NetApp Cloud Insights for FlexPod

FlexPod

NetApp
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NetApp Cloud Insights for FlexPod

TR-4868: NetApp Cloud Insights for FlexPod

Alan Cowles, NetApp

In partnership with:

The solution detailed in this technical report is the configuration of the NetApp Cloud Insights service to monitor the NetApp AFF A800 storage system running NetApp ONTAP, which is deployed as a part of a FlexPod Datacenter solution.

Customer value

The solution detailed here provides value to customers who are interested in a fully-featured monitoring solution for their hybrid cloud environments, where ONTAP is deployed as the primary storage system. This includes FlexPod environments that use NetApp AFF and FAS storage systems.

Use cases

This solution applies to the following use cases:

- Organizations that want to monitor various resources and utilization in their ONTAP storage system deployed as part of a FlexPod solution.
- Organizations that want to troubleshoot issues and shorten resolution time for incidents that occur in their FlexPod solution with their AFF or FAS systems.
- Organizations interested in cost optimization projections, including customized dashboards to provide detailed information about wasted resources, and where cost savings can be realized in their FlexPod environment, including ONTAP.

Target audience

The target audience for the solution includes the following groups:

- IT executives and those concerned with cost optimization and business continuity.
- Solutions architects with an interest in data center or hybrid cloud design and management.
- Technical support engineers responsible for troubleshooting and incident resolution.

You can configure Cloud Insights to provide several useful types of data that you can use to assist with planning, troubleshooting, maintenance, and ensuring business continuity. By monitoring the FlexPod Datacenter solution with Cloud Insights and presenting the aggregated data in easily digestible customized dashboards; it is not only possible to predict when resources in a deployment might need to be scaled to meet demands, but also to identify specific applications or storage volumes that are causing problems within the system. This helps to ensure that the infrastructure being monitored is predictable and performs according to expectations, allowing an organization to deliver on defined SLA's and to scale infrastructure as needed,

eliminating waste and additional costs.

Architecture

In this section, we review the architecture of a FlexPod Datacenter converged infrastructure, including a NetApp AFF A800 system that is monitored by Cloud Insights.

Solution technology

A FlexPod Datacenter solution consists of the following minimum components to provide a highly available, easily scalable, validated, and supported converged infrastructure environment.

- Two NetApp ONTAP storage nodes (one HA pair)
- Two Cisco Nexus data center network switches
- Two Cisco MDS fabric switches (optional for FC deployments)
- Two Cisco UCS fabric interconnects
- One Cisco UCS blade chassis with two Cisco UCS B-series blade servers

Or

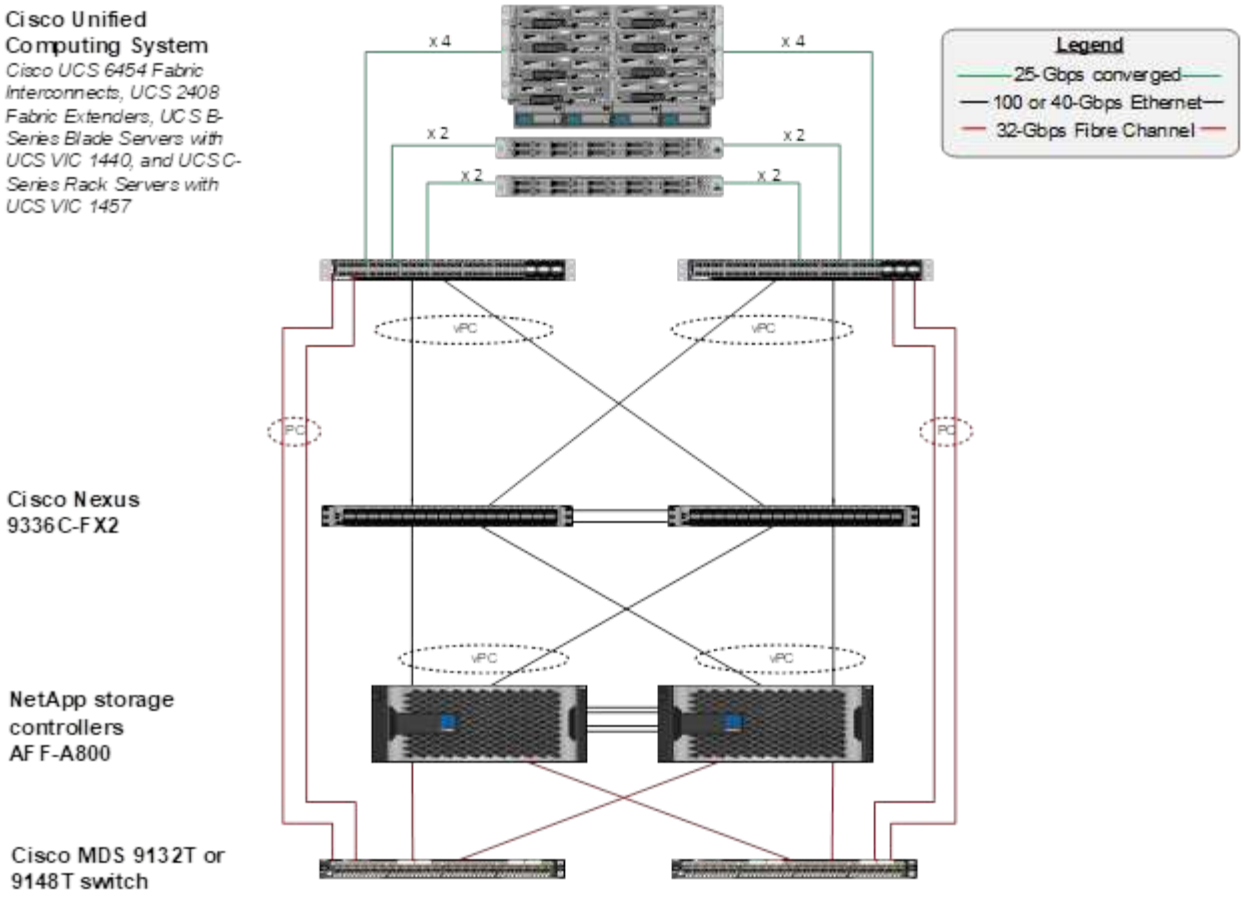
- Two Cisco UCS C-Series rackmount servers

For Cloud Insights to collect data, an organization must deploy an Acquisition Unit as a virtual or physical machine either within their FlexPod Datacenter environment, or in a location where it can contact the components from which it is collecting data. You can install the Acquisition Unit software on a system running several supported Windows or Linux operating systems. The following table lists solution components for this software.

Operating system	Version
Microsoft Windows	10
Microsoft Windows Server	2012, 2012 R2, 2016, 2019
Red Hat Enterprise Linux	7.2 – 7.6
CentOS	7.2 – 7.6
Oracle Enterprise Linux	7.5
Debian	9
Ubuntu	18.04 LTS

Architectural diagram

The following figure shows the solution architecture.



Hardware requirements

The following table lists the hardware components that are required to implement the solution. The hardware components that are used in any particular implementation of the solution might vary based on customer requirements.

Hardware	Quantity
Cisco Nexus 9336C-FX2	2
Cisco UCS 6454 Fabric Interconnect	2
Cisco UCS 5108 Blade Chassis	1
Cisco UCS 2408 Fabric Extenders	2
Cisco UCS B200 M5 Blades	2
NetApp AFF A800	2

Software requirements

The following table lists the software components that are required to implement the solution. The software components that are used in any particular implementation of the solution might vary based on customer requirements.

Software	Version
Cisco Nexus Firmware	9.3(5)
Cisco UCS Version	4.1(2a)
NetApp ONTAP Version	9.7
NetApp Cloud Insights Version	September 2020, Basic
Red Hat Enterprise Linux	7.6
VMware vSphere	6.7U3

Use case details

This solution applies to the following use cases:

- Analyzing the environment with data provided to NetApp Active IQ digital advisor for assessment of storage system risks and recommendations for storage optimization.
- Troubleshooting problems in the ONTAP storage system deployed in a FlexPod Datacenter solution by examining system statistics in real-time.
- Generating customized dashboards to easily monitor specific points of interest for ONTAP storage systems deployed in a FlexPod Datacenter converged infrastructure.

Design considerations

The FlexPod Datacenter solution is a converged infrastructure designed by Cisco and NetApp to provide a dynamic, highly available, and scalable data center environment for the running of enterprise workloads. Compute and networking resources in the solution are provided by Cisco UCS and Nexus products, and the storage resources are provided by the ONTAP storage system. The solution design is enhanced on a regular basis, when updated hardware models or software and firmware versions become available. These details, along with best practices for solution design and deployment, are captured in Cisco Validated Design (CVD) or NetApp Verified Architecture (NVA) documents and published regularly.

The latest CVD document detailing the FlexPod Datacenter solution design is available here.

Deploy Cloud Insights for FlexPod

To deploy the solution, you must complete the following tasks:

1. Sign up for the Cloud Insights service
2. Create a VMware virtual machine (VM) to configure as an Acquisition Unit
3. Install the Red Hat Enterprise Linux (RHEL) host
4. Create an Acquisition Unit instance in the Cloud Insights Portal and install the software
5. Add the monitored storage system from the FlexPod Datacenter to Cloud Insights.

Sign up for the NetApp Cloud Insights service

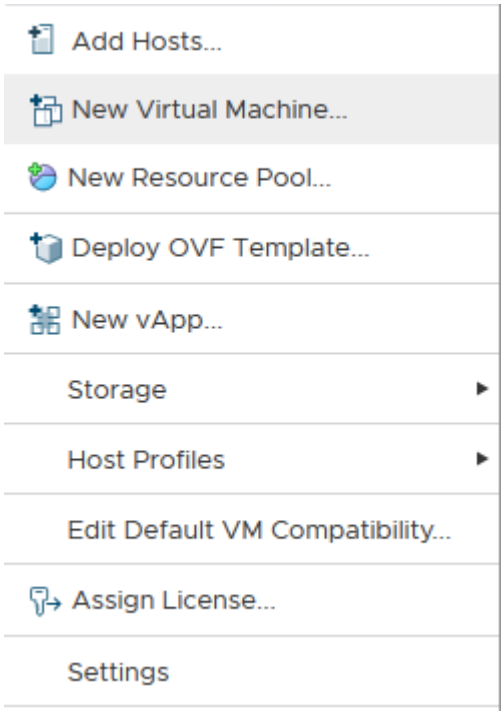
To sign up for the NetApp Cloud Insights Service, complete the following steps:

1. Go to https://cloud.netapp.com/cloud-insights
2. Click the button in the center of the screen to start the 14-day free trial, or the link in the upper right corner to sign up or log in with an existing NetApp Cloud Central account.

