



# Manage NetApp HCI

## HCI

NetApp  
October 30, 2020

This PDF was generated from [https://docs.netapp.com/us-en/hci/task\\_hcc\\_dashboard.html](https://docs.netapp.com/us-en/hci/task_hcc_dashboard.html) on October 30, 2020.  
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# Manage NetApp HCI

## Monitor your NetApp HCI system

### Monitor storage and compute resources with the HCC Dashboard

With the NetApp Hybrid Control (HCC) Dashboard, you can view all your storage and compute resources at a glance. Additionally, you can monitor storage capacity, storage performance, and compute utilization.

Only compute nodes that are managed and clusters with at least one managed node in H-series hardware appear on the HCC Dashboard.

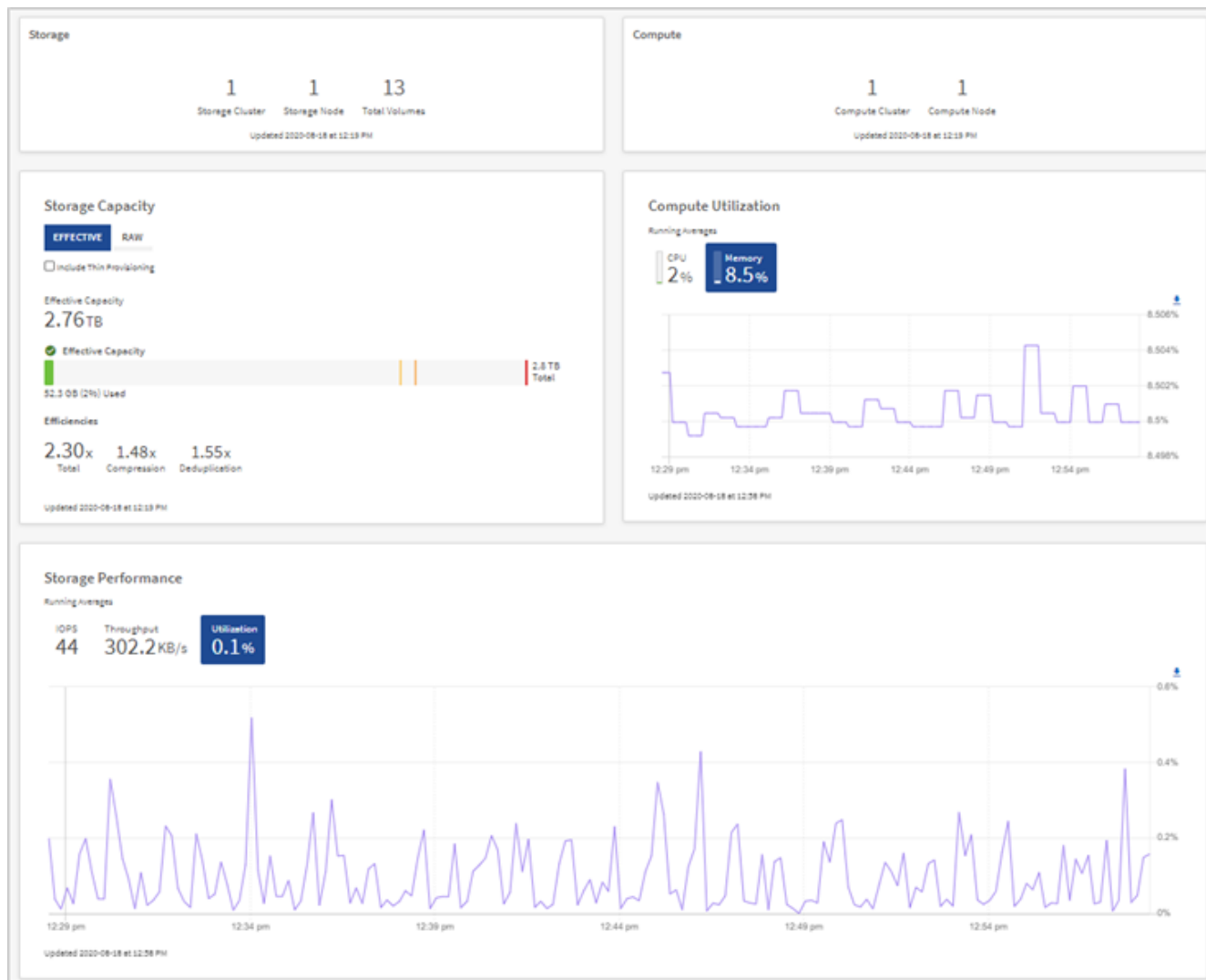
- [Access the NetApp HCC Dashboard](#)
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- [Monitor storage capacity](#)
- [Monitor storage performance](#)
- [Monitor compute utilization](#)

### Access the NetApp HCC Dashboard

1. Open a web browser and browse to the IP address of the management node. For example:

```
https://[management node IP address]
```

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI storage cluster administrator credentials.
3. View the HCC Dashboard.



You might see some or all these panes, depending on your installation. For example, for storage-only installations, the HCC Dashboard shows only the Storage pane, the Storage Capacity pane, and the Storage Performance pane.

## Monitor storage resources

Use the **Storage** pane to see your total storage environment. You can monitor the number of storage clusters, storage nodes, and total volumes.

## Monitor compute resources

Use the **Compute** pane to see your total NetApp H-series compute environment. You can monitor the number of compute clusters and total compute nodes.

## Monitor storage capacity

Monitoring the storage capacity of your environment is critical. Using the Storage Capacity pane, you can determine your storage capacity efficiency gains with or without compression, deduplication, and

thin provisioning features enabled.

You can see the total physical storage space available in your cluster on the **RAW** tab, and information about the provisioned storage on the **EFFECTIVE** tab.



To view cluster health, also look at the SolidFire Active IQ Dashboard. See [Monitor performance, capacity, and cluster health in NetApp SolidFire Active IQ](#).

### Steps

1. Click the **RAW** tab, to see the total physical storage space used and available in your cluster.

Look at the vertical lines to determine whether your used capacity is less than the total or less than Warning, Error, or Critical thresholds. Hover over the lines to see details.



You can set the threshold for Warning, which defaults to 3% below the Error threshold. The Error and Critical thresholds are preset and not configurable by design. The Error threshold indicates that less than one node of capacity remains in the cluster. For steps on setting the threshold, see [Setting cluster full threshold](#).



For details about the related cluster thresholds Element API, see “[getClusterFullThreshold](#)” in the *Element API Guide*. To view details about block and metadata capacity, see [Understanding cluster fullness levels](#) in the *Element User Guide*.

2. Click the **EFFECTIVE** tab, to see information about total storage provisioned to connected hosts and to see efficiency ratings.
  - a. Optionally, check **Include Thin Provisioning** to see thin provisioning efficiency rates in the Effective Capacity bar chart.
  - b. **Effective Capacity bar chart:** Look at the vertical lines to determine whether your used capacity is less than the total or less than Warning, Error, or Critical thresholds. Similar to the

Raw tab, you can hover over the vertical lines to see details.

- c. **Efficiencies:** Look at these ratings to determine your storage capacity efficiency gains with compression, deduplication, and thin provisioning features enabled. For example, if compression shows as “1.3x”, this means that storage efficiency with compression enabled is 1.3 times more efficient than without it.



Total Efficiencies equals  $(\text{maxUsedSpace} * \text{efficiency factor}) / 2$ , where  $\text{efficiencyFactor} = (\text{thinProvisioningFactor} * \text{deDuplicationFactor} * \text{compressionFactor})$ . When Thin Provisioning is unchecked, it is not included in the Total Efficiency.

- d. If the effective storage capacity nears an Error or Critical threshold, consider clearing the data on your system. Alternatively, consider expanding your system.

See [Expansion overview](#).

3. For further analysis and historical context, look at [NetApp SolidFire Active IQ details](#).

## Monitor storage performance

You can look at how much IOPS or throughput you can get out of a cluster without surpassing the useful performance of that resource by using the Storage Performance pane. Storage performance is the point at which you get the maximum utilization before latency becomes an issue.

The Storage Performance pane helps you identify whether the performance is reaching the point where the performance might degrade if the workloads increase.

The information on this pane refreshes every 10 seconds and shows an average of all the points on the graph.

For details about the associated Element API method, see the [GetClusterStats](#) method in the *Element API Reference Guide*.

