NetApp

Requirements and pre-deployment tasks

HCI

NetApp
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Requirements and pre-deployment tasks

Requirements for NetApp HCI deployment overview

NetApp HCI has specific physical and network requirements for proper operation in your datacenter. Ensure that you implement the following requirements and recommendations before you begin deployment.

Before you receive your NetApp HCI hardware, ensure that you complete the checklist items in the pre-deployment workbook from NetApp Professional Services. This document contains a comprehensive list of tasks you need to complete to prepare your network and environment for a successful NetApp HCI deployment.

Here are the links to the requirements and pre-deployment tasks:

- Network port requirements
- Network and switch requirements
- Network cable requirements
- IP address requirements
- Network configuration
- DNS and timekeeping requirements
- Environmental requirements
- Protection Domains
- Witness Node resource requirements for two-node storage clusters

Find more information

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

Management node requirements

As a best practice, only associate one management node with one VMware vCenter instance, and avoid defining the same storage and compute resources or vCenter instances in multiple management nodes. Defining the same resources in multiple management nodes can cause problems such as incorrect resource reporting in NetApp ActiveIQ.

Network port requirements

You might need to allow the following ports through your datacenter's edge firewall so that you can manage the system remotely, allow clients outside of your datacenter to connect to resources, and ensure that internal services can function properly. Some of these ports, URLs, or IP addresses might not be required, depending on how you use the

system. All ports are TCP unless stated otherwise.

> ⓘ NetApp is in the process of rebuilding the online repository that hosts software and firmware bundle downloads that support the NetApp Hybrid Cloud Control automated upgrade workflow.
> Learn More

> ⓘ The NetApp Hybrid Cloud Control web UI and API download software packages from the NetApp online software repository, which uses JFrog Artifactory Cloud as a distribution hub and CDN technologies for file hosting. Because of this, some URLs or IP addresses might resolve to other URLs or IP addresses based on the content delivery network. If possible, you should work with a network engineer to add these URLs or IP addresses to the firewall rules, using the following general steps:
>
> **Steps**
>
> 1. Use the Wget or cURL utilities to access a URL (repo.netapp.com, for example).
> 2. Receive a failure to access the URL (different from repo.netapp.com).
> 3. Edit the firewall rules to allow the new URL.
> 4. Repeat the above steps until the access attempt succeeds.

The following abbreviations are used in the table:

- MIP: Management IP address, a per-node address
- SIP: Storage IP address, a per-node address
- MVIP: Management virtual IP address
- SVIP: Storage virtual IP address

All ports in the table are TCP unless stated otherwise.

Source	Destination	Port	Description
Compute node BMC/IPMI	Management node	111 TCP/UDP	NetApp Hybrid Cloud Control API communication
Compute node BMC/IPMI	Management node	137-138 UDP	NetApp Hybrid Cloud Control API communication
Compute node BMC/IPMI	Management node	445	NetApp Hybrid Cloud Control API communication
Compute node BMC/IPMI	Management node	623 UDP	Remote Management Control Protocol (RMCP) port. Required for NetApp Hybrid Cloud Control compute firmware upgrades.
Compute node BMC/IPMI	Management node	2049 TCP/UDP	NetApp Hybrid Cloud Control API communication

Source	Destination	Port	Description
iSCSI clients	Storage cluster MVIP	443	(Optional) UI and API access
iSCSI clients	Storage cluster SVIP	3260	Client iSCSI communications
iSCSI clients	Storage node SIP	3260	Client iSCSI communications
Management node	`sfsupport.solidfire.com`	22	Reverse SSH tunnel for support access
Management node	Storage node MIP	22	SSH access for support
Management node	DNS servers	53 TCP/UDP	DNS lookup
Management node	Compute node BMC/IPMI	139	NetApp Hybrid Cloud Control API communication
Management node	Storage node MIP	442	UI and API access to storage node and Element software upgrades
Management node	Storage node MVIP	442	UI and API access to storage node and Element software upgrades
Management node	`23.32.54.122, 216.240.21.15`	443	Element software upgrades
Management node	Baseboard management controller (BMC)	443	Hardware monitoring and inventory connection (Redfish and IPMI commands)
Management node	Compute node BMC/IPMI	443	NetApp Hybrid Cloud Control HTTPS communication
Management node	`monitoring.solidfire.com`	443	Storage cluster reporting to Active IQ
Management node	Online software repository: • `https://repo.netapp.com/bintray/api/package` • `https://repo.netapp.com/downloads` • `https://netappdownloads.jfrog.io:443`	443	Management node service upgrades