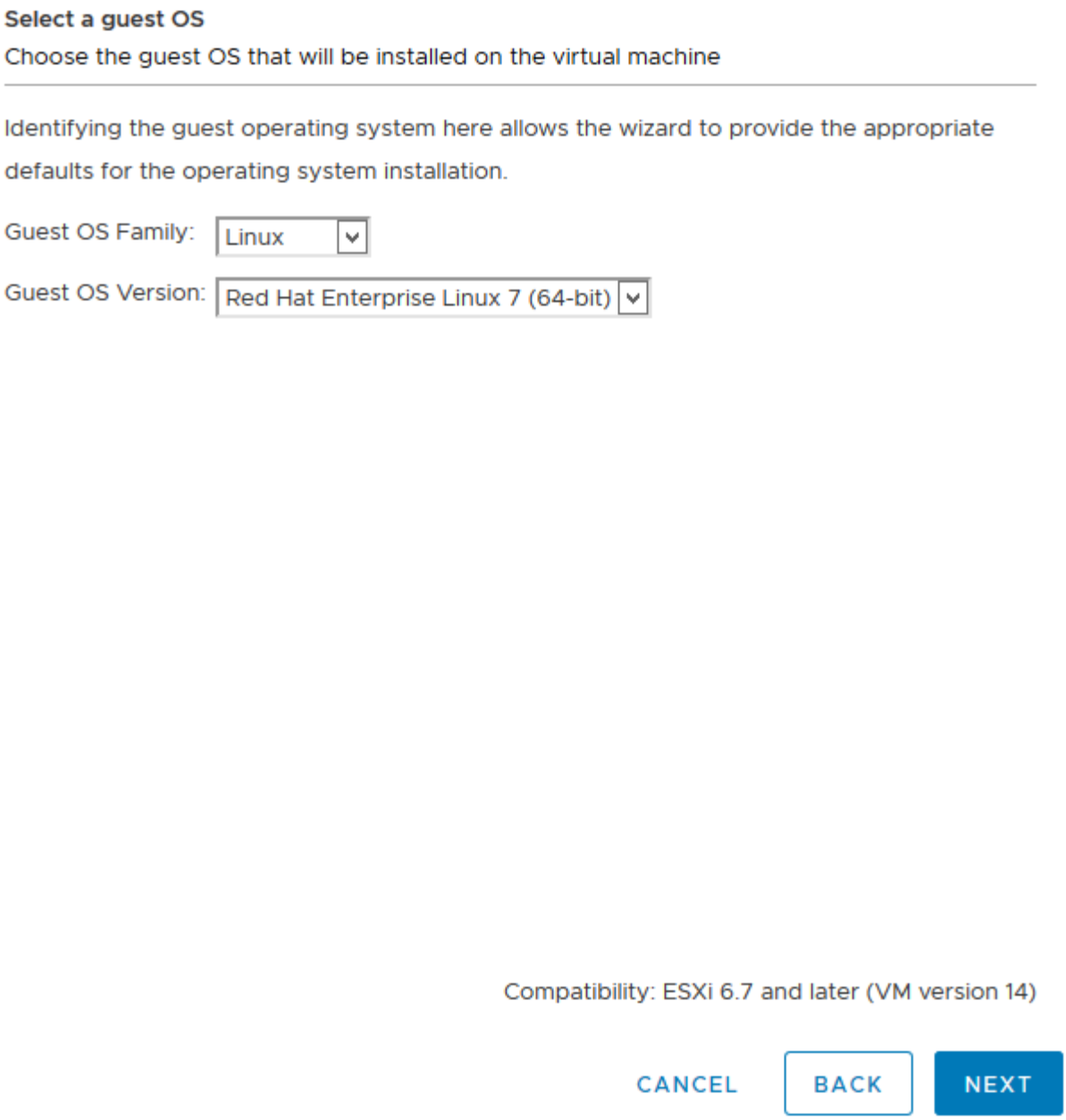
Create a VMware virtual machine to configure as an acquisition unit

To create a VMware VM to configure as an acquisition unit, complete the following steps:

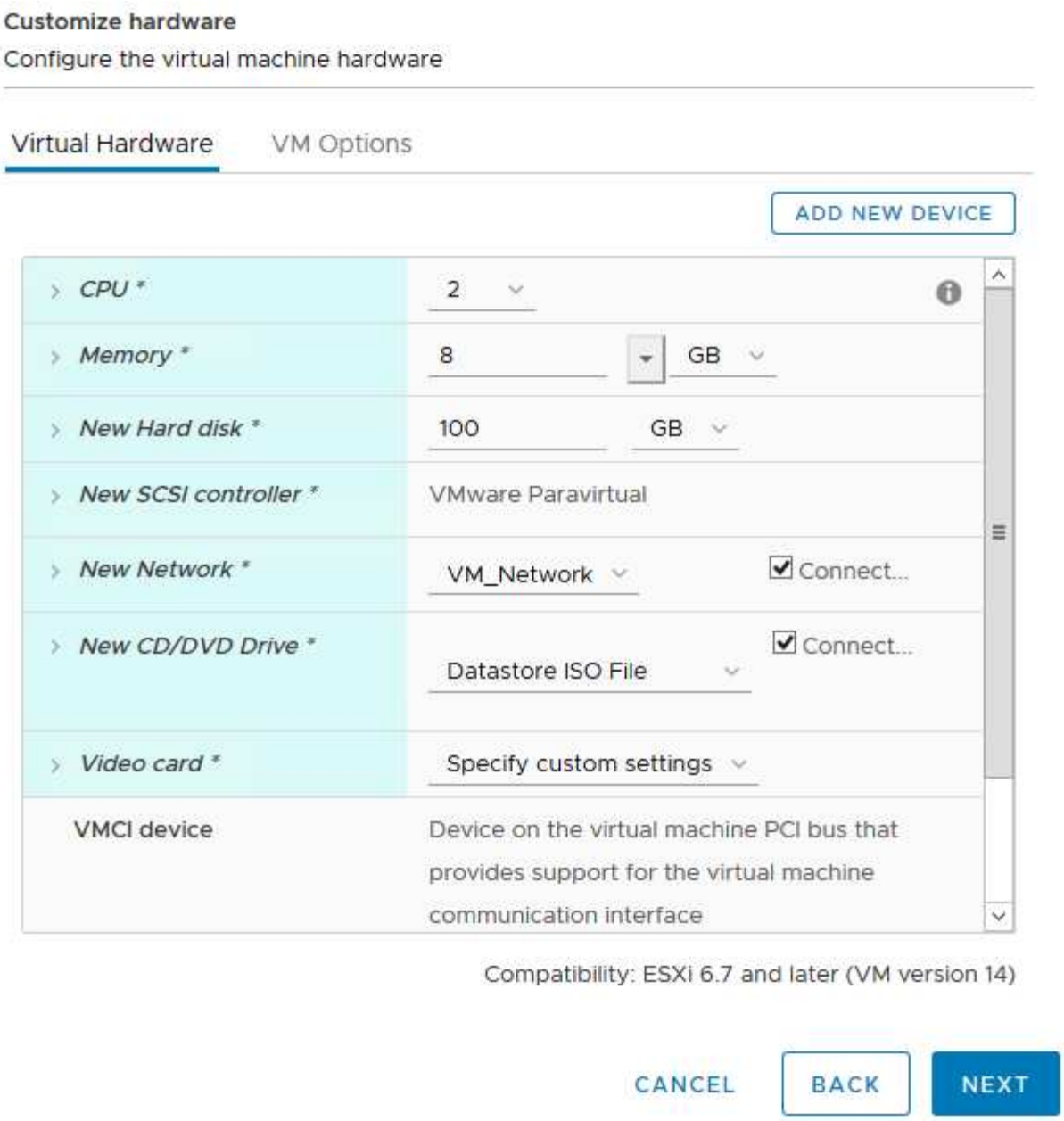
1. Launch a web browser and log in to VMware vSphere and select the cluster you want to host a VM.
2. Right-click that cluster and select Create A Virtual Machine from the menu.



3. In the New Virtual Machine wizard, click Next.
4. Specify the name of the VM and select the data center that you want to install it to, then click Next.
5. On the following page, select the cluster, nodes, or resource group you would like to install the VM to, then click Next.
6. Select the shared datastore that hosts your VMs and click Next.
7. Confirm the compatibility mode for the VM is set to `ESXi 6.7 or later` and click Next.
8. Select Guest OS Family Linux, Guest OS Version: Red Hat Enterprise Linux 7 (64-bit).



9. The next page allows for the customization of hardware resources on the VM. The Cloud Insights Acquisition Unit requires the following resources. After the resources are selected, click Next:
   a. Two CPUs
   b. 8GB of RAM
   c. 100GB of hard disk space
   d. A network that can reach resources in the FlexPod Datacenter and the Cloud Insights server through an SSL connection on port 443.
   e. An ISO image of the chosen Linux distribution (Red Hat Enterprise Linux) to boot from.

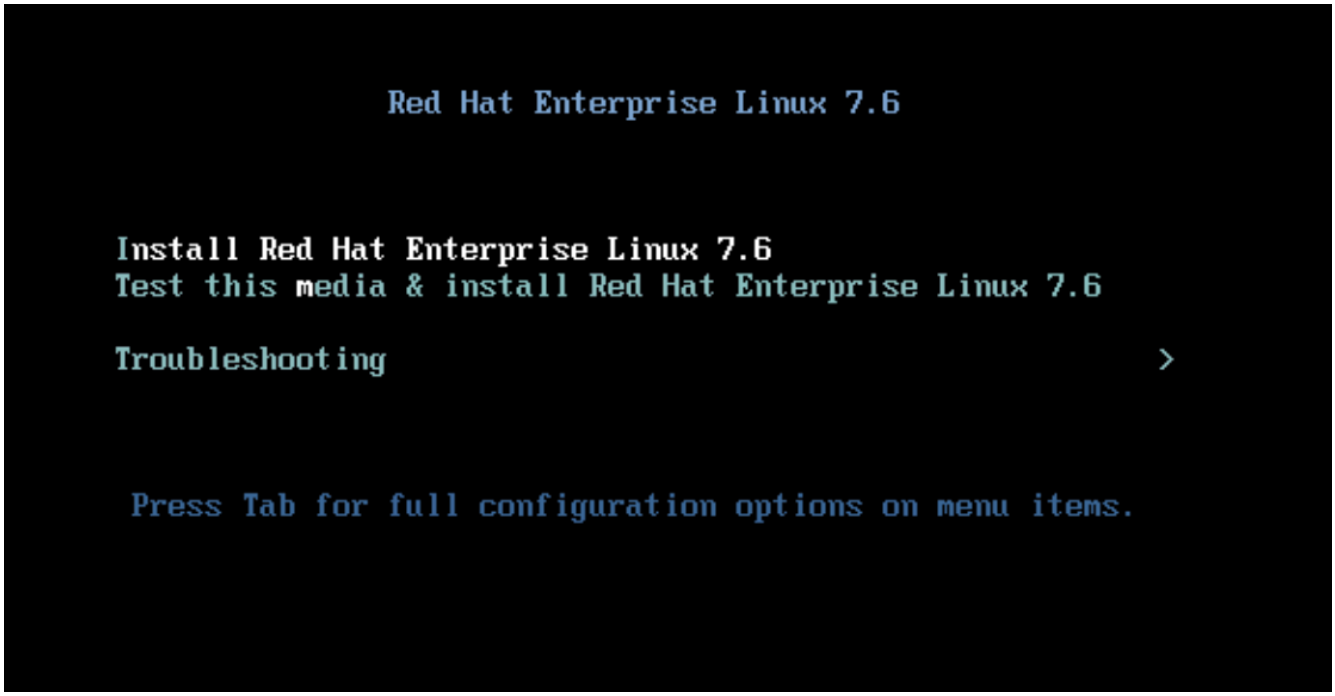


10. To create the VM, on the Ready to Complete page, review the settings and click Finish.

Install Red Hat Enterprise Linux

To install Red Hat Enterprise Linux, complete the following steps:

