Deploy NetApp HCI

NetApp HCI

NetApp
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Access the NetApp Deployment Engine

NetApp Deployment Engine access options overview

To deploy NetApp HCI, you need to access the NetApp Deployment Engine on one of the NetApp H-Series storage nodes via the IPv4 address assigned to the Bond1G interface, which is the logical interface that combines ports A and B for storage nodes. This storage node becomes the controlling storage node for the deployment process. Depending on your environment, you need to either configure the IPv4 address or retrieve it from one of the storage nodes.

> ⓘ You can only access the NetApp Deployment Engine using the Bond1G interface of a storage node. Using the Bond10G interface, the logical interface that combines ports C and D for storage nodes, is not supported.

Use one of the following methods that best describes your network environment to access the NetApp Deployment Engine:

Scenario	Method
You do not have DHCP in your environment	Access the NetApp Deployment Engine in environments without DHCP
You have DHCP in your environment	Access the NetApp Deployment Engine in environments with DHCP
You want to assign all IP addresses manually	Manually assign IP addresses to access the NetApp Deployment Engine

Find more information

- Configure Fully Qualified Domain Name web UI access

Access the NetApp Deployment Engine in environments without DHCP

When DHCP is not in use on the network, you need to set a static IPv4 address on the Bond1G interface of one of the storage nodes (also known as a controlling storage node) that you will use to access the NetApp Deployment Engine. The NetApp Deployment Engine on the controlling storage node will discover and communicate with other compute and storage nodes using IPv4 addresses that have been auto-configured on the Bond10G interfaces of all nodes. You should use this method unless your network has special requirements.

What you'll need

- You or your network administrator have completed the tasks in the Installation and Setup Instructions document.
- You have physical access to the NetApp HCI nodes.

- All of the NetApp HCI nodes are powered on.
- DHCP is not enabled for the NetApp HCI networks and the NetApp HCI nodes have not obtained IP addresses from DHCP servers.
- The NetApp HCI management network is configured as the native VLAN on the Bond1G and Bond10G interfaces of all nodes.

Steps

1. Plug a KVM into the back of one of the NetApp HCI storage nodes (this node will become the controlling storage node).
2. Configure the IP address, subnet mask, and gateway address for Bond1G in the user interface. You can also configure a VLAN ID for the Bond1G network if needed.

   You cannot reuse this IPv4 address later during deployment with the NetApp Deployment Engine.

3. Open a web browser on a computer that can access the NetApp HCI management network.
4. Browse to the IP address you assigned to the controlling storage node. For example:

   ```
   http://<Bond1G IP address>
   ```

   Make sure you use HTTP here.

   This takes you to the NetApp Deployment Engine user interface.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Access the NetApp Deployment Engine in environments with DHCP

In environments where servers automatically acquire IPv4 configuration from DHCP, you can access the NetApp Deployment Engine using the IPv4 address assigned to the Bond1G interface on one of the storage nodes. You can use a USB stick to retrieve the IPv4 address from one of the storage nodes. The NetApp Deployment Engine will automatically discover other compute and storage nodes that use DHCP-assigned IPv4 addresses. You should not use this method unless your network has special requirements.

What you'll need

- You or your network administrator have completed the tasks in the Installation and Setup Instructions document.
- You have physical access to the NetApp HCI nodes.
- All of the NetApp HCI nodes are powered on.
- DHCP is enabled on the NetApp HCI management and storage networks.

- The DHCP address pool is large enough to accommodate two IPv4 addresses per NetApp HCI node.

> For the NetApp HCI deployment to succeed, all nodes in the deployment must either have DHCP-acquired or auto-configured IPv4 addresses (you cannot mix IPv4 address assignment methods).

About this task

If DHCP is in use only for the storage network (Bond10G interfaces), you should use the steps outlined in xref:./docs/Access the NetApp Deployment Engine in environments without DHCP to access the NetApp Deployment Engine.

Steps

1. Wait several minutes for the nodes to request IP addresses.
2. Choose a storage node and insert a USB stick into the node. Leave it in for at least five seconds.
3. Remove the USB stick, and insert it into your computer.
4. Open the `readme.html` file. This takes you to the NetApp Deployment Engine user interface.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Manually assign IP addresses to access the NetApp Deployment Engine

You can manually assign static IPv4 addresses to the Bond1G and Bond10G interfaces on all NetApp HCI nodes to access the NetApp Deployment Engine and deploy NetApp HCI. You should not use this method unless your network has special requirements.

What you'll need

- You or your network administrator have completed the tasks in the Installation and Setup Instructions document.
- You have physical access to the NetApp HCI nodes.
- All of the NetApp HCI nodes are powered on.
- DHCP is not enabled for the NetApp HCI networks and the NetApp HCI nodes have not obtained IP addresses from DHCP servers.
  NOTE: All IP addresses you assign manually before using the NetApp Deployment Engine to deploy the system are temporary and cannot be reused. If you choose to manually assign IP addresses, you need to set aside a second permanent set of unused IP addresses that you can assign during final deployment.

About this task

In this configuration, compute and storage nodes will use static IPv4 addresses to discover and communicate with other nodes during deployment. This configuration is not recommended.

Steps

1. Plug a KVM into the back of one of the NetApp HCI storage nodes (this node will become the controlling storage node).
2. Configure the IP address, subnet mask, and gateway address for Bond1G and Bond10G in the user interface. You can also configure a VLAN ID for each network if needed.

