InternalVol..., volume.na..., qtree.name, timeToFull..., and backen.

Object	persisten...	workload...	namespace	storageVirt...	InternalVol...	volume.na...	qtree.name	timeToFull...	backen
kubernetes.pod_to_storage									
importer-prime-4f1b8351-2678-4295-b9db-64...	pvc-d4c2cecc-24b	opershift-virtualization-os-image	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	0.16		
importer-prime-8f792a39-02bb-4e86-a8a8-d5...	pvc-d50f5be7-3cf1	opershift-virtualization-os-image	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	0.16		
virt-launcher-rhel9-demo-vm2-pdngg	pvc-98e342c0-20e	virtual-machines-demo	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	0.00		
virt-launcher-rhel9-demo-vm2-pdngg	pvc-953a188-99f	virtual-machines-demo	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	3.88		
virt-launcher-rhel9-demo-vm2-rnzj	pvc-f4d1adc3-314	virtual-machines	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	3.88		
virt-launcher-rhel9-demo-vm2-rnzj	pvc-ad805a7b-4af	virtual-machines	zoneb	ntaphci-a300e9u25	3d72704c-6108-11e	0.00	0.00		

Clicking on any of the links will give you the corresponding details from ONTP storage. For example, clicking on an SVM name in the storageVirtualMachine column will pull details about the SVM from ONTAP. Clicking on an internal volume name will pull details about the volume in ONTAP.

storageVirtualMachin...	internalVolume.name	volume.na..
zation-os-image zoneb		ntaphci-a300e9u25:zoneb:trident_p
zation-os-image zoneb		ntaphci-a300e9u25:zoneb:trident_p
demo zoneb		ntaphci-a300e9u25:zoneb:trident_p
demo zoneb		ntaphci-a300e9u25:zoneb:trident_p
	zoneb	ntaphci-a300e9u25:zoneb:trident_p
	zoneb	ntaphci-a300e9u25:zoneb:trident_p

The screenshot displays the NetApp PCS Sandbox interface for a resource named 'zoneb'. It is divided into several sections:

- Storage Virtual Machine Summary:**
 - Type: Data
 - Status: Running
 - Storage: ntaphci-a300e9u25
 - Wpypart: Default
 - Allowed Protocols: cifs, nfs, smb, iqn, vifs, vvol
 - Internal Volume LVR: %
 - Capacity (GB): 1,074.0 GB
 - Used Capacity (GB): 101.4 GB
 - Defragmentation Savings: 0.1 %
 - Compression Savings: 0.1 %
 - IOPS - Total: 26.21 IOPS
 - Latency - Total: 0.28 ms
 - Comment:
 - UUID: 335a91c1-c9f0-11e0-0100-000000000001
 - Alert Monitors:
- User Data:**
 - Application(s): None
 - CTS_storage (Yes)
 - Storage: CTS_Bulk
 - IOB Service Level: VRTS
 - IOB % Util: 0
 - Tier: Tier 1
 - SSD Reads: 0
 - Recommended_Instance_Type: VRTS
 - SS Slacker: recommended instant...
- Expert View:**
 - Latency (ms) (Y-axis: 0.00 to 0.30)
 - IOPS (IOPS) (Y-axis: 0 to 40)
 - Time Range: 9:45 AM to 12:15 PM
- Resource:**
 - zoneb
 - Top Config Hubs: ntaphci-a3...-eh-nc001 (87%)
 - Additional Resources: Search Assets...
- Internal Volume Summary (Bottom Section):**
 - Storage: ntaphci-a300e9u25
 - Storage Pool: ntaphci-a300e9u25:zoneb
 - Storage Virtual Machine: zoneb
 - Status: Online
 - Type: (None)
 - VVOL: vvol3847-82b-11e0-0100-000000000001
 - Total Capacity (GB): 20.7 GB
 - Used Capacity (GB): 16.1 GB
 - Storage Pool Reserve: 0.1 GB
 - Latency - Total: 0.20 ms
 - Storage Pool Utilization: 0.23 %
 - IOPS - Total: 2.32 IOPS
 - Databases:
 - Defragmentation Savings: 0.1 %
 - This Provisioned: Yes
 - Replication Source(s): 0 IOPS
 - Alert Monitors: 3, 180 - A300, Abnormal Spikes in Internal Volume IOPS... (4x)
 - Show All (24): View Topology
- Expert View (Bottom Section):**
 - Latency (ms) (Y-axis: 0 to 0.75)
 - Time Range: 9:45 AM to 12:15 PM
- Resource (Bottom Section):**
 - zoneb
 - Top Config Hub: ntaphci-a3...-eh-nc001 (28%)
 - Additional Resources: ntaphci-a300e9u25 (18%)

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