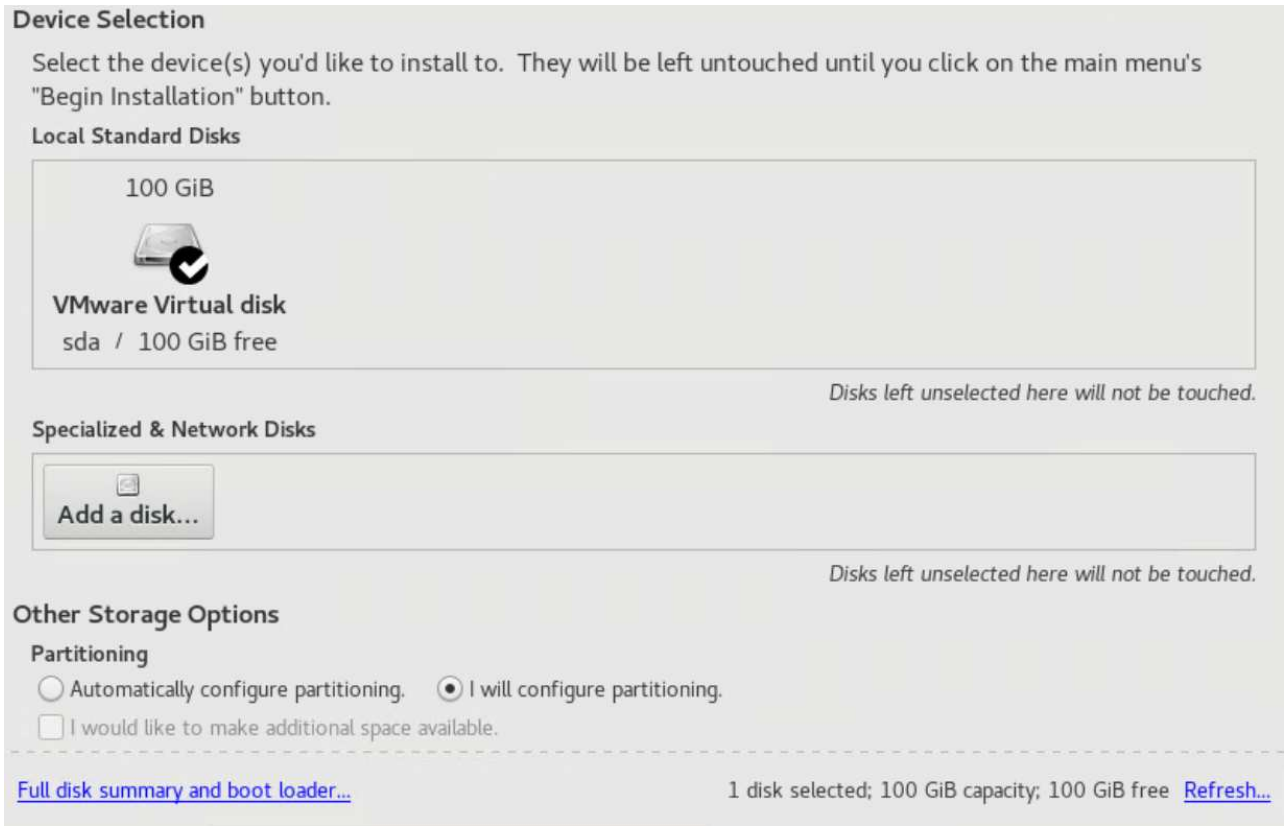
1. Power on the VM, click the window to launch the virtual console, and then select the option to Install Red Hat Enterprise Linux 7.6.



2. Select the preferred language and click Continue.

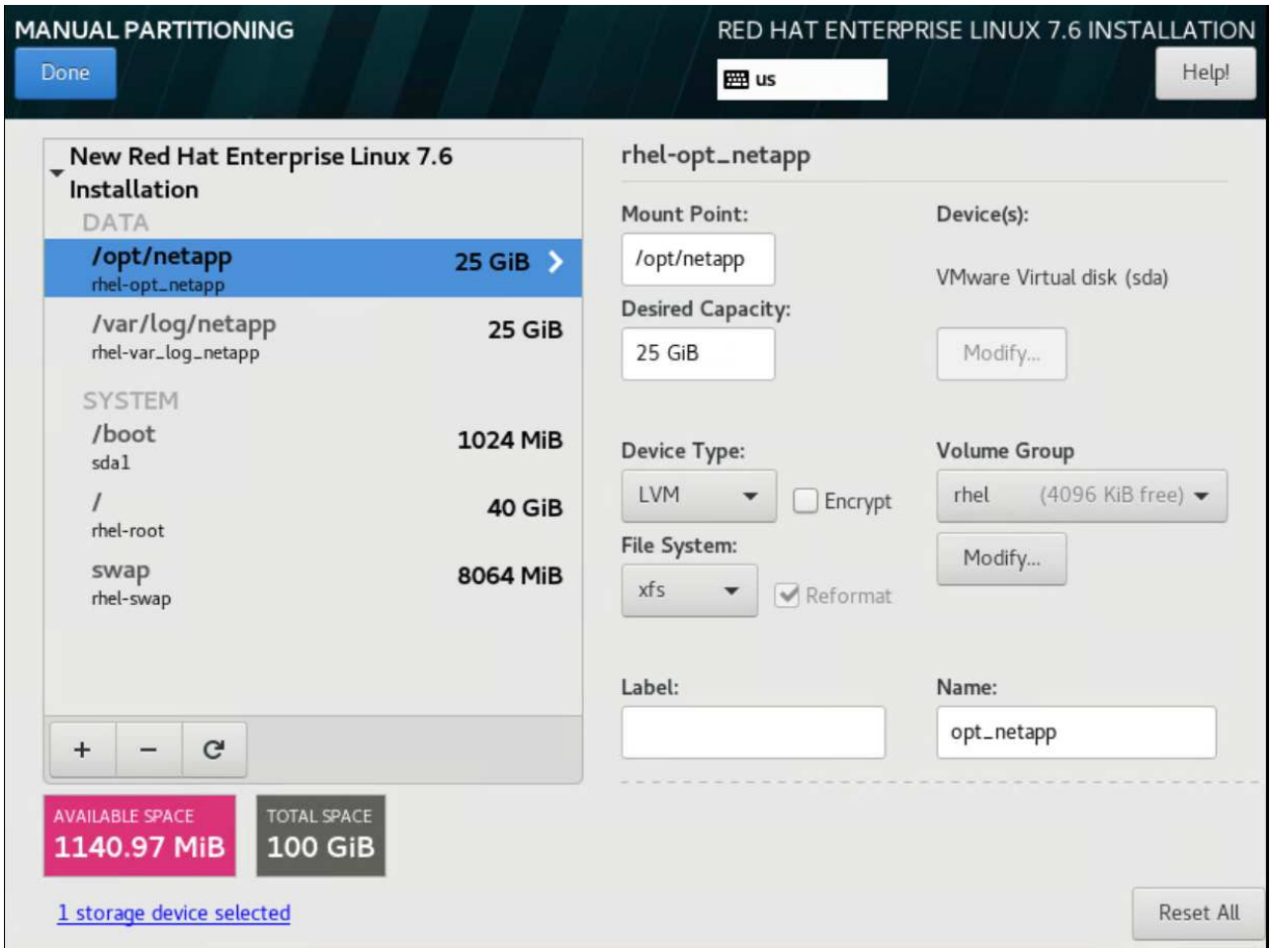
   The next page is Installation Summary. The default settings should be acceptable for most of these options.

3. You must customize the storage layout by performing the following options:
   a. To customize the partitioning for the server, click Installation Destination.
   b. Confirm that the VMware Virtual Disk of 100GiB is selected with a black check mark and select the I Will Configure Partitioning radio button.



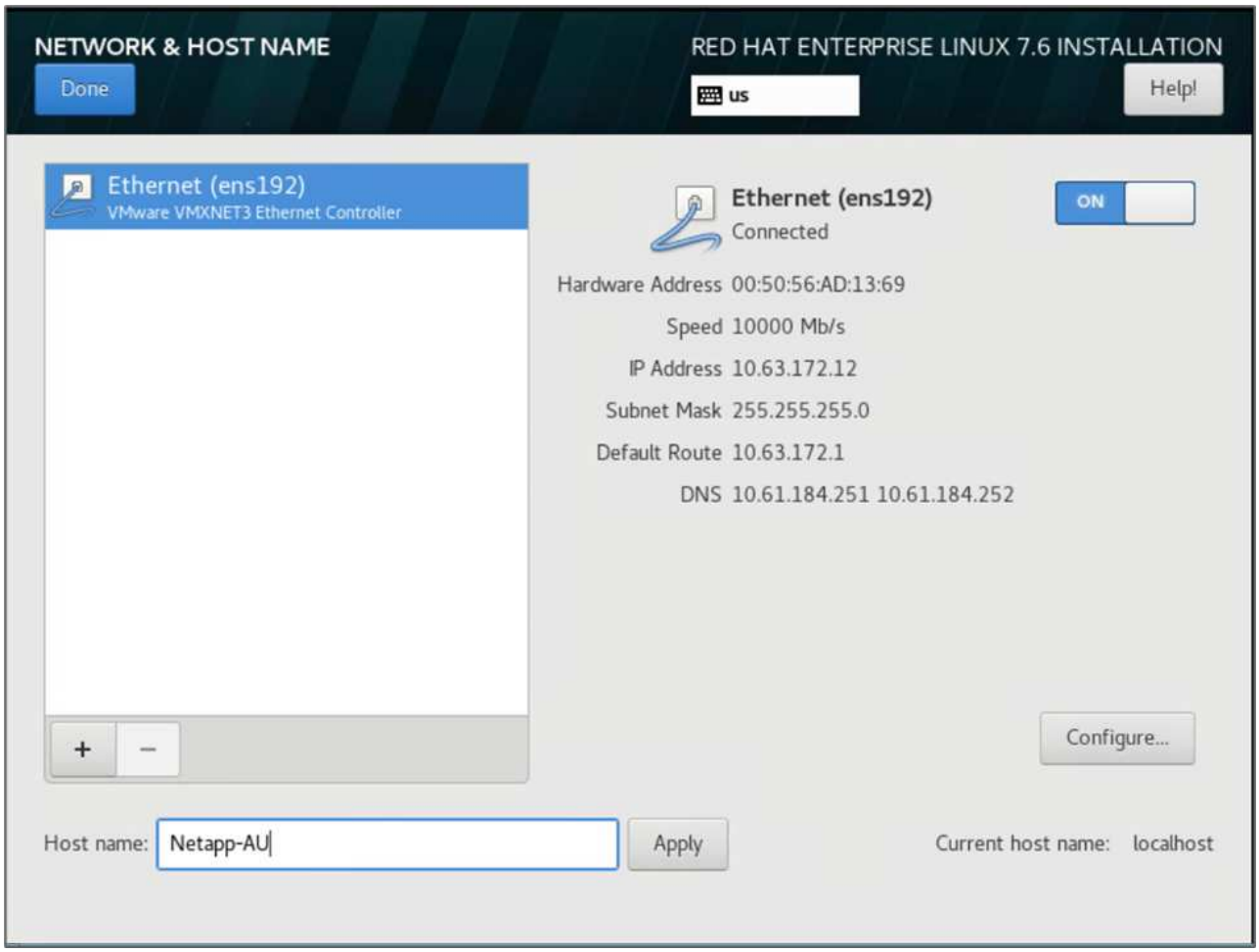
c. Click Done.

   A new menu displays enabling you to customize the partition table. Dedicate 25 GB each to `/opt/netapp` and `/var/log/netapp`. You can automatically allocate the rest of the storage to the system.