3. Repeat step 2 for the remaining storage and compute nodes.
4. Open a web browser on a computer that can access the NetApp HCI management network.
5. Browse to the Bond1G IP address you assigned to the controlling storage node. For example:

   ```
   http://<Bond1G IP address>
   ```

   This takes you to the NetApp Deployment Engine user interface.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Start your deployment

Before continuing with your NetApp HCI deployment, you need to read and understand the end user license agreements.

Steps

1. On the **Welcome to NetApp HCI** page, click **Get Started**.
2. On the **Prerequisites** page, do the following:
   a. Ensure each prerequisite is met, and click each associated checkbox to confirm.
   b. Click **Continue**.
3. On the **End User Licenses** page, do the following:
   a. Read the NetApp End User License Agreement.
   b. If you accept the terms, click **I accept** at the bottom of the agreement text.
   c. Read the VMware End User License Agreement.
   d. If you accept the terms, click **I accept** at the bottom of the agreement text.
   e. Click **Continue**.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Import an installation profile

If you obtained the NetApp ConfigBuilder profile output for your installation, you can import it during the NetApp HCI installation process to automatically fill out the fields in the NetApp Deployment Engine. This is an optional step.

About this task

If you import an installation profile, you still need to enter credentials for NetApp HCI to use on the **Credentials** page of the NetApp Deployment Engine.

If fields in the installation profile are left blank or entered incorrectly, you might need to manually enter or correct the information in the NetApp Deployment Engine pages. If you need to add or correct information, ensure that you update the information in your records and the installation profile.

Import a profile

1. On the **Installation Profile** page, click **Browse** to search for and upload your installation profile.
2. In the file dialog, select and open the profile JSON file.
3. After the profile is successfully imported, click **Continue**.

   You can step through each page of the NetApp Deployment Engine and verify the settings that were imported from the installation profile.

Continue without importing a profile

1. To skip the import step, on the **Installation Profile** page, click **Continue**.

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page

Configure VMware vSphere

VMware vSphere configuration

NetApp HCI uses the vCenter Server and ESXi components of VMware vSphere. vCenter Server is used to manage and monitor the VMware ESXi hypervisor installed on each compute node. You can install and configure a new vSphere deployment, which also installs the NetApp Element Plug-in for vCenter Server, or you can join and extend an existing vSphere deployment.

Be aware of the following caveats when you use the NetApp Deployment Engine to install a new vSphere deployment:

- The NetApp Deployment Engine installs the new vCenter Server Appliance with the Small deployment size option.
- The vCenter Server license is a temporary evaluation license. For continued operation after the evaluation period, you need to obtain a new license key from VMware and add it to the vCenter Server license inventory.

If your vSphere inventory configuration uses a folder to store the NetApp HCI cluster within the vCenter datacenter, some operations, such as expanding NetApp HCI compute resources, will fail. Ensure that the NetApp HCI cluster is directly under the datacenter in the vSphere web client inventory tree, and is not stored in a folder. See the NetApp Knowledgebase article for more information.

If you install a new vCenter Server, you can install a vSphere standard switch or a vSphere distributed switch (VDS) during network configuration. A VDS enables a simplified, centralized management of virtual machine

network configuration after NetApp HCI deployment. Cloud data services functionality on NetApp HCI requires a VDS; vSphere standard switches are not supported for cloud data services.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Configure a new VMware vSphere environment

You can deploy a new vSphere environment as part of the NetApp HCI installation process by providing some of the network information that vSphere should use. Note that if you configure vSphere using an IP address, the address cannot be changed after installation.

What you'll need

You have obtained the network information for the planned vSphere environment.

Steps

1. Click **Configure a new vSphere deployment**.
2. Select which version of vSphere the system should install during deployment.
3. Configure the new vSphere environment using one of the following options:

Option	Steps
Use a domain name (recommended).	a. Click **Configure Using a Fully Qualified Domain Name**. b. Enter the vCenter Server domain name in the **vCenter Server Fully Qualified Domain Name** field. c. Enter the DNS server IP address in the **DNS Server IP Address** field. d. Click **Continue**.
Use an IP address.	a. Click **Configure Using an IP Address**. b. Click **Continue**.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Join an existing VMware vSphere deployment

You can configure NetApp HCI to take advantage of an existing vSphere deployment by providing the vCenter Server network information and credentials.

What you'll need

- If you are joining an existing vSphere 6.7 deployment, make sure vCenter Server is running version 6.7 Update 1.
- If you are joining an existing vSphere 6.5 deployment, make sure vCenter Server is running version 6.5 Update 2 or later.
- Obtain the network details and administrator credentials for your existing vSphere deployment.
- If the NetApp Element Plug-in for vCenter Server is registered to the existing vCenter instance, you need to unregister it before continuing. The plug-in is re-registered after NetApp HCI deployment is complete.

About this task

If you join multiple vCenter Server systems that are connected using vCenter Linked Mode, NetApp HCI only recognizes one of the vCenter Server systems.

- Beginning with Element Plug-in for vCenter Server 5.0, to use vCenter Linked Mode, you register the Element Plug-in from a separate management node for each vCenter Server that manages NetApp SolidFire storage clusters (recommended).
- Using Element Plug-in for vCenter Server 4.10 and earlier to manage cluster resources from other vCenter Servers using vCenter Linked Mode is limited to local storage clusters only.