Source	Destination	Port	Description
Management node	Storage cluster MVIP	443	UI and API access to storage node and Element software upgrades
Management node	VMware vCenter	443	NetApp Hybrid Cloud Control HTTPS communication
Management node	Compute node BMC/IPMI	623 UDP	Remote Management Control Protocol (RMCP) port. Required for NetApp Hybrid Cloud Control compute firmware upgrades.
Management node	VMware vCenter	5988-5989	NetApp Hybrid Cloud Control HTTPS communication
Management node	Witness Node	9442	Per-node configuration API service
Management node	vCenter Server	9443	vCenter Plug-in registration. The port can be closed after registration is complete.
SNMP server	Storage cluster MVIP	161 UDP	SNMP polling
SNMP server	Storage node MIP	161 UDP	SNMP polling
Storage node MIP	DNS servers	53 TCP/UDP	DNS lookup
Storage node MIP	Management node	80	Element software upgrades
Storage node MIP	S3/Swift endpoint	80	(Optional) HTTP communication to S3/Swift endpoint for backup and recovery
Storage node MIP	NTP server	123 UDP	NTP
Storage node MIP	Management node	162 UDP	(Optional) SNMP traps
Storage node MIP	SNMP server	162 UDP	(Optional) SNMP traps
Storage node MIP	LDAP server	389 TCP/UDP	(Optional) LDAP lookup
Storage node MIP	Management node	443	Element software upgrades
Storage node MIP	Remote storage cluster MVIP	443	Remote replication cluster pairing communication
Storage node MIP	Remote storage node MIP	443	Remote replication cluster pairing communication

Source	Destination	Port	Description
Storage node MIP	S3/Swift endpoint	443	(Optional) HTTPS communication to S3/Swift endpoint for backup and recovery
Storage node MIP	LDAPS server	636 TCP/UDP	LDAPS lookup
Storage node MIP	Management node	10514 TCP/UDP, 514 TCP/UDP	Syslog forwarding
Storage node MIP	Syslog server	10514 TCP/UDP, 514 TCP/UDP	Syslog forwarding
Storage node MIP	Remote storage node MIP	2181	Intercluster communication for remote replication
Storage node SIP	S3/Swift endpoint	80	(Optional) HTTP communication to S3/Swift endpoint for backup and recovery
Storage node SIP	Compute node SIP	442	Compute node API, configuration and validation, and access to software inventory
Storage node SIP	S3/Swift endpoint	443	(Optional) HTTPS communication to S3/Swift endpoint for backup and recovery
Storage node SIP	Remote storage node SIP	2181	Intercluster communication for remote replication
Storage node SIP	Storage node SIP	3260	Internode iSCSI
Storage node SIP	Remote storage node SIP	4000 through 4020	Remote replication node-to-node data transfer
System administrator PC	Storage node MIP	80	(NetApp HCI only) Landing page of NetApp Deployment Engine
System administrator PC	Management node	442	HTTPS UI access to management node
System administrator PC	Storage node MIP	442	HTTPS UI and API access to storage node, (NetApp HCI only) Configuration and deployment monitoring in NetApp Deployment Engine
System administrator PC	Management node	443	HTTPS UI and API access to management node

Source	Destination	Port	Description
System administrator PC	Storage cluster MVIP	443	HTTPS UI and API access to storage cluster
System administrator PC	Storage node MIP	443	HTTPS storage cluster creation, post-deployment UI access to storage cluster
System administrator PC	Witness Node	8080	Witness Node per-node web UI
vCenter Server	Storage cluster MVIP	443	vCenter Plug-in API access
vCenter Server	Management node	8443	(Optional) vCenter Plug-in QoSSIOC service.
vCenter Server	Storage cluster MVIP	8444	vCenter VASA provider access (VVols only)
vCenter Server	Management node	9443	vCenter Plug-in registration. The port can be closed after registration is complete.

Find more information

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

Network and switch requirements

The switches you use for NetApp HCI require specific configuration to ensure a successful deployment. See your switch documentation for specific instructions on implementing each of the following requirements for your environment.

A NetApp HCI deployment requires at least three network segments, one for each of the following types of traffic:

- Management
- VMware vMotion
- Storage/Data

Depending on the NetApp H-Series compute and storage node models and the planned cabling configuration, you can physically separate these networks using separate switches or logically separate them using VLANs. For most deployments, however, you need to logically separate these networks (and any other additional virtual machine networks) using VLANs.

Compute and storage nodes need to be able to communicate before, during, and after deployment. If you are implementing separate management networks for storage and compute nodes, ensure that these management networks have network routes between them. These networks must have gateways assigned, and there must be a route between the gateways. Ensure that each new node has a gateway assigned to facilitate

communication between nodes and management networks.