### Steps

1. View the Storage Performance pane. For details, hover over points in the graph.
  - a. **IOPS** tab: See the current operations per second. Look for trends in data or spikes. For example, if you see that the maximum IOPS is 160K and 100K of that is free or available IOPS, you might consider adding more workloads to this cluster. On the other hand, if you see that only 140K is available, you might consider offloading workloads or expanding your system.



- b. **Throughput** tab: Monitor patterns or spikes in throughput. Also monitor for continuously high throughput values, which might indicate that you are nearing the maximum useful performance of the resource.



- c. **Utilization** tab: Monitor the utilization of IOPS in relation to the total IOPS available summed up at the cluster level.



2. For further analysis, look at storage performance by using the Element Plug-in for vCenter Server.

[Performance shown in the NetApp Element Plug-in for vCenter Server.](#)

## Monitor compute utilization

In addition to monitoring IOPS and throughput of your storage resources, you also might want to view the CPU and memory usage of your compute assets. The total IOPS that a node can provide is based on the physical characteristics of the node, for example, the number of CPUs, the CPU speed, and the amount of RAM.

### Steps

1. View the **Compute Utilization** pane. Using both the CPU and Memory tabs, look for patterns or spikes in utilization. Also look for continuously high usage, indicating that you might be nearing the maximum utilization for the compute clusters.



This pane shows data only for those compute clusters managed by this installation.





- a. **CPU** tab: See the current average of CPU utilization on the compute cluster.
  - b. **Memory** tab: See the current average memory usage on the compute cluster.
2. For further analysis on compute information, look at these resources:
- a. [NetApp Element Plug-in for vCenter Server for cluster management details](#)
  - b. [NetApp SolidFire Active IQ for historical data](#)

### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## View your inventory on the Nodes page

You can view both your storage and compute assets in your system and determine their IP addresses, names, and software versions.

You can view storage information for your multiple node systems and any NetApp HCI Witness Nodes associated with two-node or three-node clusters.

Witness Nodes manage quorum within the cluster; they are not used for storage. Witness Nodes are applicable only to NetApp HCI and not to all-flash storage environments.

For more information about Witness Nodes, see [Nodes definitions](#).

For SolidFire Enterprise SDS nodes, you can monitor inventory on the Storage tab.

### Steps

1. Open a web browser and browse to the IP address of the management node. For example:

https://[management node IP address]

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI storage cluster administrator credentials.

The NetApp Hybrid Cloud Control Dashboard appears.

3. In the left navigation, click **Nodes**.

The Storage tab appears.

## Nodes

Only NetApp HCI Nodes are displayed on this page.

STORAGE

COMPUTE

Cluster1

1 of 1

Two-node

Filter

Columns

Download

Hostname	Node Model	Element Version	Management IP Address
stg01	H410S-0	12.0.0.318	- VLAN 1184
stg02	H410S-0	12.0.0.318	- VLAN 1184

1 - 2 of 2 results

30

Witness Nodes

Hostname	Management IP Address	Storage (iSCSI) IP Address
wit01		
wit02		

4. On the **Storage** tab of the Nodes page, review the following information:
  - a. Two-node clusters: A “two-node” label appears on the Storage tab and the associated Witness Nodes are listed.
  - b. Three-node clusters: The storage nodes and associated Witness Nodes are listed. Three-node clusters have a Witness Node deployed on standby to maintain high availability in the case of node failure.
  - c. Clusters with four nodes or more: Information for clusters with four or more nodes appears. Witness Nodes do not apply. If you started with two or three storage nodes and added more nodes, the Witness Nodes still appear. Otherwise, the Witness Nodes table does not appear.
  - d. The firmware bundle version: Starting with management services version 2.14, if you have clusters running Element 12.0 or later, you can see the firmware bundle version for these clusters. If the nodes in a cluster have different firmware versions on them, you can see **Multiple** in the **Firmware Bundle Version** column.
5. To view compute inventory information, click **Compute**.

6. You can manipulate the information on these pages in several ways:

- a. To filter the list of items in the results, click the **Filter** icon and select the filters. You can also enter text for the filter.
- b. To show or hide columns, click the **Show/Hide Columns** icon.
- c. To download the table, click the **Download** icon.
- d. To add or edit the stored BMC credentials for a compute node with BMC connection errors, click **Edit connection settings** in the error message text in the **BMC Connection Status** column. Only if the connection attempt fails for a compute node, an error message is displayed in this column for that node.



To view the number of storage and compute resources, look at the NetApp Hybrid Cloud Control (HCC) Dashboard. See [Monitor storage and compute resources with the HCC Dashboard](#).

### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Edit Baseboard Management Controller connection information

You can change Baseboard Management Controller (BMC) administrator credentials in NetApp Hybrid Cloud Control for each of your compute nodes. You might need to change credentials prior to upgrading BMC firmware or to resolve a **Hardware ID not available** or **Unable to Detect** error indicated in NetApp Hybrid Cloud Control.

### *What you'll need*

Cluster administrator permissions to change BMC credentials.



If you set BMC credentials during a health check, there can be a delay of up to 15 minutes before the change is reflected on the **Nodes** page.

### *Options*

Choose one of the following options to change BMC credentials:

- [Use NetApp Hybrid Cloud Control to edit BMC information](#)
- [Use the REST API to edit BMC information](#)

## Use NetApp Hybrid Cloud Control to edit BMC information

You can edit the stored BMC credentials using the NetApp Hybrid Cloud Control Dashboard.

### Steps

1. Open a web browser and browse to the IP address of the management node. For example:

```
https://[management node IP address]
```

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI storage cluster administrator credentials.
3. In the left navigation blue box, select the NetApp HCI installation.

The NetApp Hybrid Cloud Control Dashboard appears.

4. In the left navigation, click **Nodes**.
5. To view compute inventory information, click **Compute**.

A list of your compute nodes appears. The **BMC Connection Status** column shows the result of BMC connection attempts for each compute node. If the connection attempt fails for a compute node, an error message is displayed in this column for that node.

6. To add or edit the stored BMC credentials for a compute node with BMC connection errors, click **Edit connection settings** in the error message text.
7. In the dialog that appears, add the correct administrator user name and password for the BMC of this compute node.
8. Click **Save**.
9. Repeat steps 6 through 8 for any compute node that has missing or incorrect stored BMC credentials.



Updating BMC information refreshes the inventory and ensures that management node services are aware of all hardware parameters needed to complete the upgrade.

## Use the REST API to edit BMC information

You can edit the stored BMC credentials using the NetApp Hybrid Cloud Control REST API.

### Steps

1. Locate the compute node hardware tag and BMC information:
  - a. Open the inventory service REST API UI on the management node:

```
https://[management node IP]/inventory/1/
```

- b. Click **Authorize** and complete the following:
  - i. Enter the cluster user name and password.
  - ii. Enter the client ID as `mnode-client`.
  - iii. Click **Authorize** to begin a session.
  - iv. Close the authorization window.
- c. From the REST API UI, click **GET /installations**.
- d. Click **Try it out**.
- e. Click **Execute**.
- f. From the response, copy the installation asset ID (`id`).
- g. From the REST API UI, click **GET /installations/{id}**.
- h. Click **Try it out**.
  - i. Paste the installation asset ID into the `id` field.
  - j. Click **Execute**.
- k. From the response, copy and save the node asset id (`id`), BMC IP address (`bmcAddress`), and node serial number (`chassisSerialNumber`) for use in a later step.

```
"nodes": [  
  {  
    "bmcDetails": {  
      "bmcAddress": "10.117.1.111",  
      "credentialsAvailable": false,  
      "credentialsValidated": false  
    },  
    "chassisSerialNumber": "221111019323",  
    "chassisSlot": "C",  
    "hardwareId": null,  
    "hardwareTag": "00000000-0000-0000-0000-ac1f6ab4ecf6",  
    "id": "8cd91e3c-1b1e-1111-b00a-4c9c4900b000",  
  },  
]
```

2. Open the hardware service REST API UI on the management node:

```
https://[management node IP]/hardware/2/
```

3. Click **Authorize** and complete the following:
  - a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client` if the value is not already populated.
  - c. Click **Authorize** to begin a session.