Steps

1. Click **Join and extend an existing vSphere deployment**.
2. Enter the domain name or IP address in the **vCenter Server Domain Name or IP address** field.
   If you enter a domain name, you also need to enter the IP address of an active DNS server in the **DNS Server IP Address** field that appears.
3. Enter the credentials of a vSphere administrator in the **User Name and Password** fields.
4. Click **Continue**.

If the NetApp Element Plug-in for vCenter Server was registered during this step, an error message appears requiring that you unregister the plug-in. Do so before continuing NetApp HCI deployment. The plug-in is re-registered after deployment is complete.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Configuring NetApp HCI credentials

During deployment, you define a set of credentials to be used across the newly deployed VMware vSphere environment, the NetApp HCI compute and storage resources, and the management node. If you are deploying NetApp HCI into an existing vSphere environment, these credentials are not applied to the existing vCenter Server.

About this task

Remember the following points about the credentials you set in the NetApp HCI Deployment Engine:

- **NetApp Hybrid Cloud Control (HCC) or Element UI**: To log in to NetApp HCC or the Element user interface upon successful deployment, use the user name and password specified in this deployment step.

- **VMware vCenter**: To log in to vCenter (if installed as part of deployment), use user name with the suffix `@vsphere.local` or the built-in `Administrator@vsphere.local` user account, and the password specified in this deployment step.
- **VMware ESXi**: To log in to ESXi on the compute nodes, use the user name `root` and the same password specified in this deployment step.

For interaction with VMware vCenter instances, NetApp Hybrid Cloud Control will use one of the following:

- The built-in `Administrator@vsphere.local` user account on the vCenter instance that was installed as part of the deployment.
- The vCenter credentials that were used to connect the NetApp HCI deployment to an existing VMware vCenter Server.

Steps

1. On the **Credentials** page, enter a user name in the **User Name** field.
2. Enter a password in the **Password** field. The password must conform to the password criteria visible in the **Password must contain** box.
3. Confirm the password in the **Re-enter Password** field.
4. Click **Continue**.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes
- To update vCenter and ESXi credentials later, see Update vCenter or ESXi credentials.

Select a network topology

When cabling NetApp HCI nodes, you have the option of using different network cable configurations depending on your needs. For each compute node, you can use all six network ports, with different types of traffic assigned to each pair of ports, or you can use two ports with all types of traffic assigned to the ports. Storage nodes use the standard four-cable configuration. Your choice affects which compute nodes are selectable in the inventory.

What you'll need

If you choose the two-cable network topology for compute nodes, consider the following requirements:

- You have a VMware vSphere Enterprise Plus license ready to apply after deployment is complete.
- You have verified that the configuration of your network and network switches is correct.
- VLAN tagging is required for storage and vMotion networks for all compute and storage nodes.

Steps

1. On the **Network Topology** page, select a compute node topology that fits the way you installed compute nodes for NetApp HCI:
    - **6 Cable Option**: The six-cable option provides dedicated ports for each type of traffic (management, virtual machine, and storage). You can optionally enable vSphere Distributed Switch (VDS). Enabling

VDS configures a distributed switch, enabling simplified, centralized management of virtual machine network configuration after NetApp HCI deployment is complete. If you enable it, you must have a vSphere Enterprise Plus license ready to apply after deployment.

- **2 Cable Option**: The two-cable option combines management, virtual machine, and storage traffic on two bonded ports. This cabling option requires VDS, and automatically enables it. You must have a vSphere Enterprise Plus license ready to apply after deployment.

2. Some cabling options display multiple back panel views of different types of node hardware. Cycle through the back panel views to see how to connect the network cables for that specific node model and cabling option.
3. When finished, click **Continue**.

Find more information

- Supported firmware and ESXi driver versions for NetApp HCI and firmware versions for NetApp HCI storage nodes

Inventory selection

Inventory selection and node compatibility

When choosing nodes for your deployment, some restrictions apply to the node configurations you can combine in the same deployment.

Storage node compatibility

NetApp HCI supports storage nodes and drives with SED (Self-encrypting drive) and FIPS 140-2 drive encryption capability. When deploying or expanding NetApp HCI, you can mix nodes with different reported levels of encryption, but NetApp HCI only supports the more basic form of encryption in this situation. For example, if you mix a storage node that is FIPS encryption capable with nodes that only support SED encryption, SED encryption is supported with this configuration, but FIPS drive encryption is not.

Adding storage nodes capable of FIPS drive encryption to the storage cluster does not automatically enable the FIPS drive encryption feature. After you deploy or expand an installation with FIPS-capable nodes, you need to manually enable FIPS drive encryption. See the Element software documentation for instructions.

All storage nodes must run the same minor version of Element software to be compatible in the same deployment. For example, you cannot mix a storage node running Element 11.3.1 with other storage nodes running Element 11.5.

Depending on node hardware configuration, H410S storage nodes might appear in the inventory list labeled as H300S, H500S, or H700S storage nodes.

NetApp HCI supports only certain storage node models in two-node storage clusters. For more information, see two-node storage clusters or the Release Notes for your NetApp HCI version.

For two-node storage cluster deployments, the storage node types are limited to nodes with 480GB and 960GB drives.