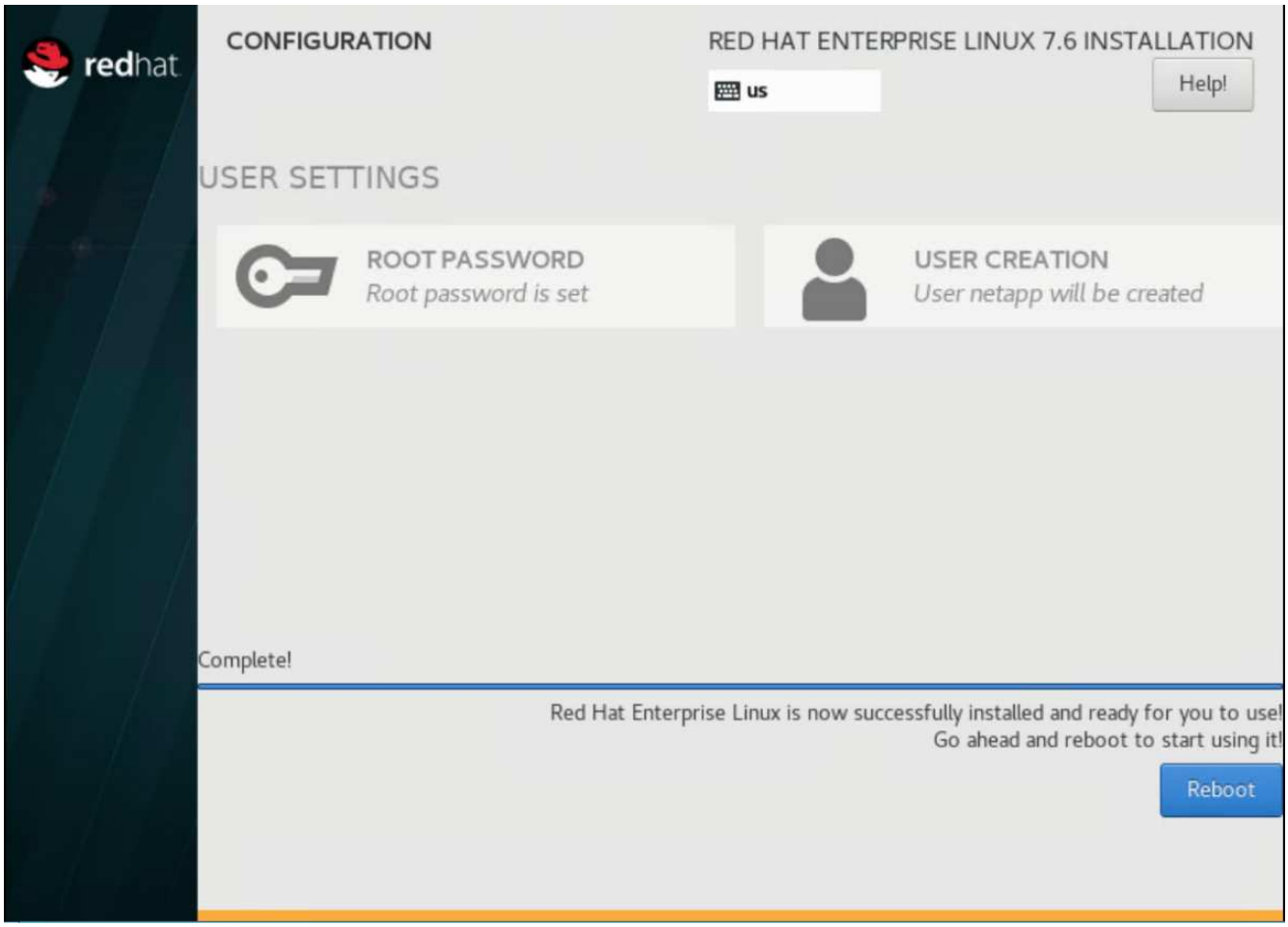
d. To return to Installation Summary, click Done.

4. Click Network and Host Name.
   a. Enter a host name for the server.
   b. Turn on the network adapter by clicking the slider button. If Dynamic Host Configuration Protocol (DHCP) is configured on your network, you will receive an IP address. If it is not, click Configure, and manually assign an address.



c. . Click Done to return to Installation Summary.

5. On the Installation Summary page, click Begin Installation.
6. On the Installation Progress page, you can set the root password or create a local user account. When the installation finishes, click Reboot to restart the server.



7. After the system has rebooted, log in to your server and register it with Red Hat Subscription Manager.

```
[root@Netapp-AU ~]# subscription-manager register
Registering to: subscription.rhsm.redhat.com:443/subscription
Username: alan.cowles@netapp.com
Password:
The system has been registered with ID: a47f2e7b-81cd-4757-85c7-eb1818c2c2a1
The registered system name is: Netapp-AU
[root@Netapp-AU ~]#
```

8. Attach an available subscription for Red Hat Enterprise Linux.

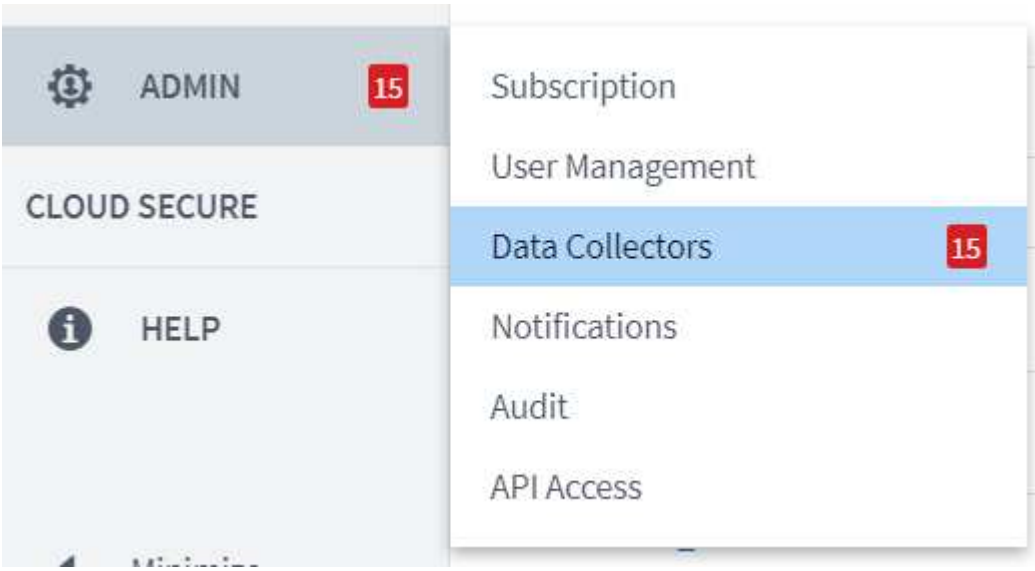
```
[root@Netapp-AU ~]# subscription-manager attach --pool=8a85f99b710f3b1901713b90b9e154cf
Successfully attached a subscription for: Red Hat Enterprise Linux, Standard Support (128 Sockets, NFR, Partner Only)
[root@Netapp-AU ~]#
```

Create an acquisition unit instance in the Cloud Insights portal and install the software

To create an acquisition unit instance in the Cloud Insights portal and install the software, complete the

following steps:

1. From the home page of Cloud Insights, hover over the Admin entry in the main menu to the left and select Data Collectors from the menu.

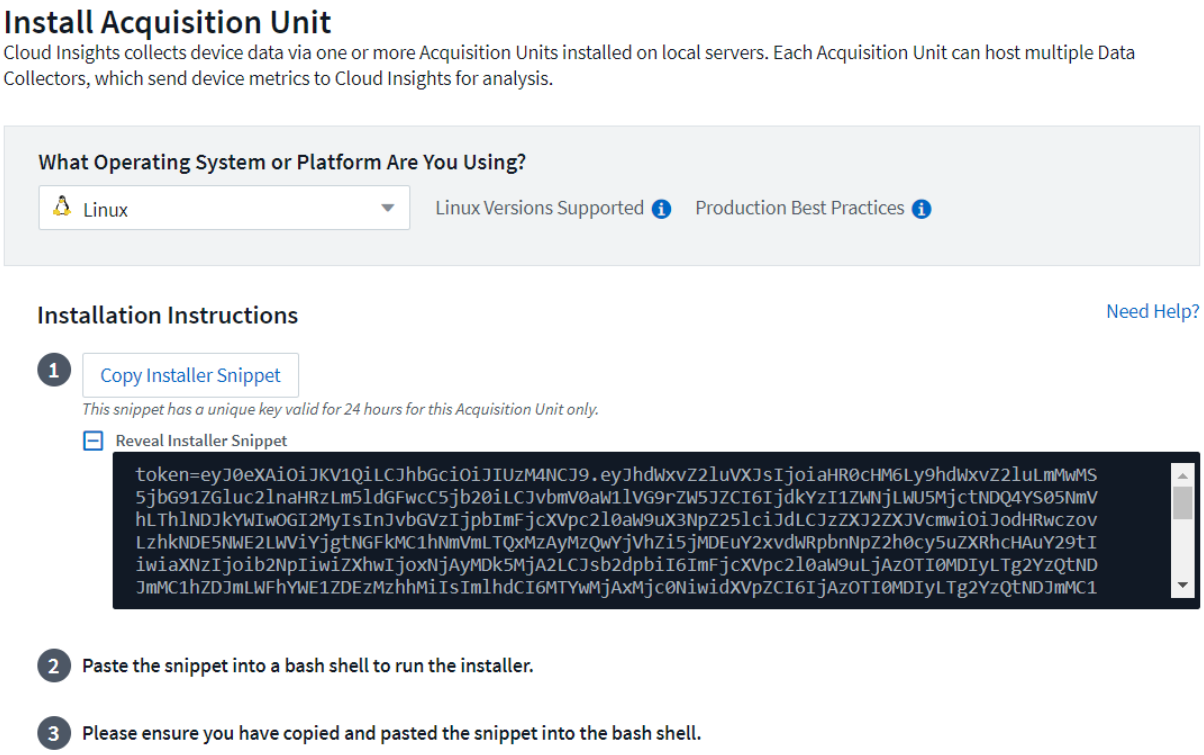


2. In the top center of the Data Collectors page, click the link for Acquisition Units.

3. To create a new Acquisition Unit, click the button on the right.

4. Select the operating system that you want to use to host your Acquisition Unit and follow the steps to copy the installation script from the web page.

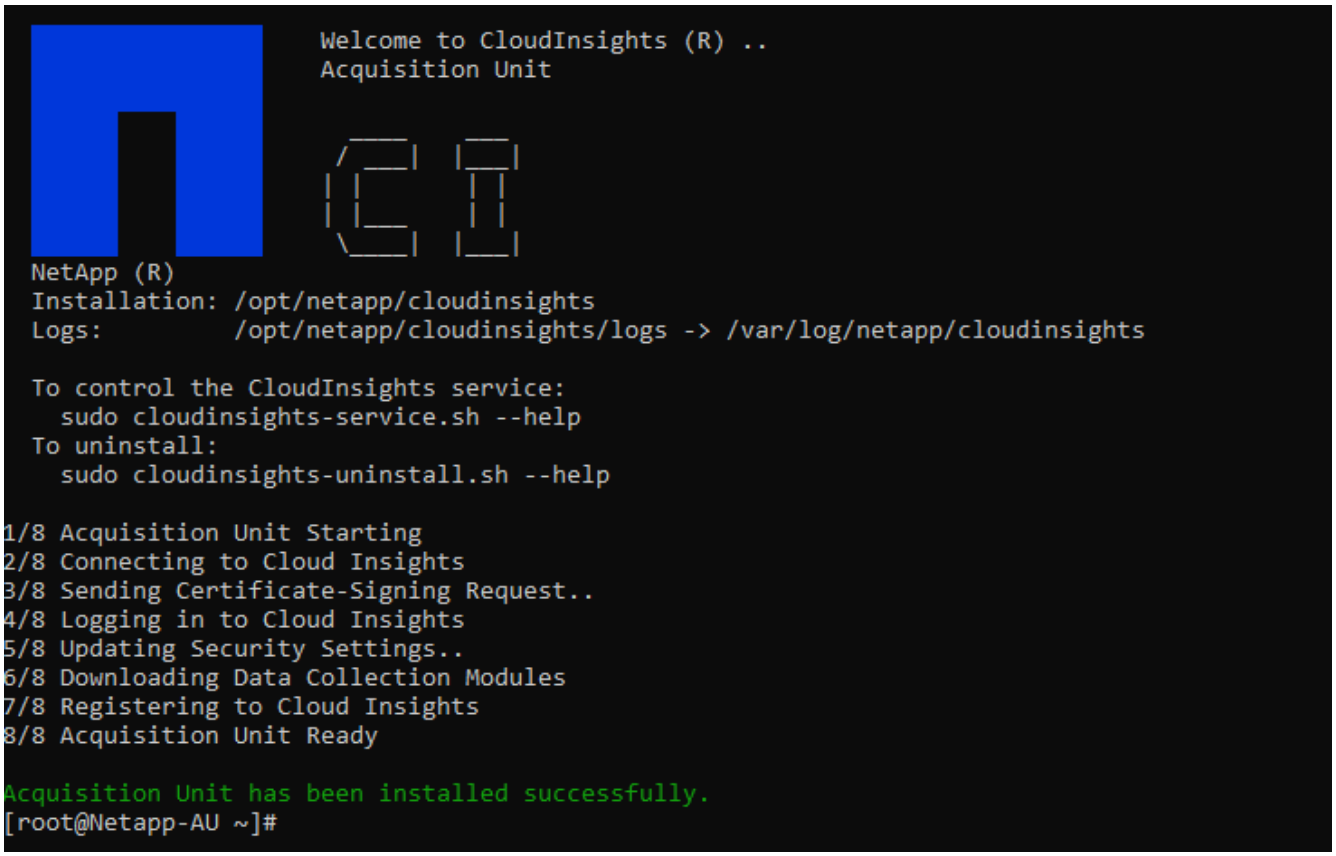
   In this example, it is a Linux server, which provides a snippet and a token to paste into the CLI on our host. The web page waits for the Acquisition Unit to connect.