- d. Close the window.
4. Click **PUT /nodes/{hardware\_id}**.
5. Click **Try it out**.
6. Enter the node asset id that you saved earlier in the **hardware\_id** parameter.
7. Enter the following information in the payload:

Parameter	Description
<b>assetId</b>	The installation asset id ( <b>id</b> ) that you saved in step 1(f).
<b>bmcIp</b>	The BMC IP address ( <b>bmcAddress</b> ) that you saved in step 1(k).
<b>bmcPassword</b>	An updated password to log into the BMC.
<b>bmcUsername</b>	An updated user name to log into the BMC.
<b>serialNumber</b>	The chassis serial number of the hardware.

Example payload:

```
{
  "assetId": "7bb41e3c-2e9c-2151-b00a-8a9b49c0b0fe",
  "bmcIp": "10.117.1.111",
  "bmcPassword": "mypassword1",
  "bmcUsername": "admin1",
  "serialNumber": "221111019323"
}
```

8. Click **Execute** to update BMC credentials.
- A successful result returns a response similar to the following:

```
{
  "credentialid": "33333333-cccc-3333-cccc-333333333333",
  "host_name": "hci-host",
  "id": "8cd91e3c-1b1e-1111-b00a-4c9c4900b000",
  "ip": "1.1.1.1",
  "parent": "abcd01y3-ab30-1ccc-11ee-11f123zx7d1b",
  "type": "BMC"
}
```

## Find more information

- [Known issues and workarounds for compute node upgrades](#)

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Monitor volumes on your storage cluster

The SolidFire system provisions storage using volumes. Volumes are block devices accessed over the network by iSCSI or Fibre Channel clients. You can monitor details about access groups, accounts, initiators, used capacity, Snapshot data protection status, number of iSCSI sessions, and the Quality of Service (QoS) policy associated with the volume.

You can also see details on active and deleted volumes.

With this view, you might first want to monitor the Used capacity column.

You can access this information only if you have NetApp Hybrid Cloud Control (HCC) administrative privileges.

### *Steps*

1. Open a web browser and browse to the IP address of the management node. For example:

```
https://[management node IP address]
```

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI storage cluster administrator credentials.
3. In the left navigation blue box, select the NetApp HCI installation.

The Hybrid Cloud Control Dashboard appears.

4. In the left navigation, select the cluster and select **Storage > Volumes**.

The Volumes page Overview tab appears.

OVERVIEW ACCESS GROUPS ACCOUNTS INITIATORS QOS POLICIES

VOLUMES

Overview

Active Deleted

5. On the Volumes page, use the following options:



- Filter the results by clicking the **Filter** icon.
  - Hide or show columns by clicking the **Hide/Show** icon.
  - Refresh data by clicking the **Refresh** icon.
  - Download a CSV file by clicking on the **Download** icon.
6. Monitor the Used capacity column. If Warning, Error, or Critical thresholds are reached, the color represents the used capacity status:
- Warning - Yellow
  - Error - Orange
  - Critical - Red
7. From the Volumes view, click the tabs to see additional details about the volumes:
- Access Groups:** You can see the volume access groups that are mapped from initiators to a collection of volumes for secured access.

See information about [access groups](#) in the *NetApp Element User Guide*.

- Accounts:** You can see the user accounts, which enable clients to connect to volumes on a node.



When you create a volume, it is assigned to a specific user account.

See information about [user accounts](#) in the *NetApp Element User Guide*.

- c. **Initiators:** You can see the iSCSI initiator IQN or Fibre Channel WWPNs for the volume. Each IQN added to an access group can access each volume in the group without requiring CHAP authentication. Each WWPN added to an access group enables Fibre Channel network access to the volumes in the access group.

See information about [access groups, initiators, and CHAP authentication methods](#) in the *NetApp Element User Guide*.

- d. **QoS Policies:** You can see the QoS policy applied to the volume. A QoS policy applies standardized settings for minimum IOPS, maximum IOPS, and burst IOPS to multiple volumes.

See information about [Quality of Service policies](#) in the *NetApp Element User Guide*.

### Find more information

- [NetApp SolidFire and Element Documentation Center](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Monitor performance, capacity, and cluster health with SolidFire Active IQ

By using SolidFire Active IQ, you can monitor the events, performance, and capacity of your clusters. You can access SolidFire Active IQ from the NetApp Hybrid Control Dashboard.

### Before you begin

- You must have a NetApp Support account to take advantage of this service.
- You must have authorization to use management node REST APIs.
- You have deployed a management node running version 12.0 or later.
- Your cluster version is running NetApp Element software 12.0 or later.
- You have Internet access. The Active IQ collector service cannot be used from dark sites.

### About this task

You can obtain continually updated historical views of cluster-wide statistics. You can set up notifications to alert you about specified events, thresholds, or metrics on a cluster so that they can be addressed quickly.

As part of your normal support contract, NetApp Support monitors this data and alerts you to potential system issues.

## Steps

1. Open a web browser and browse to the IP address of the management node. For example:

```
https://[management node IP address]
```

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI storage cluster administrator credentials.
3. From the Dashboard, click the menu on the upper right.
4. Select **View Active IQ**.

The [SolidFire Active IQ Dashboard](#) appears.

5. To learn about SolidFire Active IQ, from the Dashboard, click the menu icon on the upper right and click **Documentation**.
6. From the SolidFire Active IQ interface, verify that the NetApp HCI compute and storage nodes are reporting telemetry correctly to Active IQ:
  - a. If you have more than one NetApp HCI installation, click **Select a Cluster** and choose the cluster from the list.
  - b. In the left navigation pane, click **Nodes**.
7. If a node or nodes are missing from the list, contact NetApp Support.



To view the number of storage and compute resources, look at the Hybrid Cloud Control (HCC) Dashboard. See [Monitor storage and compute resources with the HCC Dashboard](#).

## Find more information

- [NetApp SolidFire Active IQ Documentation](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Collect logs for troubleshooting

If you have trouble with your NetApp HCI or SolidFire all-flash storage installation, you can collect logs to send to NetApp Support to help with diagnosis. You can either use NetApp Hybrid Cloud Control or the REST API to collect logs on NetApp HCI or Element systems.

### *What you'll need*

- Ensure that your storage cluster version is running NetApp Element software 11.3 or later.

- Ensure that you have deployed a management node running version 11.3 or later.

### *Log collection options*

Choose one of the following options:

- [Use NetApp Hybrid Cloud Control to collect logs](#)
- [Use the REST API to collect logs](#)

### **Use NetApp Hybrid Cloud Control to collect logs**

You can access the log collection area from the NetApp Hybrid Cloud Control Dashboard.

#### *Steps*

1. Open a web browser and browse to the IP address of the management node. For example:

```
https://[management node IP address]
```

2. Log in to NetApp Hybrid Cloud Control by providing the NetApp HCI or Element storage cluster administrator credentials.
3. From the Dashboard, click the menu on the upper right.
4. Select **Collect Logs**.

The **Collect Logs** page appears. If you have collected logs before, you can download the existing log package, or begin a new log collection.

5. Select a date range in the **Date Range** drop-down menu to specify what dates the logs should include.

If you specify a custom start date, you can select the date to begin the date range. Logs will be collected from that date up to the present time.

6. In the **Log Collection** section, select the types of log files the log package should include.

For storage and compute logs, you can expand the list of storage or compute nodes and select individual nodes to collect logs from (or all nodes in the list).

7. Click **Collect Logs** to start log collection.

Log collection runs in the background, and the page shows the progress.



Depending on the logs you collect, the progress bar might remain at a certain percentage for several minutes, or progress very slowly at some points.

8. Click **Download Logs** to download the log package.

The log package is in a compressed UNIX .tgz file format.

## Use the REST API to collect logs

You can use REST API to collect NetApp HCI or Element logs.

### Steps

1. Locate the storage cluster ID:

a. Open the management node REST API UI on the management node:

```
https://[management node IP]/logs/1/
```

b. Click **Authorize** and complete the following:

i. Enter the cluster user name and password.

ii. Enter the client ID as `mnode-client` if the value is not already populated.

iii. Click **Authorize** to begin a session.

2. Collect logs from NetApp HCI or Element:

a. Click **POST /bundle**.

b. Click **Try it out**.

c. Change the values of the following parameters in the **Request body** field depending on which type of logs you need to collect and for what time range:

Parameter	Type	Description
<code>modifiedSince</code>	Date string	Only include logs modified after this date and time. For example, the value "2020-07-14T20:19:00.000Z" defines a start date of July 14, 2020 at 20:19 UTC.
<code>computeLogs</code>	Boolean	Set this parameter to <code>true</code> to include compute node logs.