Compute node compatibility

Compute nodes must meet the following requirements to be selectable as inventory:

- The CPU generations in all compute nodes must match for proper VMware vMotion functionality. After you select a compute node from the inventory, you cannot select compute nodes with different CPU generations.
- You cannot intermix compute nodes with GPU-enabled compute nodes in the same compute cluster. If you select a GPU-enabled compute node, CPU-only compute nodes become unselectable, and vice versa.
- The software version running on the compute node must match the major and minor version of the NetApp Deployment Engine hosting the deployment. If this is not the case, you need to reimage the compute node using the RTFI process. See the NetApp Knowledgebase articles regarding RTFI for instructions.
- The compute node must have the cabling configuration you selected on the Network Topology page to be selectable in the **Compute Nodes** list.
- The network cabling configurations for compute nodes of the same model must match within a single compute cluster.

Find more information

- NetApp Element Plug-in for vCenter Server
- SolidFire and Element software documentation

Select inventory

On the **Inventory** page, the NetApp Deployment Engine automatically detects available compute and storage nodes, enabling you to select and add all NetApp HCI resources to the deployment. If a node does not meet the requirements for deployment, it is not selectable and problems are indicated as errors. You can position your cursor over the error in the node's row to see an explanation. When choosing node inventory on the Inventory page, the storage node that is hosting the NetApp Deployment Engine is automatically selected, and you cannot deselect it.

Restricted configurations include vSphere 7.0 with H610C or H615C compute nodes and two or three storage nodes. If you want to proceed with a restricted configuration, you must select a different vSphere version, such as vSphere 6.7, or prevent the deployment of Witness Nodes by having a minimum of four storage nodes in the configuration.

What you'll need

Jumbo frames must be enabled for proper inventory detection. If no nodes or only a subset of nodes appear in the inventory, verify that the switch ports used for NetApp HCI nodes (all SFP+/SFP28 interfaces) are configured with jumbo frames.

Steps

1. On the **Inventory** page, view the list of available nodes.

   If the system cannot detect any inventory, it displays an error. Correct the error before continuing.
   If your system uses DHCP for IP address assignment, the storage and compute resources might not appear in the inventory immediately.

2. Optional: If a resource does not appear in the inventory immediately, or if you address an error and need to refresh the inventory, click **Refresh Inventory**. You might need to refresh the inventory multiple times.
3. Optional: To filter the inventory on node attributes, such as node type:
   a. Click **Filter** in the header of the **Compute Nodes** or **Storage Nodes** lists.
   b. Choose criteria from the drop-down lists.
   c. Below the drop-down lists, enter information to satisfy the criteria.
   d. Click **Add Filter**.
   e. Clear individual filters by clicking **X** next to an active filter, or clear all filters by clicking **X** above the list of filters.
4. Select all compute nodes that shipped with your system from the **Compute Nodes** list.

   You need to select at least two compute nodes to proceed with deployment.
5. Select all storage nodes that shipped with your system from the **Storage Nodes** list.

   You need to select at least two storage nodes to proceed with deployment.
6. Optional: If a storage node selection box is flagged, that storage node exceeds 33% of the total storage cluster capacity. Do of the following:
   - Clear the selection box for the flagged storage node.
   - Select additional storage nodes to more equally distribute the storage cluster capacity between nodes.
7. Click **Continue**.

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Configure network settings

NetApp HCI provides a network settings page with several sections to simplify network configuration. You can proceed through each section and enter information or assign IP addresses for hosts and nodes in each network.

What you'll need

- You have obtained the following information:
  - The planned naming prefix for the hosts and storage cluster
  - All planned subnet mask, starting IP address, default gateway, and VLAN IDs for the management, iSCSI, and vMotion networks
  - The subnet mask, IP address, default gateway, and VLAN IDs for any planned VMware vCenter deployment
  - The Network Time Protocol (NTP) server address for NetApp HCI
  - The DNS server IP address information for NetApp HCI

- If you are deploying a vSphere Distributed Switch, you have a vSphere Enterprise Plus license ready to apply after deployment is complete.
- If you assigned VLAN IDs to node ports during terminal user interface (TUI) configuration, you have configured those ports with the same VLAN ID during network configuration. You do not need to configure tagged host ports as access ports or native VLANs on the connected switch ports.
- You have verified that your network switch configuration is correct. Incorrect switch configurations (such as incorrect VLANs or MTU size) will cause deployment errors.

About this task

If you selected the two-cable network topology for compute nodes, you need to use VLAN IDs for the vMotion and storage networks for all compute and storage nodes in the deployment (VLAN IDs are optional for the management networks). Note that NetApp HCI validates the IP addresses you enter during these steps, but you can disable this validation with the **Live network validation is** button. NetApp HCI also performs checks on other information that you enter during these steps, such as ensuring that no subnets overlap, ensuring that no VLAN IDs are assigned to multiple networks, and other basic validations.

In environments that require host-side VLAN tagging before deployment, if you have configured VLAN IDs on compute and storage nodes so they are discoverable by the NetApp Deployment Engine, ensure you use the correct VLANs when configuring network settings in the NetApp Deployment Engine.

If you are deploying a two-node or three-node storage cluster, you can complete IP address information for Witness Nodes on the **Network Settings** page.