NetApp HCI has the following switch requirements:

- All switch ports connected to NetApp HCI nodes must be configured as spanning tree edge ports.
  - On Cisco switches, depending on the switch model, software version and port type, you can do this with one of the following commands:
    - `spanning-tree port type edge`
    - `spanning-tree port type edge trunk`
    - `spanning-tree portfast`
    - `spanning-tree portfast trunk`
  - On Mellanox switches, you can do this with the `spanning-tree port type edge` command.
- NetApp HCI nodes have redundant ports for all network functions except out-of-band management. For the best resiliency, divide these ports across two switches with redundant uplinks to either a traditional hierarchical architecture or a layer 2 spine-and-leaf architecture.
- The switches handling storage, virtual machine, and vMotion traffic must support speeds of at least 10GbE per port (up to 25GbE per port is supported).
- The switches handling management traffic must support speeds of at least 1GbE per port.
- You must configure jumbo frames on the switch ports handling storage and vMotion traffic. Hosts must be able to send 9000 byte packets end-to-end for a successful installation.
- You must configure the management network switch ports to allow whatever size MTU the management NIC ports on each host are configured for. For example, if the host management network ports use an MTU size of 1750 bytes, the management network switch ports must be configured to allow at least an MTU of 1750 bytes (the management network does not require an MTU of 9000 bytes). The MTU settings should be consistent end-to-end.
- Round-trip network latency between all storage and compute nodes should not exceed 2ms.

All NetApp HCI nodes provide additional out-of-band management capabilities via a dedicated management port. NetApp H300S, H300E, H500S, H500E, H700S, H700E and H410C nodes also allow for IPMI access via Port A. As a best practice, you should ease remote management of NetApp HCI by configuring out-of-band management for all nodes in your environment.

Find more information

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

Network cable requirements

You can use the following guidelines to ensure that you have enough of the right type of network cables for the size of your deployment. For RJ45 ports, you must use Cat 5e or Cat 6 rated cables.

- Two-cable compute node configuration: Each compute node must to be connected to a 10/25GbE network via two SFP+/SFP28 interfaces (one additional Cat 5e/6 cable is optional for out-of-band management).
- Six-cable compute node configuration: Each compute node must to be connected to a 10/25GbE network

via four SFP+/SFP28 interfaces and to a 1/10GbE network via two Cat 5e/6 cables (one additional Cat 5e/6 cable is optional for out-of-band management).

- Each storage node must be connected to a 10/25GbE network via two SFP+/SFP28 interfaces and to a 1/10GbE network via two Cat 5e/6 cables (one additional Cat 5e/6 cable is optional for out-of-band management).

- Ensure the network cables you use to connect the NetApp HCI system to your network are long enough to comfortably reach your switches.

For example, a deployment containing four storage nodes and three compute nodes (using the six-cable configuration) requires the following number of network cables:

- (14) Cat 5e/6 cables with RJ45 connectors (plus seven cables for IPMI traffic, if desired)
- (20) Twinax cables with SFP28/SFP+ connectors

This is due to the following reasons:

- Four storage nodes require eight (8) Cat 5e/6 cables and eight (8) Twinax cables.
- Three compute nodes using the six-cable configuration require six (6) Cat 5e/6 cables and twelve (12) Twinax cables.

ⓘ In a six-cable configuration, two ports are reserved for VMware ESXi and set up and managed by the NetApp Deployment Engine. You cannot access or manage these ESXi-dedicated ports using the Element TUI or the Element web GUI.

Find more information

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

IP address requirements

NetApp HCI has specific IP address requirements that depend on the size of your deployment. Note that by default the initial IP addresses you assign to each node before using the NetApp Deployment Engine to deploy the system are temporary and cannot be reused. You need to set aside a second permanent set of unused IP addresses that you can assign during final deployment.

Number of IP addresses needed per NetApp HCI deployment

The NetApp HCI storage network and management network should each use separate contiguous ranges of IP addresses. Use the following table to determine how many IP addresses you need for your deployment:

System component	Management network IP addresses needed	Storage network IP addresses needed	vMotion network IP addresses needed	Total IP addresses needed per component
Compute node	1	2	1	4
Storage node	1	1		2

System component	Management network IP addresses needed	Storage network IP addresses needed	vMotion network IP addresses needed	Total IP addresses needed per component
Storage cluster	1	1		2
VMware vCenter	1			1
Management node	1	1		2
Witness Node	1	1		2 per Witness Node (two Witness Nodes are deployed for each two-node or three-node storage cluster)

IP addresses reserved by NetApp HCI

NetApp HCI reserves the following IP address ranges for system components. When planning your network, avoid using these IP addresses:

IP address range	Description
10.0.0.0/24	Docker overlay network
10.0.1.0/24	Docker overlay network
10.255.0.0/16	Docker swarm ingress network
169.254.100.1/22	Docker bridge network
169.254.104.0/22	Docker bridge network

Find more information

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

Network configuration

Network configuration

NetApp HCI can utilize multiple different network cabling and VLAN configurations. It is important to plan your network configuration to ensure a successful deployment.