5. Paste the snippet into the CLI of the Red Hat Enterprise Linux machine that was provisioned and click Enter.

```
[root@Netapp-AU ~]# token=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzM4NCJ9.eyJhdWxvZ2luVXJsIjoiaHR0cHM6Ly9hdWxvZ2luLmMwMS5jbG91ZGluc
2lnaHRzLm5ldGFwcC5jb20iLCJvbmV0aW1lVG9rZW5JZCI6IjQ5ZTY0MGM5LTY5MTItNDQ4Yi04YmI4LTIwNGY2OTQ2YzY1YSIsInJvbGVzIjpbImFjcXVpc
2l0aW9uX3NpZ25lciJdLCJzZXJ2ZXJVcmwiOiJodHRwczovLzhkNDE5NWE2LWViYjgtNGFkMC1hNmVmLTQxMzAyMzQwYjVhZi5jMDEuY2xvdWRpbnNpZ2h0c
y5uZXRhcHAuY29tIiwiaXNzIjoib2NpIiwiZXhwIjoxNjAyMTgyNzg2LCJsb2dpbiI6ImFjcXVpc2l0aW9uLjc4MTliZGI3LTk5OWQtNGNiYS05YmU1LTMwZ
TcxZjk0ODRiZCIsImlhdCI6MTYwMjA5NjMyNiwidXVpZCI6Ijc4MTliZGI3LTk5OWQtNGNiYS05YmU1LTMwZTcxZjk0ODRiZCIsInRlbmFudCI6IjhkNDE5N
WE2LWViYjgtNGFkMC1hNmVmLTQxMzAyMzQwYjVhZiIsInRlbmFudFN1YmRvbWFpbiI6InBzMTMyNSJ9.RvWLR3wH1_k6fIOCiO_h-Wok2STfFPDj7VksmXqw
-GZ-JqSIe8SZE4Sv3DuWrWM6 domainUrl=https://8d4195a6-ebb8-4ad0-a6ef-41302340b5af.c01.cloudinsights.netapp.com/rest/v1/au
version=1.253.0 bootstrap=cloudinsights-au-install-bootstrap.sh && curl $proxy_auth_scheme -H "Authorization: Bearer $to
ken" -o $bootstrap $domainUrl/installerBootstrap && sudo chmod 755 $bootstrap && sudo /bin/bash -c "TOKEN=$token HTTPS_P
ROXY=$https_proxy PROXY_AUTH_SCHEME=$proxy_auth_scheme AU_VERSION=$version INSTALLER_NAME=cloudinsights-linux-au-install
er-$version INSTALLER_URL=$domainUrl/installers/linux/$version ./$bootstrap"
```

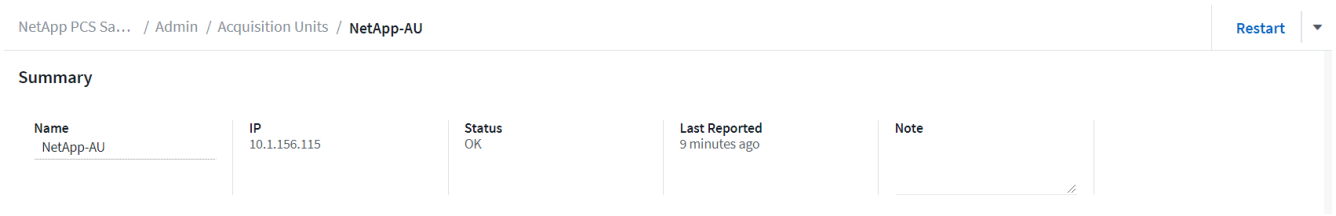
The installation program downloads a compressed package and begins the installation. When the installation is complete, you receive a message stating that the Acquisition Unit has been registered with NetApp Cloud Insights.



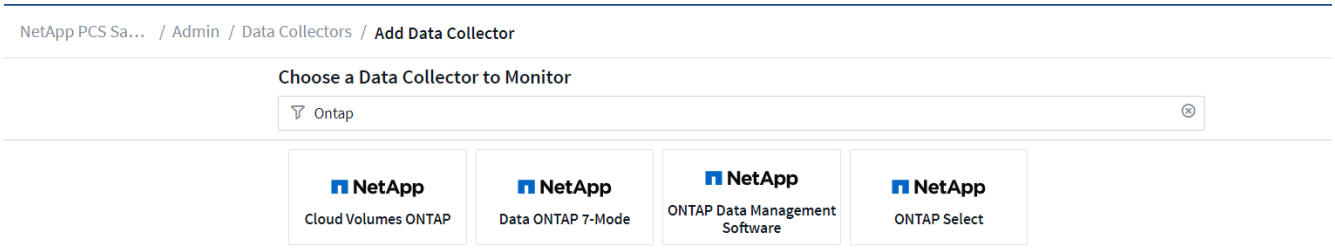
Add the monitored storage system from the FlexPod Datacenter to Cloud Insights

To add the ONTAP storage system from a FlexPod deployment, complete the following steps:

1. Return to the Acquisition Units page on Cloud Insights portal and find the listed newly registered unit. To display a summary of the unit, click the unit.

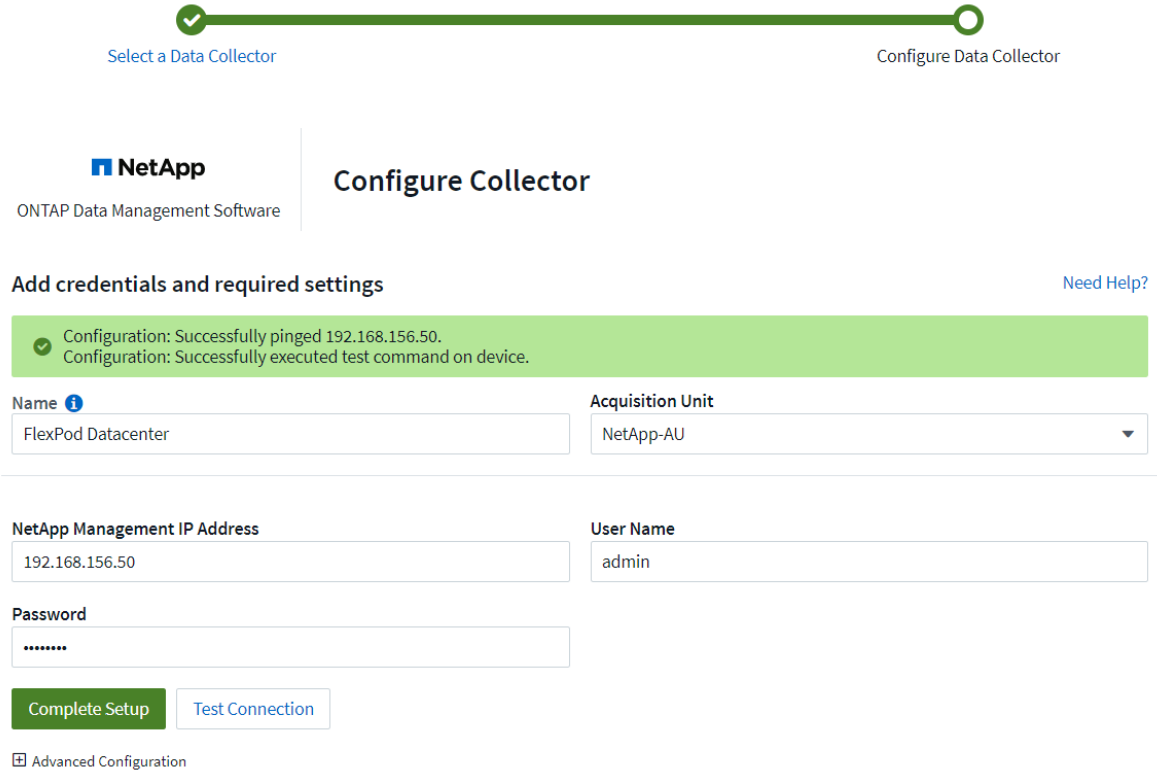


2. To start a wizard to add the storage system, on the Summary page, click the button for creating a data collector. The first page displays all the systems from which data can be collected. Use the search bar to search for ONTAP.



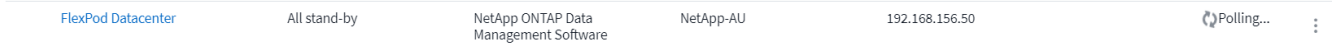
3. Select ONTAP Data Management Software.

   A page displays that enables you to name your deployment and select the Acquisition Unit that you want to use. You can provide the connectivity information and credentials for the ONTAP system and test the connection to confirm.



4. Click Complete Setup.

   The portal returns to the Data Collectors page and the Data Collector begins its first poll to collect data from the ONTAP storage system in the FlexPod Datacenter.



Use cases

With Cloud Insights set up and configured to monitor your FlexPod Datacenter solution,

we can explore some of the tasks that you can perform on the dashboard to assess and monitor your environment. In this section, we highlight five primary use cases for Cloud Insights:

- Active IQ integration
- Exploring real-time dashboards
- Creating custom dashboards
- Advanced troubleshooting
- Storage optimization

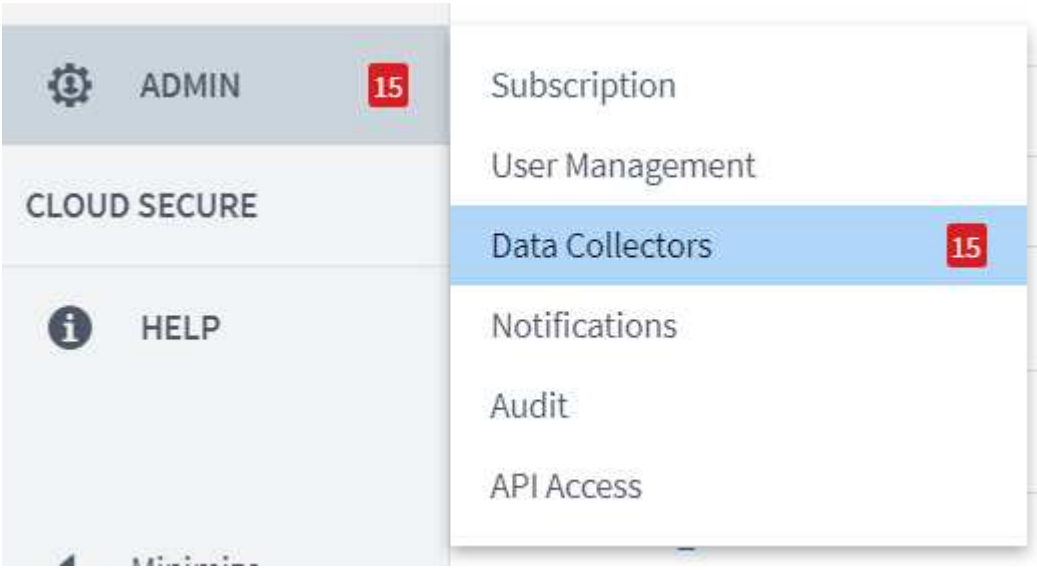
Active IQ integration

Cloud Insights is fully integrated into the Active IQ storage monitoring platform. An ONTAP system, deployed as a part of a FlexPod Datacenter solution, is automatically configured to send information back to NetApp through the AutoSupport function, which is built into each system. These reports are generated on a scheduled basis, or dynamically whenever a fault is detected in the system. The data communicated through AutoSupport is aggregated and displayed in easily accessible dashboards under the Active IQ menu in Cloud Insights.