In the IP address assignment pages, information you enter in the **Automatically assign IP addresses** mode does not affect information entered in the **Manually assign IP addresses** mode, and vice versa. If you enter IP addresses in both modes, NetApp HCI uses the IP address information in whatever mode is active when you click **Continue** at the bottom of the page.

Troubleshooting common problems

NetApp HCI performs checks on the information you enter on these pages. Here are some common problems and workarounds:

Problem	Workaround
In automatic IP address assignment mode, after you enter a starting IP address, you see the message `IPs in the range are in use:` with a scrollable drop-down list of the in-use IP addresses.	NetApp HCI has assigned a contiguous range of IP addresses, but one or more of those IP addresses is already in use. Free the in-use IP addresses and try again, or use manual IP address assignment mode to assign specific IP addresses.

Problem	Workaround
After entering a default gateway, you see the message `The gateway is not valid.`	The default gateway IP address either does not match the subnet you provided, or there is an issue with the network or server you need to resolve. See the following NetApp Knowledge Base articles for more information: • Troubleshoot an invalid gateway in the NetApp Deployment Engine • The gateway is not valid in the NetApp Deployment Engine
You complete several **Network Settings** configuration pages and realize that there is incorrect information on one of the previous pages in the sequence.	Using the numbered page sequence at the top of the page, you can select a page that you have previously completed and change information there. When finished, you can click **Continue** on the completed pages to return to the current page.

Configure DNS and NTP settings

Steps

1. On the **DNS/NTP** page, enter the DNS and NTP server information for NetApp HCI in the following fields:

Field	Description
DNS Server IP Address 1	The IP address of the primary DNS server for NetApp HCI. If you specified a DNS server on the vCenter Configuration page, this field is populated and read-only.
DNS Server IP Address 2 (Optional)	An optional IP address of a secondary DNS server for NetApp HCI.
NTP Server Address 1	The IP address or fully qualified domain name of the primary NTP server for this infrastructure.
NTP Server Address 2 (Optional)	An optional IP address or fully qualified domain name of the secondary NTP server for this infrastructure.

Assign VLAN IDs

On the **VLAN IDs** page, you can assign VLAN IDs to NetApp HCI networks. You can also choose to not use VLAN IDs. If you selected the two-cable network topology for compute nodes, you need to use VLAN IDs for the vMotion and storage networks for all compute and storage nodes in the deployment (VLAN IDs are optional for the management networks).

When you assign VLAN IDs, you are configuring VLAN tags that NetApp HCI will apply to the network traffic. You do not need to enter your native VLAN as a VLAN ID; to use the native VLAN for a network, leave the appropriate field empty.

Steps

Choose one of the following options:

Option	Steps
Assign VLAN IDs	1. Select **Yes** for the **Will you assign VLAN IDs** option. 2. In the **VLAN ID** column, enter a VLAN tag to use for each type of network traffic you want to assign to a VLAN. Both compute vMotion traffic and iSCSI traffic must use an unshared VLAN ID. 3. Click **Continue**.
Do not assign VLAN IDs	1. Select **No** for the **Will you assign VLAN IDs** option. 2. Click **Continue**.

Configure the management network

On the **Management** page, you can choose to have NetApp HCI automatically populate IP address ranges for the management networks based on a starting IP address, or you can choose to manually enter all IP address information.

Steps

Choose one of the following options:

Option	Steps
Automatically assign IP addresses	1. Select the **Automatically assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for each VLAN. 3. In the **Default Gateway** column, enter a default gateway for each VLAN. 4. In the **Subnet** column, enter a starting IP address to use for each VLAN and node type. NetApp HCI automatically populates the ending IP addresses for each host or group of hosts. 5. Click **Continue**.

Option	Steps
Manually assign IP addresses	1. Select the **Manually assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for each VLAN. 3. In the **Default Gateway** column, enter a default gateway for each VLAN. 4. In the row for each host or node, enter the IP address for that host or node. 5. Enter the Management Virtual IP (MVIP) address for the management network. 6. Click **Continue**.

Configure the vMotion network

On the **vMotion** page, you can choose to have NetApp HCI automatically populate IP address ranges for the vMotion network based on a starting IP address, or you can choose to manually enter all IP address information.

Steps

Choose one of the following options:

Option	Steps
Automatically assign IP addresses	1. Select the **Automatically assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for each VLAN. 3. (Optional) In the **Default Gateway** column, enter a default gateway for each VLAN. 4. In the **Subnet** column, enter a starting IP address to use for each VLAN and node type. NetApp HCI automatically populates the ending IP addresses for each host or group of hosts. 5. Click **Continue**.
Manually assign IP addresses	1. Select the **Manually assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for each VLAN. 3. (Optional) In the **Default Gateway** column, enter a default gateway for each VLAN. 4. In the row for each host or node, enter the IP address for that host or node. 5. Click **Continue**.

Configure the iSCSI network

On the **iSCSI** page, you can choose to have NetApp HCI automatically populate IP address ranges for the iSCSI network based on a starting IP address, or you can choose to manually enter all IP address information.