Parameter	Type	Description
<code>computeIds</code>	UUID array	If <code>computeLogs</code> is set to <code>true</code> , populate this parameter with the management node asset IDs of compute nodes to limit log collection to those specific compute nodes. Use the GET <a href="https://[management node IP]/logs/1/bundle/options">https://[management node IP]/logs/1/bundle/options</a> endpoint to see all possible node IDs you can use.
<code>mnodeLogs</code>	Boolean	Set this parameter to <code>true</code> to include management node logs.
<code>storageCrashDumps</code>	Boolean	Set this parameter to <code>true</code> to include storage node crash debug logs.
<code>storageLogs</code>	Boolean	Set this parameter to <code>true</code> to include storage node logs.
<code>storageNodeIds</code>	UUID array	If <code>storageLogs</code> is set to <code>true</code> , populate this parameter with the storage cluster node IDs to limit log collection to those specific storage nodes. Use the GET <a href="https://[management node IP]/logs/1/bundle/options">https://[management node IP]/logs/1/bundle/options</a> endpoint to see all possible node IDs you can use.

d. Click **Execute** to begin log collection.

The response should return a response similar to the following:

```
{
  "_links": {
    "self": "https://10.1.1.5/logs/1/bundle"
  },
  "taskId": "4157881b-z889-45ce-adb4-92b1843c53ee",
  "taskLink": "https://10.1.1.5/logs/1/bundle"
}
```

3. Check on the status of the log collection task:

a. Click **GET /bundle**.

- b. Click **Try it out**.
- c. Click **Execute** to return a status of the collection task.
- d. Scroll to the bottom of the response body.

You should see a `percentComplete` attribute detailing the progress of the collection. If the collection is complete, the `downloadLink` attribute contains the full download link including the file name of the log package.

- e. Copy the file name at the end of the `downloadLink` attribute.

#### 4. Download the collected log package:

- a. Click **GET /bundle/{filename}**.
- b. Click **Try it out**.
- c. Paste the file name you copied earlier into the `filename` parameter text field.
- d. Click **Execute**.

After execution, a download link appears in the response body area.

- e. Click **Download file** and save the resulting file to your computer.

The log package is in a compressed UNIX .tgz file format.

### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Work with the management node

### Management node overview

You can use the management node (mNode) to upgrade system services, manage cluster assets and settings, run system tests and utilities, configure Active IQ for system monitoring, and enable NetApp Support access for troubleshooting.

For clusters running Element software version 11.3 or later, you can work with the management node by using one of two interfaces:

- With the management node UI ([https:// \[mNode IP\]:442](https:// [mNode IP]:442)), you can make changes to network and cluster settings, run system tests, or use system utilities.
- With the built-in REST API UI ([https://\[mNode IP\]/mnode](https://[mNode IP]/mnode)), you can run or understand APIs relating to the management node services, including proxy server configuration, service level updates, or

asset management.

Install or recover a management node:

- [Install a management node](#)
- [Configure a storage Network Interface Controller \(NIC\)](#)
- [Recover a management node](#)

Access the management node:

- [Access the management node \(UI or REST API\)](#)

Tasks you can perform with the management node UI:

- [Configure alert monitoring on NetApp HCI](#)
- [Modify and test the management node network, cluster, and system settings](#)
- [Run system utilities from the management node](#)

Tasks you can perform with the management node REST APIs:

- [Get authorization to use REST APIs](#)
- [Enable Active IQ and NetApp HCI monitoring](#)
- [Add compute and controller assets to the management node](#)
- [Manage storage cluster assets](#)
- [View or edit existing controller assets](#)
- [Configure a proxy server for the management node](#)
- [Use the REST API to collect NetApp HCI logs](#)

Enable remote NetApp Support connections to help you troubleshoot:

- [Enable remote NetApp Support connections](#)

### **Find more information**

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## **Install or recover a management node**

### **Install a management node**

You can manually install the management node for your cluster running NetApp Element software using the appropriate image for your configuration.

This manual process is intended for SolidFire all-flash storage administrators and NetApp HCI administrators who are not using the NetApp Deployment Engine for management node installation.

### What you'll need

- Your cluster version is running NetApp Element software 11.3 or later.
- Your installation uses IPv4. The management node 11.3 does not support IPv6.



If you need to IPv6 support, you can use the management node 11.1.

- You have permission to download software from the NetApp Support Site.
- You have identified the management node image type that is correct for your platform:

Platform	Installation image type
Microsoft Hyper-V	.iso
KVM	.iso
VMware vSphere	.iso, .ova
Citrix XenServer	.iso
OpenStack	.iso

### About this task

The Element 12.2 management node is an optional upgrade. It is not required for existing deployments.

Prior to following this procedure, you should have an understanding of [persistent volumes](#) and whether or not you want to use them. Persistent volumes are optional but recommended for management node configuration data recovery in the event of a VM loss.

### Steps

1. [Download ISO or OVA and deploy the VM](#)
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5. (NetApp HCI only) [Configure compute node assets](#)

### Download ISO or OVA and deploy the VM

1. Download the OVA or ISO for your installation from the NetApp Support Site:

Element software: <https://mysupport.netapp.com/site/products/all/details/element-software/downloads-tab>

NetApp HCI: <https://mysupport.netapp.com/site/products/all/details/netapp-hci/downloads-tab>



- a. Click **Download Latest Release** and accept the EULA.
  - b. Select the management node image you want to download.
2. If you downloaded the OVA, follow these steps:
- a. Deploy the OVA.
  - b. If your storage cluster is on a separate subnet from your management node (eth0) and you want to use persistent volumes, add a second network interface controller (NIC) to the VM on the storage subnet (for example, eth1) or ensure that the management network can route to the storage network.
3. If you downloaded the ISO, follow these steps:
- a. Create a new 64-bit virtual machine from your hypervisor with the following configuration:



For Element 12.2 configurations, the increased provisioned memory capacity accommodates management services upgrades and is not used in normal operation.

- 400GB virtual disk, thin provisioned
- One virtual network interface with internet access and access to the storage MVIP.
- (Optional for SolidFire all-flash storage) One virtual network interface with management network access to the storage cluster. If your storage cluster is on a separate subnet from your management node (eth0) and you want to use persistent volumes, add a second network interface controller (NIC) to the VM on the storage subnet (eth1) or ensure that the management network can route to the storage network.



Do not power on the virtual machine prior to the step indicating to do so later in this procedure.

- b. Attach the ISO to the virtual machine and boot to the .iso install image.



Installing a management node using the image might result in 30-second delay before the splash screen appears.

4. Power on the virtual machine for the management node after the installation completes.

#### Create the management node admin and configure the network

1. Using the terminal user interface (TUI), create a management node admin user.



To move through the menu options, press the Up or Down arrow keys. To move through the buttons, press Tab. To move from the buttons to the fields, press Tab. To navigate between fields, press the Up or Down arrow keys.

## 2. Configure the management node network (eth0).



If you need an additional NIC to isolate storage traffic, see instructions on configuring another NIC: [Configure a storage Network Interface Controller \(NIC\)](#).

### Configure the management node

1. SSH into the management node.
2. Using SSH, run the following command to gain root privileges. Enter your password when prompted:

```
sudo su
```

3. Ensure time is synced between the management node and the storage cluster using NTP:
  - a. Edit the `/etc/ntp.conf` file.
  - b. Change the default time server(s) to the same NTP server used on the storage cluster.
  - c. In vSphere, verify that the **Synchronize guest time with host** box is un-checked in the VM options.



Do not enable this option if you make future changes to the VM.

4. Configure and run the management node setup command:



You will be prompted to enter passwords in a secure prompt. If your cluster is behind a proxy server, you must configure the proxy settings so you can reach a public network.

```
/sf/packages/mnode/setup-mnode --mnode_admin_user [username] --storage_mvip [mvip]  
--storage_username [username] --telemetry_active [true]
```

- a. Replace the value in [ ] brackets (including the brackets) for each of the following required parameters:



The abbreviated form of the command name is in parentheses ( ) and can be substituted for the full name.