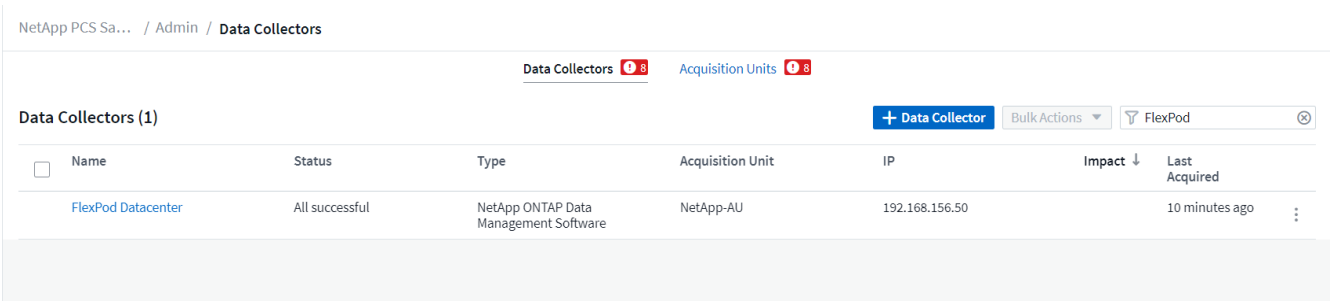
Access Active IQ information through the Cloud Insights dashboard

To access the Active IQ information through the Cloud Insights dashboard, complete the following steps:

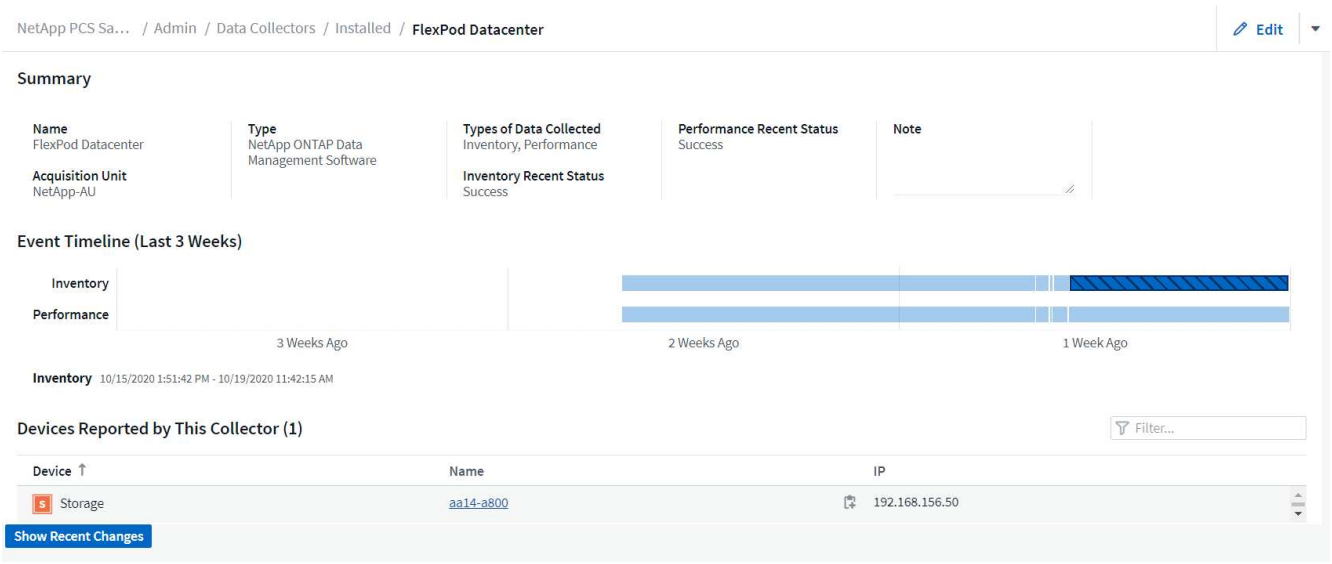
1. Click the Data Collector option under the Admin menu on the left.



2. Filter for the specific Data Collector in your environment. In this example, we filter by the term FlexPod.

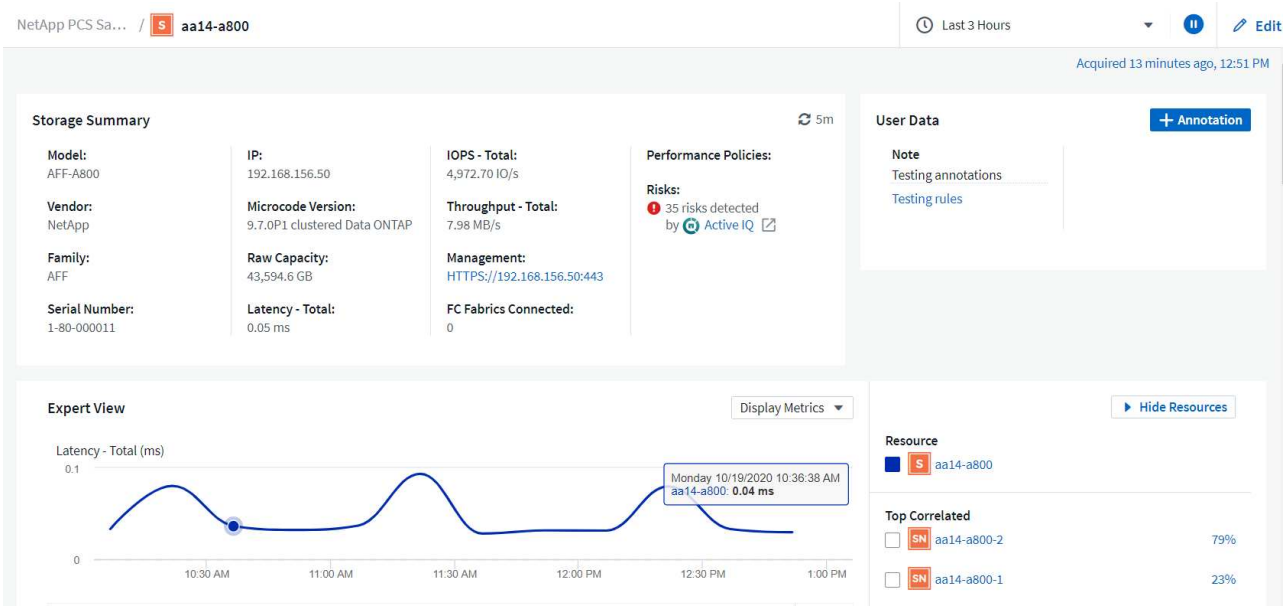


3. Click the Data Collector to get a summary of the environment and devices that are being monitored by that collector.

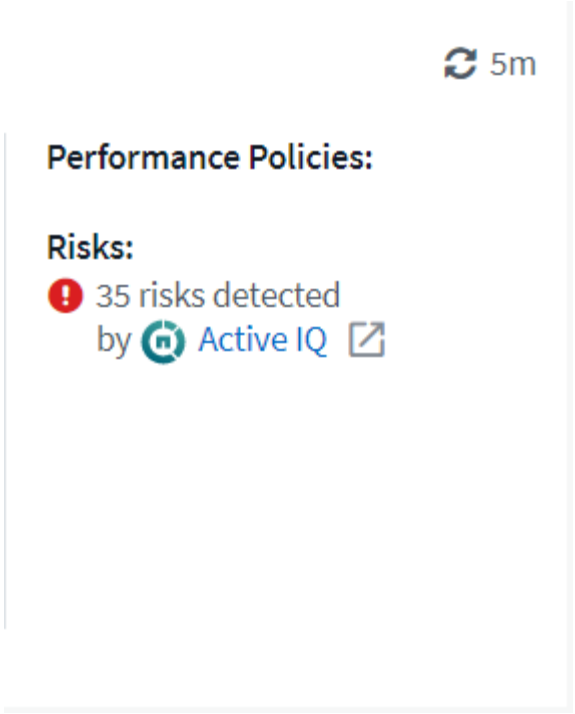


Under the device list near the bottom, click on the name of the ONTAP storage system being monitored. This displays a dashboard of information collected about the system, including the following details:

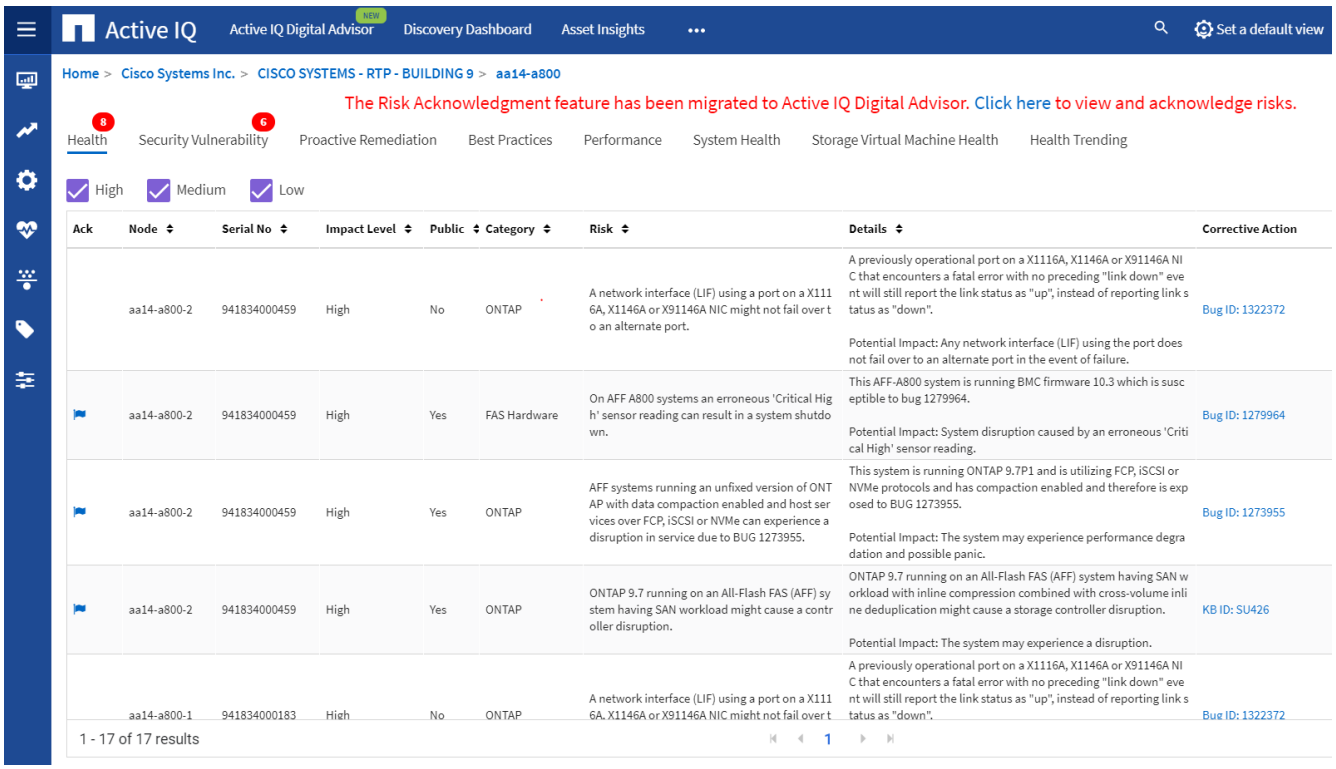
- Model
- Family
- ONTAP Version
- Raw Capacity
- Average IOPS
- Average Latency
- Average Throughput



Also, on this page under the Performance Policies section, you can find a link to NetApp Active IQ.