Steps

Choose one of the following options:

Option	Steps
Automatically assign IP addresses	1. Select the **Automatically assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for the iSCSI network. 3. (Optional) In the **Default Gateway** column, enter a default gateway for the iSCSI network. 4. In the **Subnet** column, enter a starting IP address to use for each node type. NetApp HCI automatically populates the ending IP addresses for each host or group of hosts. 5. Click **Continue**.
Manually assign IP addresses	1. Select the **Manually assign IP addresses** option. 2. In the **Subnet** column, enter a subnet definition in CIDR format for the iSCSI network. 3. (Optional) In the **Default Gateway** column, enter a default gateway for the iSCSI network. 4. In the **Management Node** section, enter an IP address for the management node. 5. For each node in the **Compute Nodes** section, enter the iSCSI A and iSCSI B IP addresses. 6. In the **Storage Virtual IP (SVIP)** row, enter the SVIP IP address for the iSCSI network. 7. In the remaining rows, for each host or node, enter the IP address for that host or node. 8. Click **Continue**.

Assign cluster and host names

On the **Naming** page, you can choose to have NetApp HCI automatically populate the cluster name and the names of the nodes in the cluster, based on a naming prefix, or you can choose to manually enter all of the names for the cluster and nodes.

Steps

Choose one of the following options:

Option	Steps
Automatically assign cluster and host names	1. Select the **Automatically assign cluster / host names** option. 2. In the **Installation Prefix** section, enter a naming prefix to use for all of the node host names in the cluster (including the management node and witness nodes). NetApp HCI automatically populates the host names based on the type of node, as well as suffixes for common node names (such as the compute and storage nodes). 3. (Optional) In the **Naming Scheme** column, modify any of the resulting names for the hosts. 4. Click **Continue**.
Manually assign cluster and host names	1. Select the **Manually assign cluster / host names** option. 2. In the **Host / Cluster Name** column, enter the host name for each host, and a cluster name for the storage cluster. 3. Click **Continue**.

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Review and deploy the configuration

You can review the information you provided before beginning deployment. You can also correct any incorrect or incomplete information before you proceed.

During deployment, the management node installation process creates volumes with names beginning with `NetApp-HCI-` in the Element storage cluster, and a SolidFire account beginning with the name `tenant_`. Do not delete these volumes or accounts; doing so will cause a loss in management functionality.

Steps

1. Optional: Select the **Download** icon to download installation information in CSV format. You can save this file and refer to it later for configuration information.

   You can import the CSV file as an installation profile on the **Installation Profile** page of the NetApp Deployment Engine (NDE) if needed during a future installation.

2. Expand each section and review the information. To expand all sections at once, select **Expand All**.
3. Optional: To make changes to information in any displayed section:
   a. Select **Edit** in the corresponding section.
   b. Make the necessary changes.
   c. Select **Continue** until you reach the **Review** page. Your previous settings are saved on each page.
   d. Repeat steps 2 and 3 to make any other necessary changes.
4. If you do not want to send cluster statistics and support information to NetApp-hosted SolidFire Active IQ servers, clear the final checkbox.

   This disables real-time health and diagnostic monitoring for NetApp HCI. Disabling this feature removes the ability for NetApp to proactively support and monitor NetApp HCI to detect and resolve problems before production is affected.

5. If all information is correct, select **Start Deployment**.

   A dialog box appears. In the event of network connectivity issues or power loss during the final setup process, or if your browser session is lost, you can copy the URL displayed in the dialog and use it to browse to the final setup progress page.

6. Review the information in the dialog and select **Copy to Clipboard** to copy the URL to your clipboard.
7. Save the URL to a text file on your computer.
8. When you are ready to proceed with deployment, select **OK**.

   Deployment begins and a progress page is displayed. Do not close the browser window or navigate away from the progress page until deployment is complete. If your browser session is lost for any reason, you can browse to the URL you copied earlier (and accept any security warnings that appear) to regain access to the final setup progress page.

   If the deployment fails, save any error message text and contact NetApp Support.

   After deployment is complete, the compute nodes might reboot more than once before becoming ready for service.

After you finish

Begin using NetApp HCI by selecting **Launch vSphere**.

- For NetApp HCI installations using vSphere 6.7, this link launches the HTML5 vSphere web interface. For installations using vSphere 6.5, this link launches the Adobe Flash vSphere web interface.
- In two storage or three storage node configurations, the NDE configures the Witness Nodes to use the local datastore on the compute nodes. As a result, your vSphere Client displays two **Datastore usage on disk** warnings. To continue, select the **Reset To Green** link in each warning.

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page

- SolidFire and Element Software Documentation

Post-deployment tasks

Post-deployment tasks

Depending on your choices during the deployment process, you need to complete some final tasks before your NetApp HCI system is ready for production use, such as updating firmware and drivers and making any needed final configuration changes.

- Supported networking changes
- Disable the smartd service on NetApp HCI compute nodes
- Disable the "lacp-individual" command on configured switches
- Create a NetApp HCC role in vCenter
- Keep VMware vSphere up to date
- Install GPU drivers for GPU-enabled compute nodes
- Access NetApp Hybrid Cloud Control
- Reduce boot media wear on a NetApp HCI compute node

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page

Supported networking changes

After you deploy NetApp HCI, you can make limited changes to the default networking configuration. However, you must meet certain requirements for smooth operation and correct network detection. Not meeting these requirements will cause unexpected behavior and might prevent you from expanding compute and storage resources.