- **--mnode\_admin\_user (-mu) [username]:** The username for the management node administrator account. This is likely to be the username for the user account you used to log into the management node.
- **--storage\_mvip (-sm) [MVIP address]:** The management virtual IP address (MVIP) of the storage cluster running Element software.
- **--storage\_username (-su) [username]:** The storage cluster administrator username for the cluster specified by the **--storage\_mvip** parameter.
- **--telemetry\_active (-t) [true]:** Retain the value true that enables data collection for analytics by Active IQ.

b. (Optional): Add Active IQ endpoint parameters to the command:

- **--remote\_host (-rh) [AIQ\_endpoint]:** The endpoint where Active IQ telemetry data is sent to be processed. If the parameter is not included, the default endpoint is used.

c. (Recommended): Add the following persistent volume parameters. Do not modify or delete the account and volumes created for persistent volumes functionality or a loss in management capability will result.

- **--use\_persistent\_volumes (-pv) [true/false, default: false]:** Enable or disable persistent volumes. Enter the value true to enable persistent volumes functionality.
- **--persistent\_volumes\_account (-pva) [account\_name]:** If **--use\_persistent\_volumes** is set to true, use this parameter and enter the storage account name that will be used for persistent volumes.



Use a unique account name for persistent volumes that is different from any existing account name on the cluster. It is critically important to keep the account for persistent volumes separate from the rest of your environment.

- **--persistent\_volumes\_mvip (-pvm) [mvip]:** Enter the management virtual IP address (MVIP) of the storage cluster running Element software that will be used with persistent volumes. This is only required if multiple storage clusters are managed by the management node. If multiple clusters are not managed, the default cluster MVIP will be used.

d. Configure a proxy server:

- **--use\_proxy (-up) [true/false, default: false]:** Enable or disable the use of the proxy. This parameter is required to configure a proxy server.
- **--proxy\_hostname\_or\_ip (-pi) [host]:** The proxy hostname or IP. This is required if you want to use a proxy. If you specify this, you will be prompted to input **--proxy\_port**.
- **--proxy\_username (-pu) [username]:** The proxy username. This parameter is optional.
- **--proxy\_password (-pp) [password]:** The proxy password. This parameter is optional.
- **--proxy\_port (-pq) [port, default: 0]:** The proxy port. If you specify this, you will be prompted to input the proxy host name or IP (**--proxy\_hostname\_or\_ip**).

- **--proxy\_ssh\_port (-ps) [port, default: 443]**: The SSH proxy port. This defaults to port 443.
- e. (Optional) Use parameter help if you need additional information about each parameter:
  - **--help (-h)**: Returns information about each parameter. Parameters are defined as required or optional based on initial deployment. Upgrade and redeployment parameter requirements might vary.
- f. Run the **setup-mnode** command.

## Configure controller assets

1. Locate the installation ID:
  - a. From a browser, log into the management node REST API UI:
  - b. Go to the storage MVIP and log in. This action causes the certificate to be accepted for the next step.
  - c. Open the inventory service REST API UI on the management node:

```
https://[management node IP]/inventory/1/
```

- d. Click **Authorize** and complete the following:
  - i. Enter the cluster user name and password.
  - ii. Enter the client ID as **mnode-client**.
  - iii. Click **Authorize** to begin a session.
- e. From the REST API UI, click **GET /installations**.
- f. Click **Try it out**.
- g. Click **Execute**.
- h. From the code 200 response body, copy and save the **id** for the installation for use in a later step.

Your installation has a base asset configuration that was created during installation or upgrade.

2. (NetApp HCI only) Locate the hardware tag for your compute node in vSphere:
  - a. Select the host in the vSphere Web Client navigator.
  - b. Click the **Monitor** tab, and click **Hardware Health**.
  - c. The node BIOS manufacturer and model number are listed. Copy and save the value for **tag** for use in a later step.
3. Add a vCenter controller asset for NetApp HCI monitoring (NetApp HCI installations only) and Hybrid Cloud Control (for all installations) to the management node known assets:
  - a. Access the mnode service API UI on the management node by entering the management node IP address followed by **/mnode**:

```
https://[management node IP]/mnode
```

- b. Click **Authorize** or any lock icon and complete the following:
  - i. Enter the cluster user name and password.
  - ii. Enter the client ID as `mnode-client`.
  - iii. Click **Authorize** to begin a session.
  - iv. Close the window.
- c. Click **POST /assets/{asset\_id}/controllers** to add a controller sub-asset.
- d. Click **Try it out**.
- e. Enter the parent base asset ID you copied to your clipboard in the **asset\_id** field.
- f. Enter the required payload values with type `vCenter` and vCenter credentials.
- g. Click **Execute**.

#### (NetApp HCI only) Configure compute node assets

1. (For NetApp HCI only) Add a compute node asset to the management node known assets:
  - a. Click **POST /assets/{asset\_id}/compute-nodes** to add a compute node sub-asset with credentials for the compute node asset.
  - b. Click **Try it out**.
  - c. Enter the parent base asset ID you copied to your clipboard in the **asset\_id** field.
  - d. In the payload, enter the required payload values as defined in the Model tab. Enter `ESXi Host` as `type` and enter the hardware tag you saved during a previous step for `hardware_tag`.
  - e. Click **Execute**.

#### Find more Information

- [Persistent volumes](#)
- [Add an asset to the management node](#)
- [Configure a storage NIC](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

#### Configure a storage Network Interface Controller (NIC)

If you are using an additional NIC for storage, you can SSH in to the management node or use the vCenter console and run a curl command to set up that network interface.

### Before you begin

- You know your eth0 IP address.
- Your cluster version is running NetApp Element software 11.3 or later.
- You have deployed a management node 11.3 or later.

### Steps

1. Open an SSH or vCenter console.
2. Replace the values in the following command template and run the command:



Values are represented by `$` for each of the required parameters for your new storage network interface. The `cluster` object in the following template is required and can be used for management node host name renaming. The `--insecure` or `-k` options should not be used in production environments.

```
curl -u $mnode_user_name:$mnode_password --insecure -X POST \
https://$mnode_IP:442/json-rpc/10.0 \
-H 'Content-Type: application/json' \
-H 'cache-control: no-cache' \
-d ' {
    "params": {
        "network": {
            "$eth1": {
                "#default" : false,
                "address" : "$storage_IP",
                "auto" : true,
                "family" : "inet",
                "method" : "static",
                "mtu" : "9000",
                "netmask" : "$subnet_mask",
                "status" : "Up"
            }
        },
        "cluster": {
            "name": "$mnode_host_name"
        }
    },
    "method": "SetConfig"
}
```

### Find more Information

- [Add an asset to the management node](#)

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Recover a management node

You can manually recover and redeploy the management node for your cluster running NetApp Element software if your previous management node used persistent volumes.

You can deploy a new OVA and run a redeploy script to pull configuration data from a previously installed management node running version 11.3 and later.

### *What you'll need*

- Your previous management node was running NetApp Element software version 11.3 or later with [persistent volumes](#) functionality engaged.
- You know the MVIP and SVIP of the cluster containing the persistent volumes.
- Your cluster version is running NetApp Element software 11.3 or later.
- Your installation uses IPv4. The management node 11.3 does not support IPv6.
- You have permission to download software from the NetApp Support Site.
- You have identified the management node image type that is correct for your platform:

Platform	Installation image type
Microsoft Hyper-V	.iso
KVM	.iso
VMware vSphere	.iso, .ova
Citrix XenServer	.iso
OpenStack	.iso

### *Steps*

1. [Download ISO or OVA and deploy the VM](#)
2. [Configure the network](#)
3. [Configure the management node](#)

## Download ISO or OVA and deploy the VM

1. Download the OVA or ISO for your installation from the NetApp Support Site:

Element software: <https://mysupport.netapp.com/site/products/all/details/element-software/downloads-tab>

NetApp HCI: <https://mysupport.netapp.com/site/products/all/details/netapp-hci/downloads-tab>

- a. Click **Download Latest Release** and accept the EULA.
  - b. Select the management node image you want to download.
2. If you downloaded the OVA, follow these steps:
  - a. Deploy the OVA.
  - b. If your storage cluster is on a separate subnet from your management node (eth0) and you want to use persistent volumes, add a second network interface controller (NIC) to the VM on the storage subnet (for example, eth1) or ensure that the management network can route to the storage network.
3. If you downloaded the ISO, follow these steps:
  - a. Create a new 64-bit virtual machine from your hypervisor with the following configuration:
    - Six virtual CPUs
    - 24GB RAM
    - 400GB virtual disk, thin provisioned
    - One virtual network interface with internet access and access to the storage MVIP.
    - (Optional for SolidFire all-flash storage) One virtual network interface with management network access to the storage cluster. If your storage cluster is on a separate subnet from your management node (eth0) and you want to use persistent volumes, add a second network interface controller (NIC) to the VM on the storage subnet (eth1) or ensure that the management network can route to the storage network.