4. To open a new browser tab and take you to the risk mitigation page, which shows which nodes are affected, how critical the risks are, and what the appropriate action is that needs to be taken to correct the identified issues, click the link for Active IQ.

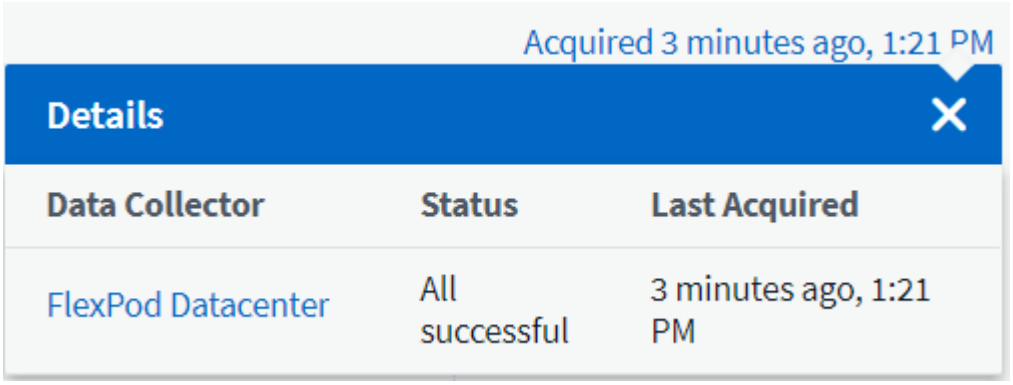


Explore real-time dashboards

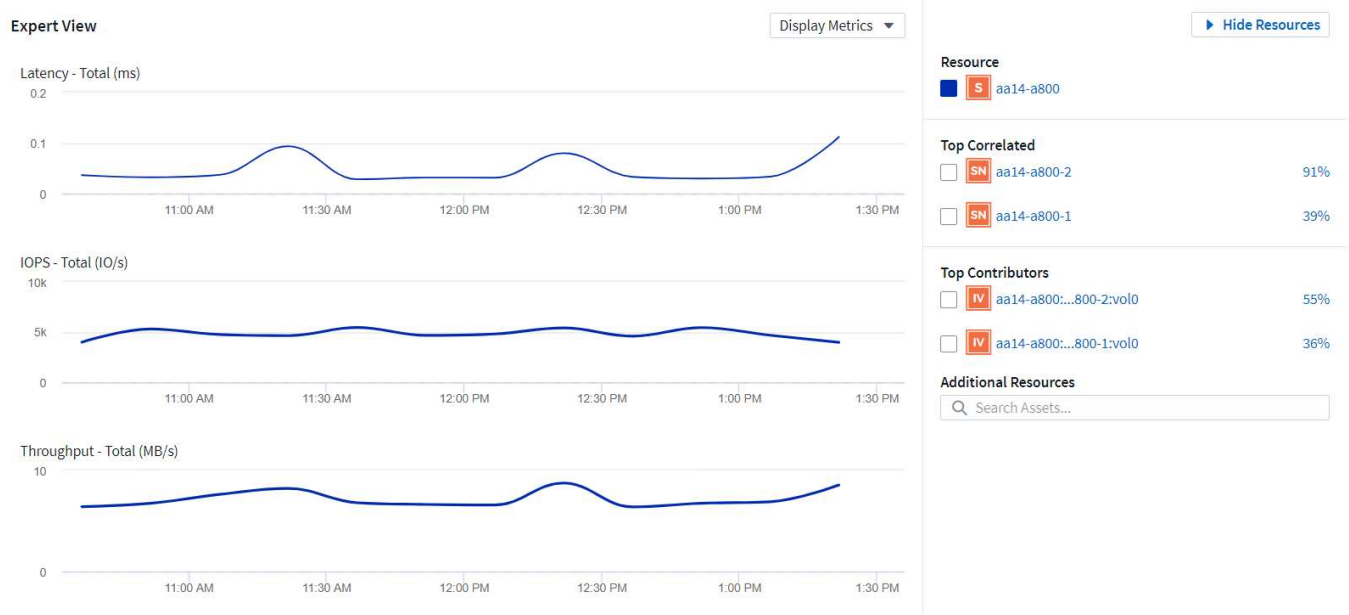
Cloud Insights can display real-time dashboards of the information that has been polled from the ONTAP storage system deployed in a FlexPod Datacenter solution. The Cloud Insights Acquisition Unit collects data in regular intervals and populates the default storage system dashboard with the information collected.

Access real-time graphs through the Cloud Insights dashboard

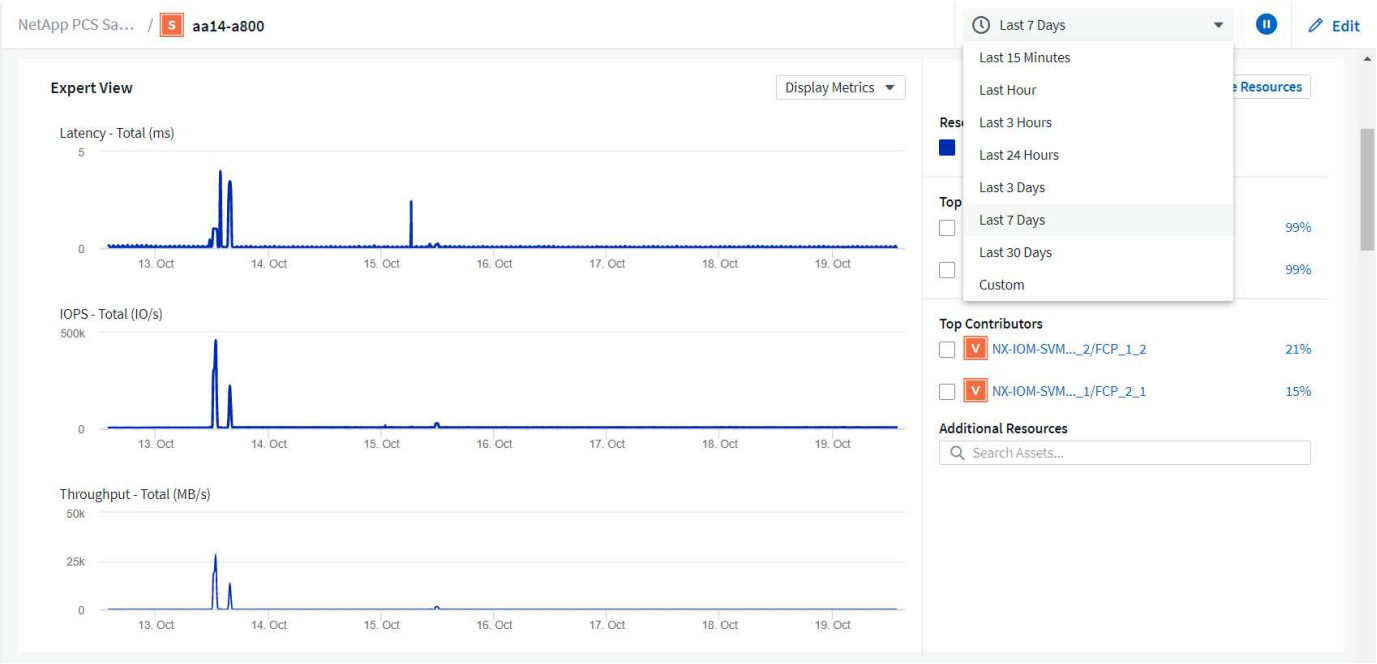
From the storage system dashboard, you can see the last time that the Data Collector updated the information. An example of this is shown in the figure below.



By default, the storage system dashboard displays several interactive graphs that show system-wide metrics from the storage system being polled, or from each individual node, including: Latency, IOPS, and Throughput, in the Expert View section. Examples of these default graphs are shown in the figure below.



By default, the graphs show information from the last three hours, but you can set this to a number of differing values or a custom value from the dropdown list near the top right of the storage system dashboard. This is shown in the figure below.



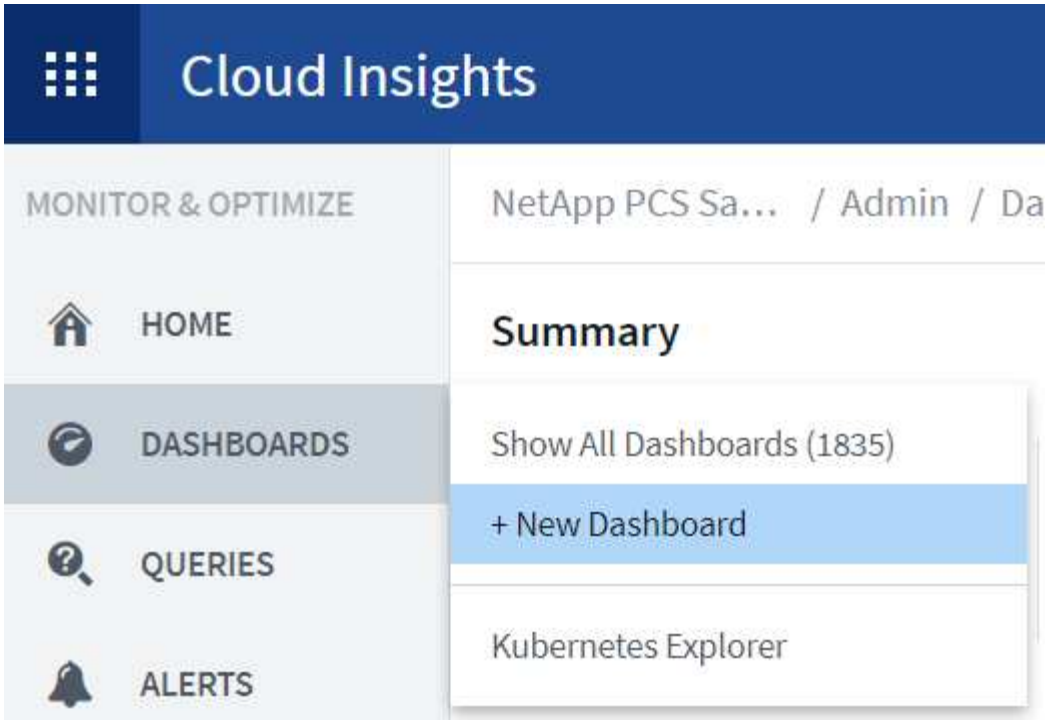
Create custom dashboards

In addition to making use of the default dashboards that display system-wide information, you can use Cloud Insights to create fully customized dashboards that enable you to focus on resource use for specific storage volumes in the FlexPod Datacenter solution, and thus the applications deployed in the converged infrastructure that depend on those volumes to run effectively. Doing so can help you to create a better visualization of specific applications and the resources they consume in the data center environment.