After you deploy your system, you can make the following changes to the default network configuration in VMware vSphere as dictated by your network requirements:

- Change vSwitch names
- Change port group names
- Add and remove additional port groups
- Change the vmnic interface failover order for any additional port groups you have added

When scaling H300E, H500E, H700E, H410C, H610C, and H615C compute nodes, NetApp HCI expects the existing compute cluster on the node to meet the following requirements:

- A minimum of four vmk interfaces
- One management vmk interface
- One vmotion vmk interface

- Two vmks on the same subnet with iSCSI bindings to the software iSCSI initiator

> Beginning with NetApp HCI 1.10, when you scale the cluster, NetApp HCI does not expect to meet the default node configurations.
>
> After you change the default settings in VMware vSphere for one or more nodes in the existing compute cluster, the settings for the new node will align with the settings for the majority of the nodes in the cluster.

NetApp Deployment Engine default configurations

The NetApp Deployment Engine sets up default configurations for the compute hosts depending on the system and cable configuration.

H300E, H500E, H700E, and H410C compute nodes

The following is a six-interface configuration for H300E, H500E, H700E, and H410C nodes with VMware vSphere Distributed Switching (VDS). This configuration is only supported when used with VMware vSphere Distributed Switches, and requires VMware vSphere Enterprise Plus licensing.

Network function	vmkernel	vmnic (physical interface)
Management	vmk0	vmnic2 (Port A), vmnic3 (Port B)
iSCSI-A	vmk1	vmnic5 (Port E)
iSCSI-B	vmk2	vmnic1 (Port D)
vMotion	vmk3	vmnic4 (Port C), vmnic0 (Port F)

The following is a six-interface configuration with VMware vSphere Standard Switching (VSS). This configuration uses VMware vSphere Standard Switches (VSS).

Network function	vmkernel	vmnic (physical interface)
Management	vmk0	vmnic2 (Port A), vmnic3 (Port B)
iSCSI-A	vmk2	vmnic1 (Port E)
iSCSI-B	vmk3	vmnic5 (Port D)
vMotion	vmk1	vmnic4 (Port C), vmnic0 (Port F)

The following is a two-interface configuration. This configuration is only supported when used with VMware vSphere Distributed Switches (VDS), and requires VMware vSphere Enterprise Plus licensing.

Network function	vmkernel	vmnic (physical interface)
Management	vmk0	vmnic1 (Port D), vmnic5 (Port E)
iSCSI-A	vmk1	vmnic1 (Port E)
iSCSI-B	vmk2	vmnic5 (Port D)
vMotion	vmk3	vmnic1 (Port C), vmnic5 (Port F)

H610C compute nodes

This configuration for H610C nodes is only supported when used with VMware vSphere Distributed Switches (VDS), and requires VMware vSphere Enterprise Plus licensing.

Ports A and B are unused on the H610C.

Network function	vmkernel	vmnic (physical interface)
Management	vmk0	vmnic2 (Port C), vmnic3 (Port D)
iSCSI-A	vmk1	vmnic3 (Port D)
iSCSI-B	vmk2	vmnic2 (Port C)
vMotion	vmk3	vmnic2 (Port C), vmnic3 (Port D)

H615C compute nodes

This configuration for H615C nodes is only supported when used with VMware vSphere Distributed Switches (VDS), and requires VMware vSphere Enterprise Plus licensing.

Network function	vmkernel	vmnic (physical interface)
Management	vmk0	vmnic0 (Port A), vmnic1 (Port B)
iSCSI-A	vmk1	vmnic0 (Port B)
iSCSI-B	vmk2	vmnic1 (Port A)
vMotion	vmk3	vmnic0 (Port A), vmnic1 (Port B)

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Disable the `smartd` service on NetApp HCI compute nodes

By default, the `smartd` service periodically polls the drives in your compute nodes. You should disable this service on all compute nodes after you deploy NetApp HCI.

Steps

1. Using SSH or a local console session, log in to VMware ESXi on the compute node using root credentials.
2. Stop the running `smartd` service:

```
/etc/init.d/smartd stop
```

3. Prevent the `smartd` service from starting at boot:

```
chkconfig smartd off
```

4. Repeat these steps on the rest of the compute nodes in your installation.

Find more information

- Turn off the smartd service in VMware ESXi
- VMware KB article 2133286

Disable the "lacp-individual" command on configured switches

By default, the Mellanox switch `lacp-individual` command and the Cisco switch `lacp suspend-individual` command remain configured post deployment. This command is not required post installation; if it remains configured, it can cause volume access issues when troubleshooting or rebooting a switch. Post deployment, you should check each Mellanox switch and Cisco switch configuration and remove the `lacp-individual` or `lacp suspend-individual` command.

Steps

1. Using SSH, open a session to the switch.
2. Show the running configuration:

   ```
   show running-config
   ```

3. Check the switch configuration output for the `lacp-individual` or `lacp suspend-individual` command.

   The `xxx-xxx` is your user supplied interface number(s). If required, you can access the interface number by displaying the Multi-chassis Link Aggregation Group interfaces: `show mlag interfaces`

   a. For a Mellanox switch, check if the output contains the following line:

      ```
      interface mlag-port-channel xxx-xxx lacp-individual enable force
      ```

   b. For a Cisco switch, check if the output contains the following line:

      ```
      interface mlag-port-channel xxx-xxx lacp suspend-individual enable force
      ```

4. If the command is present, remove it from the configuration.
   a. For a Mellanox switch:

      ```
      no interface mlag-port-channel xxx-xxx lacp-individual enable force
      ```

   b. For a Cisco switch:
      `no interface mlag-port-channel xxx-xxx lacp suspend-individual enable force`
5. Repeat these steps for each switch in your configuration.