Required network segments

NetApp HCI requires a minimum of three network segments: management, storage, and virtualization traffic (which includes virtual machines and VMware vMotion traffic). You can also separate virtual machine and vMotion traffic. These network segments usually exist as logically separated VLANs in the NetApp HCI network infrastructure.

How compute and storage nodes connect to these networks depends on how you design the network and cable the nodes. The sample network illustrations in this guide assume the following networks:

Network name	VLAN ID
Management	100
Storage	105
vMotion	107
Virtual machines	200, 201

For automatic discovery and configuration of your NetApp HCI nodes in the NetApp Deployment Engine, you must have a network segment that is available as an untagged or native VLAN on all switch ports that are used for the SFP+/SFP28 interfaces on the nodes. This will provide layer 2 communication between all nodes for discovery and deployment. Without a native VLAN, you must configure the SFP+/SFP28 interfaces of all nodes manually with a VLAN and IPv4 address to be discoverable. In the network configuration examples in this document, the management network (VLAN ID 100) is used for this purpose.

The NetApp Deployment Engine enables you to quickly configure networks for compute and storage nodes during the initial deployment. You can place certain built-in management components such as vCenter and the management node on their own network segment. These network segments require routing to allow vCenter and the management node to communicate with storage and compute management networks. In most deployments those components use the same management network (VLAN ID 100 in this example).

> ⓘ You configure virtual machine networks using vCenter. The default virtual machine network (port group "VM_Network") in NetApp HCI deployments is configured without a VLAN ID. If you plan to use multiple tagged virtual machine networks (VLAN IDs 200 and 201 in the preceding example), ensure you include them in the initial network planning.

Network configuration and cabling options

You can use a two-cable network configuration for the H410C compute nodes, simplifying cable routing. This configuration uses two SFP+/SFP28 interfaces plus an optional (but recommended) RJ45 interface for IPMI communication. These nodes can also use a six-cable configuration with two RJ45 and four SFP28/SFP+ interfaces.

The H410S and H610S storage nodes support a network topology that uses four network ports (ports A through D).

Compute nodes support three network topologies, depending on the hardware platform:

Configuration option	Cabling for H410C nodes	Cabling for H610C nodes	Cabling for H615C nodes
Option A	Two cables using ports D and E	Two cables using ports C and D	Two cables using ports A and B
Option B	Six cables using ports A through F	Not available	Not available
Option C	Similar to option B, but with native VLANs (or "access ports") on the switch for the management, storage, and vMotion networks		

Nodes that do not have the correct number of connected cables cannot participate in the deployment. For example, you cannot deploy a compute node in a six-cable configuration if it only has ports D and E connected.

> (i) You can adjust the NetApp HCI network configuration after deployment to meet infrastructure needs. However, when you expand NetApp HCI resources, remember that new nodes must have the same cable configuration as the existing compute and storage nodes.

> (i) If the NetApp Deployment Engine fails because your network does not support jumbo frames, you can perform one of the following workarounds:
>
> - Use a static IP address and manually set a maximum transmission unit (MTU) of 9000 bytes on the Bond10G network.
> - Configure the Dynamic Host Configuration Protocol to advertise an interface MTU of 9000 bytes on the Bond10G network.

Network configuration options

- Network configuration option A
- Network configuration option B
- Network configuration option C

Find more information

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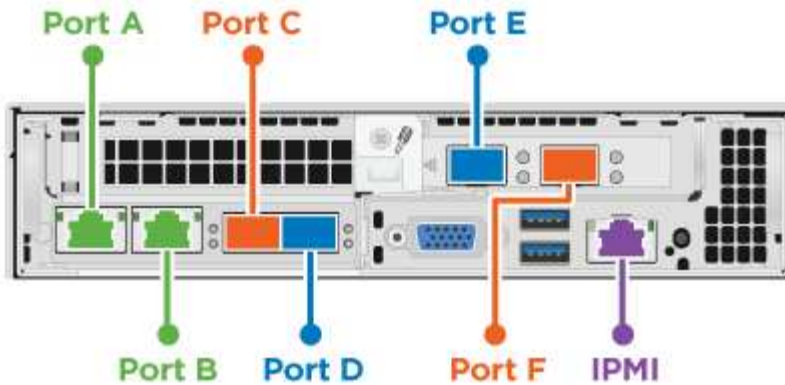
Network configuration

NetApp HCI can utilize multiple different network cabling and VLAN configurations. The first configuration, option A, uses two network cables for each compute node.