Do not power on the virtual machine prior to the step indicating to do so later in this procedure.

- b. Attach the ISO to the virtual machine and boot to the .iso install image.



Installing a management node using the image might result in 30-second delay before the splash screen appears.

4. Power on the virtual machine for the management node after the installation completes.

## Configure the network

1. Using the terminal user interface (TUI), create a management node admin user.



To move through the menu options, press the Up or Down arrow keys. To move through the buttons, press Tab. To move from the buttons to the fields, press Tab. To navigate between fields, press the Up or Down arrow keys.

2. Configure the management node network (eth0).





If you need an additional NIC to isolate storage traffic, see instructions on configuring another NIC: [Configure a storage Network Interface Controller \(NIC\)](#).

### Configure the management node

1. Log in to the management node using SSH or the console provided by your hypervisor.
2. Run the following command to gain root privileges. Enter your password when prompted:

```
sudo su
```

3. Ensure time is synced between the management node and the storage cluster using NTP:
  - a. Edit the `/etc/ntp.conf` file.
  - b. Change the default time server(s) to the same NTP server used on the storage cluster.
  - c. In vSphere, verify that the **Synchronize guest time with host** box is un-checked in the VM options.



Do not enable this option if you make future changes to the VM.

4. Create a temporary destination directory for the management services bundle contents:

```
mkdir -p /sf/etc/mnode/mnode-archive
```

5. Download the management services bundle (version 2.15.28 or later) that was previously installed on the existing management node and save it in the `/sf/etc/mnode/` directory.
6. Extract the downloaded bundle using the following command, replacing the value in [ ] brackets (including the brackets) with the name of the bundle file:

```
tar -C /sf/etc/mnode -xvf /sf/etc/mnode/[management services bundle file]
```

7. Extract the resulting file to the `/sf/etc/mnode-archive` directory:

```
tar -C /sf/etc/mnode/mnode-archive -xvf /sf/etc/mnode/services_deploy_bundle.tar.gz
```

8. Create a configuration file for accounts and volumes:

```
echo '{"trident": true, "mvip": "[mvip IP address]", "account_name": "[persistent volume account name]"}' | sudo tee /sf/etc/mnode/mnode-archive/management-services-metadata.json
```

a. Replace the value in [ ] brackets (including the brackets) for each of the following required parameters:

- **[mvip IP address]**: The management virtual IP address of the storage cluster.
- **[persistent volume account name]**: The name of the account associated with all persistent volumes in this storage cluster.

9. Configure and run the management node redeploy command to connect to persistent volumes hosted on the cluster and start services with previous management node configuration data:



You will be prompted to enter passwords in a secure prompt. If your cluster is behind a proxy server, you must configure the proxy settings so you can reach a public network.

```
/sf/packages/mnode/redeploy-mnode --mnode_admin_user [username]
```

a. Replace the value in [ ] brackets (including the brackets) with the user name for the management node administrator account. This is likely to be the username for the user account you used to log into the management node.



You can add the user name or allow the script to prompt you for the information.

- b. Run the **redeploy-mnode** command. The script displays a success message when the redeployment is complete.
- c. If you access Element or NetApp HCI web interfaces (such as the management node or NetApp Hybrid Cloud Control) using the Fully Qualified Domain Name (FQDN) of the system, [reconfigure authentication for the management node](#).

#### Find more Information

- [Persistent volumes](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Access the management node

Beginning with NetApp Element software version 11.3, the management node contains two UIs: a UI for managing REST-based services and a per-node UI for managing network and cluster settings and operating system tests and utilities.

For clusters running Element software version 11.3 or later, you can make use one of two interfaces:

- By using the management node UI ([https:// \[mNode IP\]:442](https://[mNode IP]:442)), you can make changes to network and cluster settings, run system tests, or use system utilities.
- By using the built-in REST API UI ([https://\[mNode IP\]/mnode](https://[mNode IP]/mnode)), you can run or understand APIs relating to the management node services, including proxy server configuration, service level updates, or asset management.

### **Access the management node per-node UI**

From the per-node UI, you can access network and cluster settings and utilize system tests and utilities.

#### *Steps*

1. Access the per-node UI for the management node by entering the management node IP address followed by :442

```
https://[IP address]:442
```

### Network Settings - Management

Method : static

Link Speed : 1000

IPv4 Address : 10.117.148.201

IPv4 Subnet Mask : 255.255.255.0

IPv4 Gateway Address : 10.117.151.254

IPv6 Address :

IPv6 Gateway Address :

MTU : 1500

DNS Servers : 10.117.20.40, 10.116.133.40

Search Domains : den.solidfire.net, one.den.solidfire

Status : UpAndRunning

#### Routes

[+](#) Add

[Reset Changes](#)

[Save Changes](#)

2. Enter the management node user name and password when prompted.

## Access the management node REST API UI

From the REST API UI, you can access a menu of service-related APIs that control management services on the management node.

### Steps

1. To access the REST API UI for management services, enter the management node IP address followed by `/mnode`:

```
https://[IP address]/mnode
```

# MANAGEMENT SERVICES API <sup>4.0</sup>

[ Base URL: /mnode ]  
<https://10.117.1.100/mnode/swagger.json>

The configuration REST service for MANAGEMENT SERVICES

[NetApp - Website](#)

[NetApp Commercial Software License](#)

Authorize 

## logs Log service

GET /logs Get logs from the MNODE service(s)

## assets Asset service

POST /assets Add a new asset

GET /assets Get all assets

GET /assets/compute-nodes Get all compute nodes

GET /assets/compute-nodes/{compute\_node\_id} Get a specific compute node by ID

GET /assets/controllers Get all controllers

GET /assets/controllers/{controller\_id} Get a specific controller by ID

GET /assets/storage-clusters Get all storage clusters

GET /assets/storage-clusters/{storage\_cluster\_id} Get a specific storage cluster by ID

PUT /assets/{asset\_id} Modify an asset with a specific ID

DELETE /assets/{asset\_id} Delete an asset with a specific ID

GET /assets/{asset\_id} Get an asset by it's ID

POST /assets/{asset\_id}/compute-nodes Add a compute asset

GET /assets/{asset\_id}/compute-nodes Get compute assets

PUT /assets/{asset\_id}/compute-nodes/{compute\_id} Update a specific compute node asset

DELETE /assets/{asset\_id}/compute-nodes/{compute\_id} Delete a specific compute node asset

2. Click **Authorize** or any lock icon and enter cluster admin credentials for permissions to use APIs.

## Find more Information

- [Enable the Active IQ collector service for SolidFire all-flash storage](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Work with the management node UI

### Management node UI overview

With the management node UI ([https://\[management node IP\]:442](https://[management node IP]:442)), you can make changes to network and cluster settings, run system tests, or use system utilities.

Tasks you can perform with the management node UI:

- [Configure alert monitoring on NetApp HCI](#)
- [Modify and test the management node network, cluster, and system settings](#)
- [Run system utilities from the management node](#)

**Find more information**

- [Access the management node](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

**Configure alert monitoring on NetApp HCI**

You can configure settings to monitor alerts on your NetApp HCI system.

NetApp HCI alert monitoring forwards NetApp HCI storage cluster system alerts to vCenter Server, enabling you to view all alerts for NetApp HCI from the vSphere Web Client interface.





These tools are not configured or used for storage-only clusters, such as SolidFire all-flash storage. Running the tools for these clusters results in the following 405 error, which is expected given the configuration: `webUIParseError : Invalid response from server. 405`

1. Open the per-node management node UI (`https://[IP address]:442`).
2. Click the **Alert Monitor** tab.
3. Configure the alert monitoring options.