Create a customized dashboard to assess storage resources

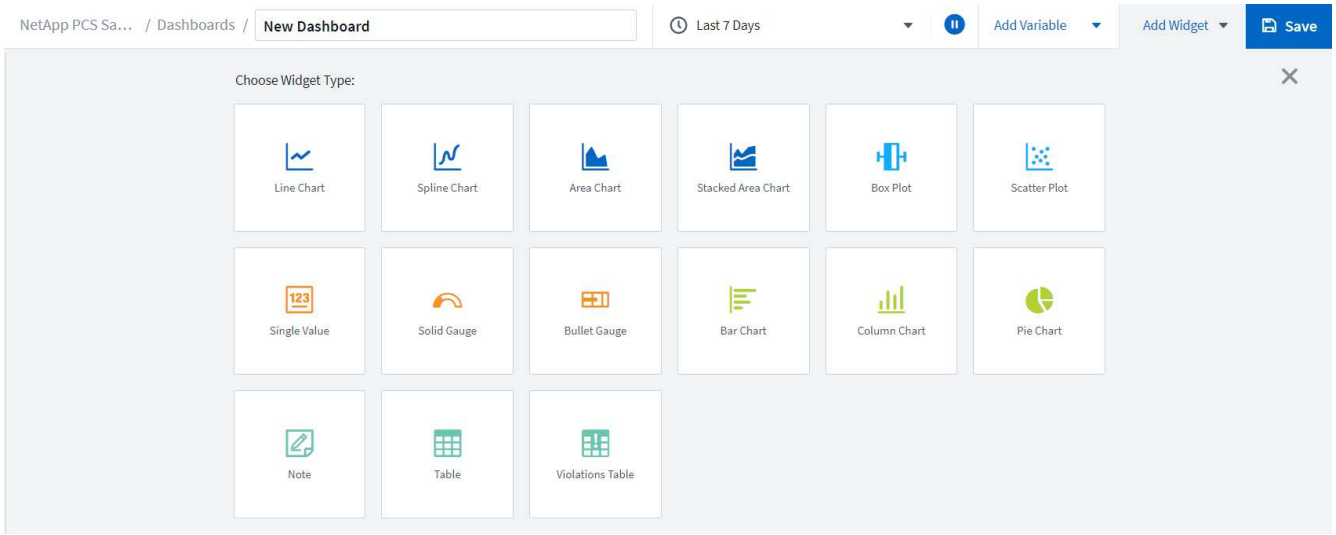
To create a customized dashboard to assess storage resources, complete the following steps:

1. To create a customized dashboard, hover over Dashboards on the Cloud Insights main menu and click + New Dashboard in the dropdown list.



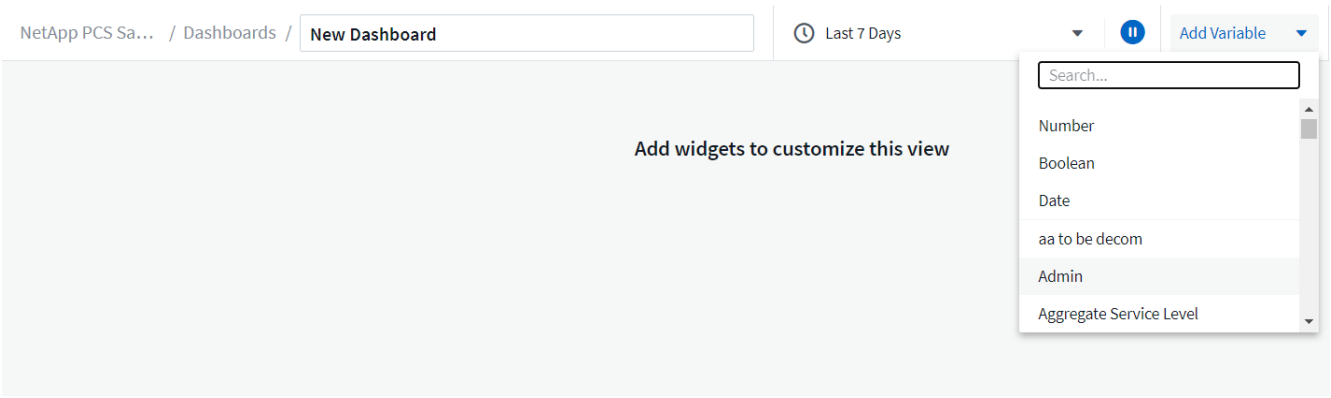
The New Dashboard window opens.

2. Name the dashboard and select the type of widget used to display the data. You can select from a number of graph types or even notes or table types to present the collected data.

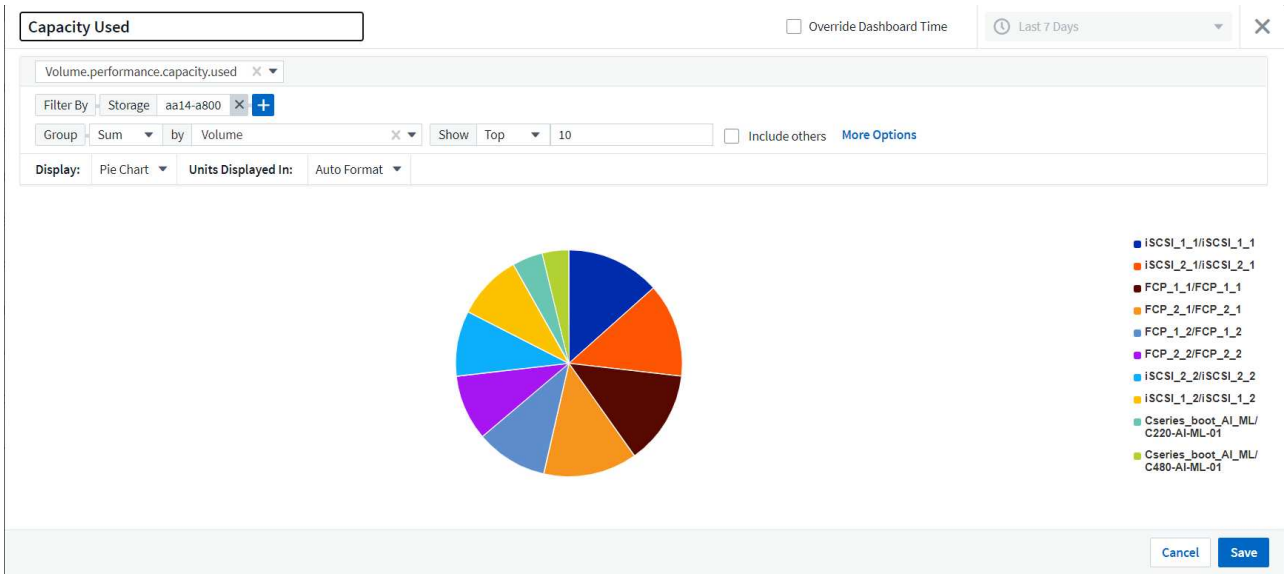


3. Choose customized variables from the Add Variable menu.

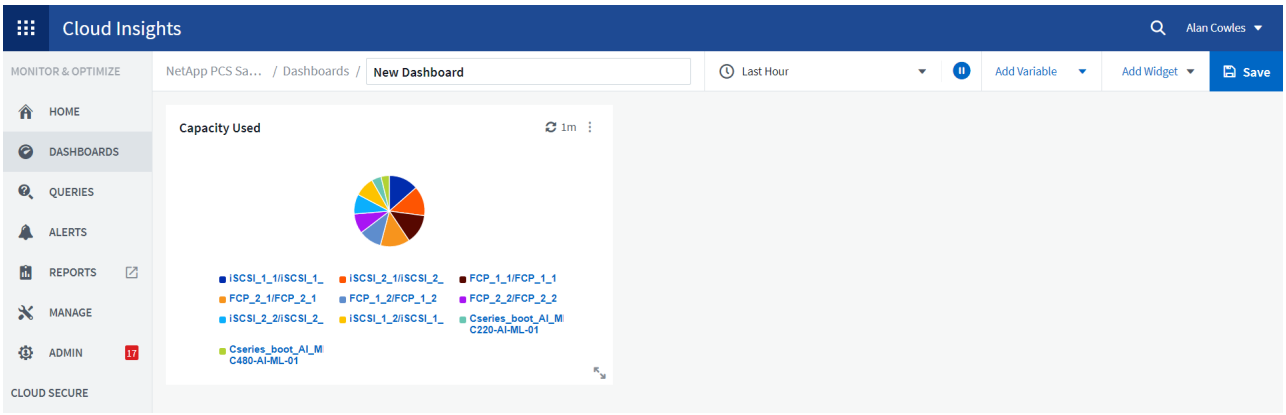
   This enables the data presented to be focused to display more specific or specialized factors.



4. To create a custom dashboard, select the widget type you would like to use, for example, a pie chart to display storage utilization by volume:
   a. Select the Pie Chart widget from the Add Widget dropdown list.
   b. Name the widget with a descriptive identifier, such as `Capacity Used`.
   c. Select the object you want to display. For example, you can search by the key term volume and select `volume.performance.capacity.used`.
   d. To filter by storage systems, use the filter and type in the name of the storage system in the FlexPod Datacenter solution.
   e. Customize the information to be displayed. By default, this selection shows ONTAP data volumes and lists the top 10.
   f. To save the customized dashboard, click the Save.



After saving the custom widget, the browser returns to the New Dashboard page where it displays the newly created widget and allows for interactive action to be taken, such as modifying the data polling period.



Advanced troubleshooting

Cloud Insights enables advanced troubleshooting methods to be applied to any storage environment in a FlexPod Datacenter converged infrastructure. Using components of each of the features mentioned above: Active IQ integration, default dashboards with real-time statistics, and customized dashboards, issues that might arise are detected early and solved rapidly. Using the list of risks in Active IQ, a customer can find reported configuration errors that could lead to issue or discover bugs that have been reported and patched versions of code that can remedy them. Observing the real-time dashboards on the Cloud Insights home page can help to discover patterns in system performance that could be an early indicator of a problem on the rise and help to resolve it expediently. Lastly, being able to create customized dashboards enables customers to focus on the most important assets in their infrastructure and monitor those directly to ensure that they can meet their business continuity objectives.

Storage optimization

In addition to troubleshooting, it is possible to use the data collected by Cloud Insights to optimize the ONTAP storage system deployed in a FlexPod Datacenter converged infrastructure solution. If a volume shows a high latency, perhaps because several VMs with high performance demands are sharing the same datastore, that information is displayed on the Cloud Insights dashboard. With this information, a storage administrator can choose to migrate one or more VMs either to other volumes, migrate storage volumes between tiers of aggregates, or between nodes in the ONTAP storage system, resulting in a performance optimized environment. The information gleaned from the Active IQ integration with Cloud Insights can highlight configuration issues that lead to poorer than expected performance, and provide the recommended corrective action that if implemented, can remediate any issues, and ensure an optimally tuned storage system.

Videos and demos

You can see a video demonstration of using NetApp Cloud Insights to assess the resources in an on-premises environment here.

You can see a video demonstration of using NetApp Cloud Insights to monitor infrastructure and set alert thresholds for infrastructure here.

You can see a video demonstration of using NetApp Cloud Insights to asses individual applications in the environment here.

Additional information

To learn more about the information that is described in this document, review the

following websites:

- Cisco Product Documentation

  https://www.cisco.com/c/en/us/support/index.html

- FlexPod Datacenter

  https://www.flexpod.com

- NetApp Cloud Insights

  https://cloud.netapp.com/cloud-insights

- NetApp Product Documentation

  https://docs.netapp.com

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