Configuration option A: Two cables for compute nodes

The NetApp H410C, H610C, and H615C compute nodes support using two network cables for connectivity to all NetApp HCI networks. This configuration requires that the storage, vMotion and any virtual machine networks use VLAN tagging. All compute and storage nodes must use the same VLAN ID scheme. This configuration uses vSphere Distributed Switches that require VMware vSphere Enterprise Plus licensing.

NetApp HCI documentation uses letters to refer to network ports on the back panel of H-series nodes.

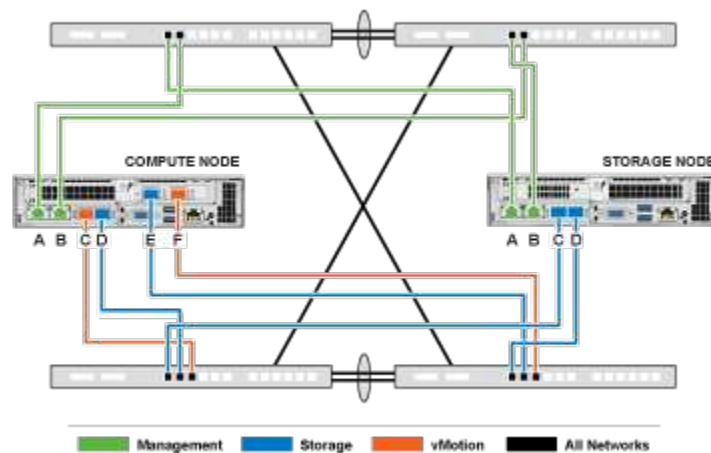Here are the network ports and locations on the H410C storage node:
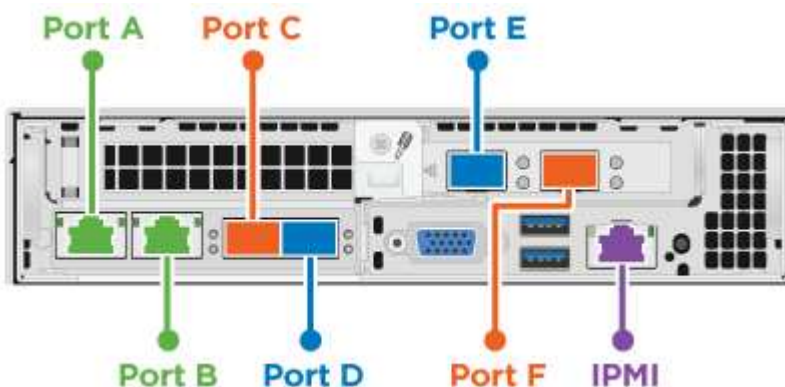
Here are the network ports and locations on the H610C compute node:
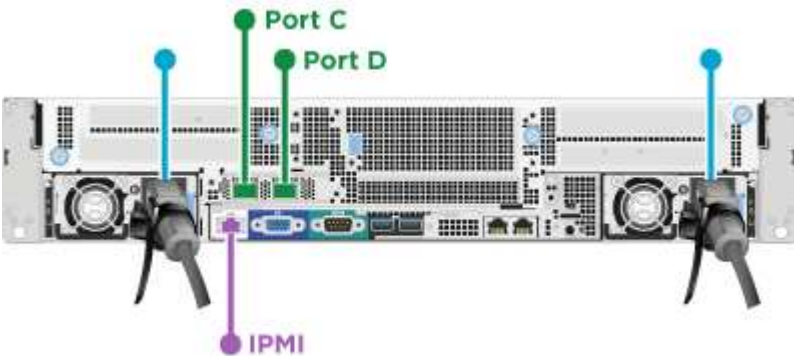
Here are the network ports and locations on the H615C compute node:

This configuration uses the following network ports on each node:

Node	Network ports used
H410C	D and E
H610C	C and D
H615C	A and B

VLAN configuration

As a best practice, you should configure the required network segments on all switch ports that the nodes are using. For example:

Network name	VLAN ID	Switch port configuration
Management	100	Native
Storage	105	Tagged
vMotion	107	Tagged
Virtual machines	200, 201	Tagged

The following illustration shows the recommended cabling configuration for two-cable H410C compute nodes and four-cable H410S storage nodes. All switch ports in this example share the same configuration.