**Alert monitoring options**

options	Description
Run Alert Monitor Tests	<p>Runs the monitor system tests to check for the following:</p> <ul style="list-style-type: none"><li>• NetApp HCI and VMware vCenter connectivity</li><li>• Pairing of NetApp HCI and VMware vCenter through datastore information supplied by the QoSSIOC service</li><li>• Current NetApp HCI alarm and vCenter alarm lists</li></ul>

options	Description
Collect Alerts	Enables or disables the forwarding of NetApp HCI storage alarms to vCenter. You can select the target storage cluster from the drop-down list. The default setting for this option is <b>Enabled</b> .
Collect Best Practice Alerts	Enables or disables the forwarding of NetApp HCI storage Best Practice alerts to vCenter. Best Practice alerts are faults that are triggered by a sub-optimal system configuration. The default setting for this option is <b>Disabled</b> . When disabled, NetApp HCI storage Best Practice alerts do not appear in vCenter.
Send Support Data To AIQ	<p>Controls the flow of support and monitoring data from VMware vCenter to NetApp SolidFire Active IQ.</p> <p>Options are the following:</p> <ul style="list-style-type: none"> <li>• <b>Enabled:</b> All vCenter alarms, NetApp HCI storage alarms, and support data are sent to NetApp SolidFire Active IQ. This enables NetApp to proactively support and monitor the NetApp HCI installation, so that possible problems can be detected and resolved before affecting the system.</li> <li>• <b>Disabled:</b> No vCenter alarms, NetApp HCI storage alarms, or support data are sent to NetApp SolidFire Active IQ.</li> </ul> <div>  <p>If you turned off the <b>Send data to AIQ</b> option using NetApp Deployment Engine, you need to <a href="#">enable telemetry</a> again using the management node REST API to configure the service from this page.</p> </div>

options	Description
Send Compute Node Data To AIQ	<p>Controls the flow of support and monitoring data from the compute nodes to NetApp SolidFire Active IQ.</p> <p>Options are the following:</p> <ul style="list-style-type: none"> <li>• Enabled: Support and monitoring data about the compute nodes is transmitted to NetApp SolidFire Active IQ to enable proactive support for the compute node hardware.</li> <li>• Disabled: Support and monitoring data about the compute nodes is not transmitted to NetApp SolidFire Active IQ.</li> </ul> <div>  <p>If you turned off the <b>Send data to AIQ</b> option using NetApp Deployment Engine, you need to <a href="#">enable telemetry</a> again using the management node REST API to configure the service from this page.</p> </div>

#### Find more Information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Work with the management node REST API

### Management node REST API UI overview

By using the built-in REST API UI ([https://\[mNode IP\]/mnode](https://[mNode IP]/mnode)), you can run or understand APIs relating to the management node services, including proxy server configuration, service level updates, or asset management.

Tasks you can perform with REST APIs:

- [Get authorization to use REST APIs](#)
- [Enable Active IQ and NetApp HCI monitoring](#)
- [Add compute and controller assets to the management node](#)
- [Manage storage cluster assets](#)



- [View or edit existing controller assets](#)
- [Configure a proxy server for the management node](#)
- [Use the REST API to collect NetApp HCI logs](#)

#### Find more information

- [Access the management node](#)
- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

#### Get authorization to use REST APIs

You must authorize before you can use APIs for management services in the REST API UI. You do this by obtaining an access token.

To obtain a token, you provide cluster admin credentials and a client ID. Each token lasts approximately ten minutes. After a token expires, you can authorize again for a new access token.

Authorization functionality is set up for you during management node installation and deployment. The token service is based on the storage cluster you defined during setup.

#### *Before you begin*

- Your cluster version should be running NetApp Element software 11.3 or later.
- You should have deployed a management node running version 11.3 or later.

#### *Steps*

1. Open the REST API UI on the management node:

```
https://[management node IP address]/mnode
```

2. Click **Authorize**.



Alternately, you can click on a lock icon next to any service API.

3. Complete the following:
  - a. Enter the cluster user name and password.
  - b. Select **Request body** from the Type drop-down list.
  - c. Enter the client ID as `mnode-client`.
  - d. Do not enter a value for the client secret.
  - e. Click **Authorize** to begin a session.



If the error message **Auth Error TypeError: Failed to fetch** is returned after you attempt to authorize, you might need to accept the SSL certificate for the MVIP of your cluster. Copy the IP in the Token URL, paste the IP into another browser tab, and authorize again.

The Available authorizations screen indicates **Authorized**.

4. Close the Available authorizations dialog box.



If you try to run a command after the token expires, a **401 Error: UNAUTHORIZED** message appears. If you see this, authorize again.

#### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

#### Configure a proxy server

If your cluster is behind a proxy server, you must configure the proxy settings so that you can reach a public network.

A proxy server is used for telemetry collectors and reverse tunnel connections. You can enable and configure a proxy server using the REST API UI if you did not already configure a proxy server during installation or upgrade. You can also modify existing proxy server settings or disable a proxy server.

The command to configure a proxy server updates and then returns the current proxy settings for the management node. The proxy settings are used by Active IQ, the NetApp HCI monitoring service that is deployed by the NetApp Deployment Engine, and other Element software utilities that are installed on the management node, including the reverse support tunnel for NetApp Support.

#### *Before you begin*

- You should know host and credential information for the proxy server you are configuring.
- Ensure that your cluster version is running NetApp Element software 11.3 or later.
- Ensure that you have deployed a management node running version 11.3 or later.

#### *Steps*

1. Access the REST API UI on the management node by entering the management node IP address followed by **/mnode**:

```
https://[management node IP]/mnode
```

2. Click **Authorize** or any lock icon and complete the following:

- a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.
3. Click **PUT /settings**.
  4. Click **Try it out**.
  5. To enable a proxy server, you must set `use_proxy` to true. Enter the IP or host name and proxy port destinations.

The proxy user name, proxy password, and SSH port are optional and should be omitted if not used.

```
{
  "proxy_ip_or_hostname": "[IP or name]",
  "use_proxy": [true/false],
  "proxy_username": "[username]",
  "proxy_password": "[password]",
  "proxy_port": [port value],
  "proxy_ssh_port": [port value: default is 443]
}
```

6. Click **Execute**.

#### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

#### Manage storage cluster assets

You can add new storage cluster assets to the management node, edit the stored credentials for known storage cluster assets, and delete storage cluster assets from the management node using the REST API.

#### *What you'll need*

- Ensure that your storage cluster version is running NetApp Element software 11.3 or later.
- Ensure that you have deployed a management node running version 11.3 or later.

#### *Storage cluster asset management options*

Choose one of the following options:

- [Retrieve the installation ID and cluster ID of a storage cluster asset](#)

- [Add a new storage cluster asset](#)
- [Edit the stored credentials for a storage cluster asset](#)
- [Delete a storage cluster asset](#)

### Retrieve the installation ID and cluster ID of a storage cluster asset

You can use the REST API get the installation ID and the ID of the storage cluster. You need the installation ID to add a new storage cluster asset, and the cluster ID to modify or delete a specific storage cluster asset.

#### Steps

1. Access the REST API UI for the inventory service by entering the management node IP address followed by `/inventory/1/`:

```
https://[management node IP]/inventory/1/
```

2. Click **Authorize** or any lock icon and complete the following:
  - a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.
3. Click **GET /installations**.
4. Click **Try it out**.
5. Click **Execute**.

The API returns a list of all known installations.

6. From the code 200 response body, save the value in the `id` field, which you can find in the list of installations. This is the installation ID. For example:

```
"installations": [  
  {  
    "id": "1234a678-12ab-35dc-7b4a-1234a5b6a7ba",  
    "name": "my-hci-installation",  
    "_links": {  
      "collection": "https://localhost/inventory/1/installations",  
      "self": "https://localhost/inventory/1/installations/1234a678-12ab-35dc-7b4a-1234a5b6a7ba"  
    }  
  }  
]
```

7. Access the REST API UI for the storage service by entering the management node IP address followed by `/storage/1/`:

```
https://[management node IP]/storage/1/
```

8. Click **Authorize** or any lock icon and complete the following:
  - a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.
9. Click **GET /clusters**.
10. Click **Try it out**.
11. Enter the installation ID you saved earlier into the `installationId` parameter.
12. Click **Execute**.

The API returns a list of all known storage clusters in this installation.

13. From the code 200 response body, find the correct storage cluster and save the value in the cluster's `storageId` field. This is the storage cluster ID.

#### Add a new storage cluster asset

You can use the REST API to add a new storage cluster asset to the management node inventory. When you add a new storage cluster asset, it is automatically registered with the management node.



Ensure you have followed the steps in [Retrieve the installation ID and cluster ID of a storage cluster asset](#) before continuing.

#### Steps

1. Access the REST API UI for the storage service by entering the management node IP address followed by `/storage/1/`:

```
https://[management node IP]/storage/1/
```

2. Click **Authorize** or any lock icon and complete the following:
  - a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.