Find more information

- Storage node goes down during troubleshooting

Keep VMware vSphere up to date

After deploying NetApp HCI, you should use VMware vSphere Lifecycle Manager to apply the latest security patches for the version of VMware vSphere used with NetApp HCI.

Use the Interoperability Matrix Tool to ensure that all versions of software are compatible. See the VMware vSphere Lifecycle Manager documentation for more information.

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Install GPU drivers for GPU-enabled compute nodes

Compute nodes with NVIDIA graphics processing units (GPUs), like the H610C, need NVIDIA software drivers installed in VMware ESXi so that they can take advantage of the increased processing power. After deploying compute nodes with GPUs, you need to perform these steps on each GPU-enabled compute node to install the GPU drivers in ESXi.

Steps

1. Open a browser and browse to the NVIDIA licensing portal at the following URL:

   ```
   https://nvid.nvidia.com/dashboard/
   ```

2. Download one of the following driver packages to your computer, depending on your environment:

vSphere version	Driver package
vSphere 6.5	`NVIDIA-GRID-vSphere-6.5-410.92-410.91-412.16.zip`
vSphere 6.7	`NVIDIA-GRID-vSphere-6.7-410.92-410.91-412.16.zip`

3. Extract the driver package on your computer.

   The resulting .VIB file is the uncompressed driver file.

4. Copy the `.VIB` driver file from your computer to ESXi running on the compute node. The following example commands for each version assume that the driver is located in the `$HOME/NVIDIA/ESX6.x/` directory on the management host. The SCP utility is readily available in most Linux distributions, or available as a downloadable utility for all versions of Windows:

ESXi version	Description
ESXi 6.5	`scp $HOME/NVIDIA/ESX6.5/NVIDIA**.vib root@<ESXi_IP_ADDR>:/.`
ESXi 6.7	`scp $HOME/NVIDIA/ESX6.7/NVIDIA**.vib root@<ESXi_IP_ADDR>:/.`

5. Use the following steps to log in as root to the ESXi host and install the NVIDIA vGPU Manager in ESXi.
   a. Run the following command to log in to the ESXi host as the root user:

      ```
      ssh root@<ESXi_IP_ADDRESS>
      ```

   b. Run the following command to verify that no NVIDIA GPU drivers are currently installed:

      ```
      nvidia-smi
      ```

      This command should return the message `nvidia-smi: not found`.

   c. Run the following commands to enable maintenance mode on the host and install the NVIDIA vGPU Manager from the VIB file:

      ```
      esxcli system maintenanceMode set --enable true
      esxcli software vib install -v /NVIDIA**.vib
      ```

      You should see the message `Operation finished successfully`.

   d. Run the following command and verify that all eight GPU drivers are listed in the command output:

      ```
      nvidia-smi
      ```

   e. Run the following command to verify that the NVIDIA vGPU package was installed and loaded correctly:

      ```
      vmkload_mod -l | grep nvidia
      ```

      The command should return output similar to the following: `nvidia 816 13808`

   f. Run the following command to reboot the host:

      ```
      reboot -f
      ```

   g. Run the following command to exit maintenance mode:

```
esxcli system maintenanceMode set --enable false
```

6. Repeat steps 4-6 for any other newly deployed compute nodes with NVIDIA GPUs.
7. Perform the following tasks using the instructions in the NVIDIA documentation site:
   a. Install the NVIDIA license server.
   b. Configure the virtual machine guests for NVIDIA vGPU software.
   c. If you are using vGPU-enabled desktops in a virtual desktop infrastructure (VDI) context, configure VMware Horizon View for NVIDIA vGPU software.

Find more information

- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Access NetApp Hybrid Cloud Control

NetApp Hybrid Cloud Control enables you to manage NetApp HCI. You can upgrade management services and other components of NetApp HCI and expand and monitor your installation. You log in to NetApp Hybrid Cloud Control by browsing to the IP address of the management node.

What you'll need

- **Cluster administrator permissions**: You have permissions as administrator on the storage cluster.
- **Management services**: You have upgraded your management services to at least version 2.1.326. NetApp Hybrid Cloud Control is not available in earlier service bundle versions. For information about the current service bundle version, see the Management Services Release Notes.

Steps

1. Open the IP address of the management node in a web browser. For example:

   ```
   https://<ManagementNodeIP>
   ```

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

   The NetApp Hybrid Cloud Control interface appears.

If you logged in using insufficient permissions, you will see an "Unable to load" message throughout HCC resource pages and resources will not be available.

Find more information

- NetApp HCI Resources page
- SolidFire and Element Software Documentation

Reduce boot media wear on a NetApp HCI compute node

When you use flash memory or NVDIMM boot media with a NetApp HCI compute node, keeping the system logs on that media results in frequent writes to that media. This can eventually degrade the flash memory. Use the instructions in the following KB article to move host logging and the core dump file to a shared storage location, which can help prevent degradation of the boot media over time and help prevent full boot disk errors.

How to reduce wear on the boot drive of a NetApp HCI compute node

Find more information

- NetApp Element Plug-in for vCenter Server
- NetApp HCI Resources page

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