Management | Storage | vMotion | All Networks

Example switch commands

You can use the following example commands to configure all switch ports used for NetApp HCI nodes. These commands are based on a Cisco configuration, but might require only small changes to apply to Mellanox switches. See your switch documentation for the specific commands you need to implement this configuration. Replace the interface name, description, and VLANs with the values for your environment.

```
interface {interface name, such as EthernetX/Y or GigabitEthernetX/Y/Z}
description {desired description, such as NetApp-HCI-NodeX-PortY}
mtu 9216
switchport mode trunk
switchport trunk native vlan 100
switchport trunk allowed vlan 105,107,200,201
spanning-tree port type edge trunk
```

> ⓘ Some switches might require inclusion of the native VLAN in the allowed VLAN list. See the documentation for your specific switch model and software version.

Find more information

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

Network configuration

NetApp HCI can utilize multiple different network cabling and VLAN configurations. The first configuration, option B, uses six network cables for each compute node.

Configuration option B: Six cables for compute nodes

As a secondary network configuration option, the H410C compute nodes support using six network cables for connectivity to all NetApp HCI networks. This configuration requires that the storage, vMotion and any virtual machine networks use VLAN tagging. You can use this configuration with vSphere Standard Switches or vSphere Distributed Switches (which require VMware vSphere Enterprise Plus licensing).

NetApp HCI documentation uses letters to refer to network ports on the back panel of H-series nodes.

Here are the network ports and locations on the H410C compute node:

VLAN configuration

When you deploy compute nodes using six cables and storage nodes using four cables, as a best practice, you should configure the required network segments on all switch ports that the nodes are using. For example:

Network name	VLAN ID	Switch port configuration
Management	100	Native
Storage	105	Tagged
vMotion	107	Tagged
Virtual machines	200, 201	Tagged

The following illustration shows the recommended cabling configuration for six-cable compute nodes and four-cable storage nodes. All switch ports in this example share the same configuration.

Example switch commands

You can use the following example commands to configure all switch ports used for NetApp HCI nodes. These commands are based on a Cisco configuration, but might require only small changes to apply to Mellanox switches. See your switch documentation for the specific commands you need to implement this configuration. Replace the interface name, description, and VLANs with the values for your environment.

```
interface {interface name, such as EthernetX/Y or GigabitEthernetX/Y/Z}
description {desired description, such as NetApp-HCI-NodeX-PortY}
mtu 9216
```

```
switchport mode trunk
switchport trunk native vlan 100
switchport trunk allowed vlan 105,107,200,201
spanning-tree port type edge trunk
```

> ⓘ Some switches might require inclusion of the native VLAN in the allowed VLAN list. See the
> documentation for your specific switch model and software version.

Find more information

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

Network configuration

NetApp HCI can utilize multiple different network cabling and VLAN configurations. The
third configuration, option C, uses six network cables for each compute node with native
VLANs.

Configuration option C: Six cables for compute nodes with native VLANs

You can deploy NetApp HCI without using tagged VLANs for storage and virtualization traffic, and instead rely
on the switch configuration to separate the network segments. You can use this configuration with vSphere
Standard Switches or vSphere Distributed Switches (which require VMware vSphere Enterprise Plus
licensing).

NetApp HCI documentation uses letters to refer to network ports on the back panel of H-series nodes.