3. Click **POST /clusters**.
4. Click **Try it out**.
5. Enter the new storage cluster's information in the following parameters in the **Request body** field:

Parameter	Type	Description
<code>installationId</code>	string	The installation in which to create the new storage cluster. Enter the installation ID you saved earlier into this parameter.
<code>mvip</code>	string	The IPv4 management virtual IP address (MVIP) of the storage cluster.
<code>userId</code>	string	The user ID used to communicate with the storage cluster (the user must have administrator privileges).
<code>password</code>	string	The password used to communicate with the storage cluster.

6. Click **Execute**.

The API returns an object containing information about the newly added storage cluster asset, such as the name, version, and IP address information.

#### Edit the stored credentials for a storage cluster asset

You can edit the stored credentials that the management node uses to log in to a storage cluster. The user you choose must have cluster admin access.



Ensure you have followed the steps in [Retrieve the installation ID and cluster ID of a storage cluster asset](#) before continuing.

#### Steps

1. Access the REST API UI for the storage service by entering the management node IP address followed by `/storage/1/`:

```
https://[management node IP]/storage/1/
```

2. Click **Authorize** or any lock icon and complete the following:

- a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.
3. Click **PUT /clusters/{storageId}**.
  4. Click **Try it out**.
  5. Paste the storage cluster ID you copied earlier into the `storageId` parameter.
  6. Change one or both of the following parameters in the **Request body** field:

Parameter	Type	Description
<code>userId</code>	string	The user ID used to communicate with the storage cluster (the user must have administrator privileges).
<code>password</code>	string	The password used to communicate with the storage cluster.

7. Click **Execute**.

#### Delete a storage cluster asset

You can delete a storage cluster asset if the storage cluster is no longer in service. When you remove a storage cluster asset, it is automatically unregistered from the management node.



Ensure you have followed the steps in [Retrieve the installation ID and cluster ID of a storage cluster asset](#) before continuing.

#### Steps

1. Access the REST API UI for the storage service by entering the management node IP address followed by `/storage/1/`:

```
https://[management node IP]/storage/1/
```

2. Click **Authorize** or any lock icon and complete the following:
  - a. Enter the cluster user name and password.
  - b. Enter the client ID as `mnode-client`.
  - c. Click **Authorize** to begin a session.
  - d. Close the window.

3. Click **DELETE** `/clusters/{storageId}`.
4. Click **Try it out**.
5. Enter the storage cluster ID you copied earlier in the `storageId` parameter.
6. Click **Execute**.

Upon success, the API returns an empty response.

#### Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

## Enable remote NetApp Support connections

If you require technical support for your NetApp Element software-based storage system, NetApp Support can connect remotely with your system if you enable remote access. To gain remote access, NetApp Support can open a reverse Secure Shell (SSH) connection to your environment.

#### About this task

You can open a TCP port for an SSH reverse tunnel connection with NetApp Support. This connection enables NetApp Support to log in to your management node. If your management node is behind a proxy server, the following TCP ports are required in the `sshd.config` file:

TCP port	Description	Connection direction
443	API calls/HTTPS for reverse port forwarding via open support tunnel to the web UI	Management node to storage nodes
22	SSH login access	Management node to storage nodes or from storage nodes to management node

#### Steps

- Log in to your management node and open a terminal session.
- At a prompt, enter the following:

```
rst -r sfsupport.solidfire.com -u element -p <port_number>
```

- To close the remote support tunnel, enter the following:

```
rst --killall
```



## Find more information

- [NetApp HCI Documentation Center](#)
- [NetApp HCI Resources Page](#)

# Power your NetApp HCI system off or on

## Powering your NetApp HCI system off or on

You can power off or power on your NetApp HCI system if you have a scheduled outage, need to perform hardware maintenance, or need to expand the system. Use the following tasks to power off or power on your NetApp HCI system as required.

You might need to power off your NetApp HCI system under a number of different circumstances, such as:

- Scheduled outages
- Chassis fan replacements
- Firmware upgrades
- Storage or compute resource expansion

The following is an overview of the tasks you need to complete to power off a NetApp HCI system:

- Power off all virtual machines except the VMware vCenter server (vCSA).
- Power off all ESXi servers except the one hosting the vCSA.
- Power off the vCSA.
- Power off the NetApp HCI storage system.

The following is an overview of the tasks you need to complete to power on a NetApp HCI system:

- Power on all physical storage nodes.
- Power on all physical compute nodes.
- Power on the vCSA.
- Verify the system and power on additional virtual machines.

## Find more information

- [Firmware and driver versions in NetApp HCI and NetApp Element software](#)

## Power off compute resources for a NetApp HCI system

To power off NetApp HCI compute resources, you need to power off individual

VMware ESXi hosts as well as the VMware vCenter Server Appliance in a certain order.

#### *Steps*

1. Log in to the vCenter instance controlling the NetApp HCI system and determine the ESXi machine hosting the vCenter Server Virtual Appliance (vCSA).
2. After you have determined the ESXi host running the vCSA, power down all other virtual machines other than the vCSA as follows:
  - a. Select a virtual machine.
  - b. Right-click and select **Power > Shut Down Guest OS**.
3. Power off all ESXi hosts that are not the ESXi host running the vCSA.
4. Power off the vCSA.

This will cause the vCenter session to end because the vCSA disconnects during the power-off process. All virtual machines should now be shut down with only one ESXi host powered on.

5. Log in to the running ESXi host.
6. Verify that all virtual machines on the host are powered off.
7. Shut down the ESXi host.

This disconnects any iSCSI sessions open to the NetApp HCI storage cluster.

#### **Find more information**

- [Firmware and driver versions in NetApp HCI and NetApp Element software](#)

### **Power off storage resources for a NetApp HCI system**

When you power off storage resources for NetApp HCI, you need to use the **Shutdown** Element API method to properly halt the storage nodes.

#### *Steps*

After you power off the compute resources, you use a web browser to shut down all the nodes of the NetApp HCI storage cluster.

1. Log in to the storage cluster and verify that you are connected to the correct MVIP.
2. Verify that the iSCSI session count is zero.
3. Navigate to **Cluster > Nodes > Active**, and record the node IDs for all of the active nodes in the cluster.
4. To power off the NetApp HCI storage cluster, open a web browser and use the following URL to invoke the power off and halt procedure, where **{MVIP}** is the management IP address of the

NetApp HCI storage system and the `nodes=[]` array includes the node IDs that you recorded in step 2. For example:

```
https://{MVIP}/json-rpc/1.0?method=Shutdown&nodes=[1,2,3,4]&option=halt
```

5. Enter the cluster administrator user name and password.
6. Validate that the API call returned successfully by verifying that all storage cluster nodes are included in the `successful` section of the API result.

You have successfully powered off all the NetApp HCI storage nodes.

### Find more information

- [Firmware and driver versions in NetApp HCI and NetApp Element software](#)

## Power on storage resources for a NetApp HCI system

You can power on NetApp HCI after the scheduled outage is complete.

### Steps

1. Power on all the storage nodes using either the physical power button or the BMC.
2. If using the BMC, log in to each node and navigate to **Remote Control > Power Control > Power On Server**.
3. When all the storage nodes are online, log in to the NetApp HCI storage system and verify that all nodes are operational.

### Find more information

- [Firmware and driver versions in NetApp HCI and NetApp Element software](#)

## Power on compute resources for a NetApp HCI system

You can power on compute resources for a NetApp HCI system after the scheduled outage is complete.

### Steps

1. Power on compute nodes using the same steps you performed for powering on the storage nodes.
2. When all the compute nodes are operational, log in to the ESXi host that was running the vCSA.
3. Log in to the compute host and verify that it sees all the NetApp HCI datastores. For a typical NetApp HCI system, you should see all the ESXi local datastores and at least the following shared datastores:

1. Assuming all storage is accessible, power on the vCSA and any other required virtual machines as follows:
  - a. Select the virtual machines in the navigator, select all the virtual machines that you want to power on, and click the **Power on** button.
2. After you power on the virtual machines, wait for approximately 5 minutes and then use a web browser to navigate to the IP address or FQDN of the vCSA appliance.

If you do not wait long enough, a message appears stating that the vSphere Client web server is initializing.

3. After the vSphere Client initializes, log in and verify that all ESXi hosts and virtual machines are online.

### Find more information

- [Firmware and driver versions in NetApp HCI and NetApp Element software](#)

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