Here are the network ports and locations on the H410C storage node:
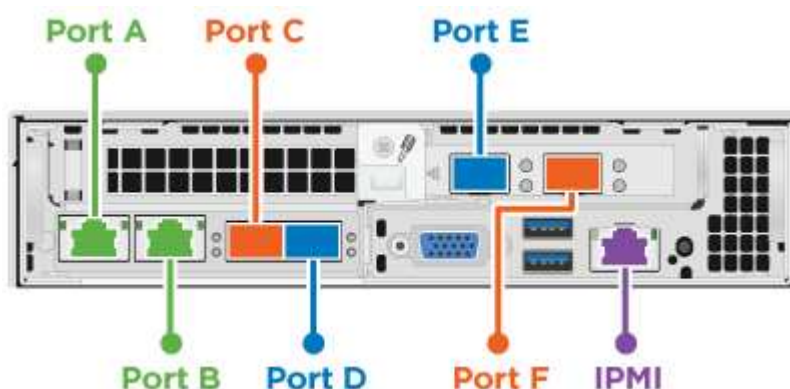
Here are the network ports and locations on the H410S storage node:
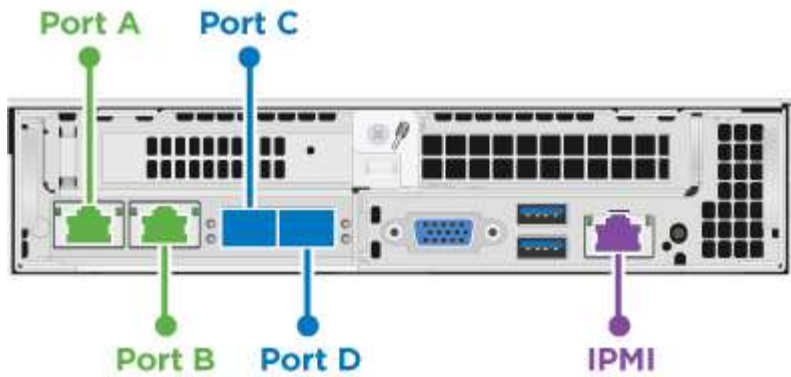
Here are the network ports and locations on the H610S storage node:
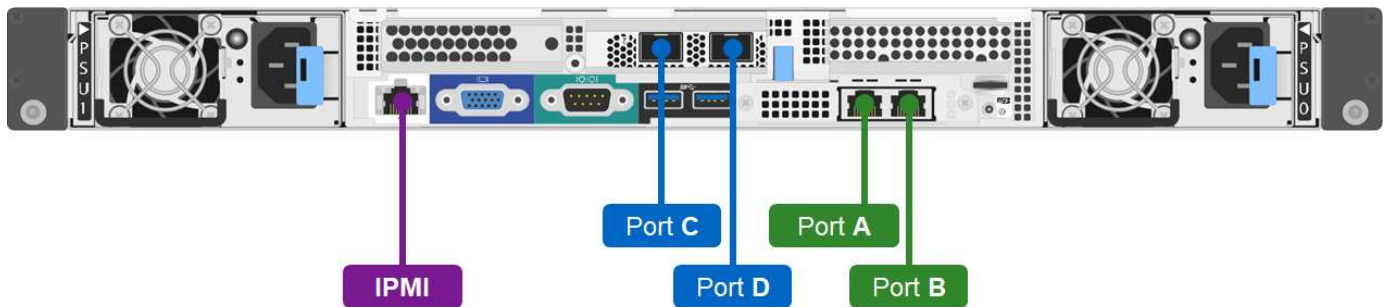
VLAN configuration for H410C, H410S, and H610S nodes

This topology option uses the following VLAN configuration on H410C, H410S, and H610S nodes:

Node ports used	Network name	VLAN ID	Connected switch port configuration
Ports A and B on compute and storage nodes	Management	100	Native
Ports D and E on compute nodes	Storage	105	Native
Ports C and D on storage nodes	Storage	105	Native
Ports C and F on compute nodes	vMotion	107	Native
Ports C and F on compute nodes	Virtual machines	200, 201	Tagged

⚠️ Be careful configuring the switch ports when deploying this configuration. Configuration errors in this network topology can result in deployment problems that are difficult to diagnose.

The following illustration shows the network configuration overview for this topology option. In the example, individual switch ports are configured with the appropriate network segment as the native network.

COMPUTE NODE · STORAGE NODE

Management · Storage · vMotion · All Networks
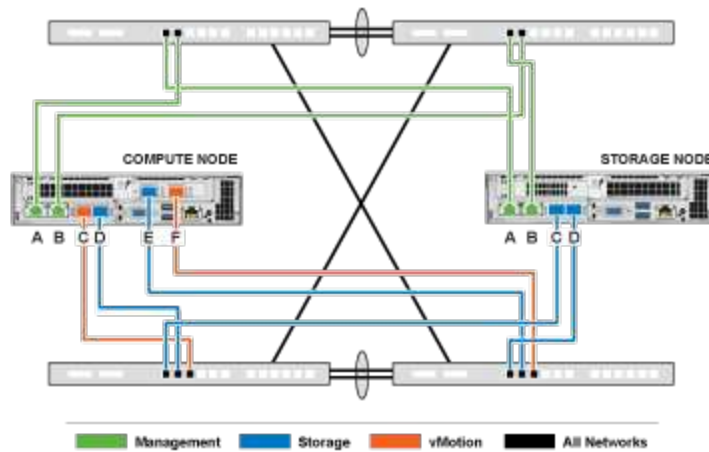
Example switch commands

You can use the following example switch commands to configure switch ports used for the NetApp HCI nodes. These commands are based on a Cisco configuration, but might require only minimal changes to apply to Mellanox switches. See your switch documentation for the specific commands you need to implement this configuration.

You can use the following example commands to configure the switch ports used for the management network. Replace the interface name, description, and VLANs with the values for your configuration.

```
interface {interface name, such as EthernetX/Y or GigabitEthernetX/Y/Z}
description {desired description, such as NetApp-HCI-NodeX-PortA|B}
switchport access vlan 100
spanning-tree port type edge
```

You can use the following example commands to configure the switch ports used for the storage network. Replace the interface name, description, and VLANs with the values for your configuration.

```
interface {interface name, such as EthernetX/Y or GigabitEthernetX/Y/Z}
description {desired description, such as NetApp-HCI-NodeX-PortC|D}
mtu 9216
switchport access vlan 105
spanning-tree port type edge
```

You can use the following example commands to configure the switch ports used for the vMotion and virtual machines network. Replace the interface name, description, and VLANs with the values for your configuration.

```
interface {interface name, such as EthernetX/Y or GigabitEthernetX/Y/Z}
description {desired description, such as NetApp-HCI-NodeX-PortC|F}
mtu 9216
switchport mode trunk
switchport trunk native vlan 107
switchport trunk allowed vlan 200,201
spanning-tree port type edge trunk
```

> ⓘ Some switches might require inclusion of the native VLAN in the allowed VLAN list. See the documentation for your specific switch model and software version.

DNS and timekeeping requirements

Before deployment, you need to prepare Domain Name System (DNS) records for your NetApp HCI system and gather NTP server information. NetApp HCI requires a DNS server with the correct DNS entries and an NTP server for a successful deployment.

Make the following DNS and timeserver preparations before deploying NetApp HCI:

- Create any needed DNS entries for hosts (such as individual compute or storage nodes) and document how the host entries map to the respective IP addresses. During deployment, you will need to assign a prefix to your storage cluster that will be applied to each host; to avoid confusion, keep your DNS naming plans in mind when choosing a prefix.

- If you are deploying NetApp HCI with a new VMware vSphere installation using a fully qualified domain name, you must create one Pointer (PTR) record and one Address (A) record for vCenter Server on any DNS servers in use before deployment.

- If you are deploying NetApp HCI with a new vSphere installation using only IP addresses, you do not need to create new DNS records for vCenter.

- NetApp HCI requires a valid NTP server for timekeeping. You can use a publicly available time server if you do not have one in your environment.

- Ensure that all storage and compute node clocks are in sync with each other, and that the clocks of devices you use to log in to NetApp HCI are in sync with the NetApp HCI nodes.

Find more information

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

Environmental requirements

Ensure that the power for the rack used to install NetApp HCI is supplied by AC power outlets, and that your datacenter provides adequate cooling for the size of your NetApp HCI installation.

For detailed capabilities of each component of NetApp HCI, see the NetApp HCI datasheet.

> ⓘ The H410C compute node operates only on high-line voltage (200-240 VAC). You must ensure that the power requirements are met when you add H410C nodes to an existing NetApp HCI installation.

Find more information

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

Protection domains

NetApp Element software supports protection domains functionality, which optimizes data layout on storage nodes for the best data availability. To use this feature, you should split storage capacity evenly across three or more NetApp H-series chassis for optimal storage reliability. In this scenario, the storage cluster automatically enables protection domains.

Find more information

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

Witness Node resource requirements for two-node storage clusters

NetApp HCI supports a minimum installation size of two storage nodes and two compute nodes. When you install NetApp HCI using a two or three-node storage cluster, you need to be aware of NetApp HCI Witness Nodes and their virtual machine (VM) resource requirements.

When a storage cluster uses two or three nodes, it also deploys a pair of Witness Nodes alongside each storage cluster. Witness Nodes have the following VM resource requirements:

Resource	Requirement
vCPU	4
Memory	12GB
Disk size	67GB

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

> **Best practice:** Configure the Witness Node VMs to use the compute node's local datastore (default set by NDE), do not configure them on shared storage, such as SolidFire storage volumes. To prevent the VMs migrating automatically, set the Witness Node VM's Distributed Resource Scheduler (DRS) automation level to **Disabled**. This prevents both Witness Nodes running on the same compute node and creating a non-high availability (HA) pair configuration.

> ⓘ When the NetApp HCI installation process installs Witness Nodes, a VM template is stored in VMware vCenter that you can use to redeploy a Witness Node in case it is accidentally removed, lost, or corrupted. You can also use the template to redeploy a Witness Node if you need to replace a failed compute node that was hosting the Witness Node. For instructions, see the **Redeploy Witness Nodes for two and three-node storage clusters** section here.

Find more information

- NetApp HCI Resources page

- NetApp Element Plug-in for vCenter Server