



# **Stage 5 Install and boot node4**

## **AFF and FAS Controller Upgrade**

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# Stage 5. Install and boot node4

During Stage 5, you install and boot node4, map the cluster and node-management ports from node2 to node4, and verify the node4 installation. You also move the NAS data LIFs owned by node2 from node3 to node4, and relocate node2's aggregates from node3 to node4.

## Steps

1. [Install and boot node4](#)
2. [Set the FC or UTA/UTA2 configuration on node4](#)
3. [Map ports from node2 to node4](#)
4. [Join the quorum when a node has a different set of network ports](#)
5. [Verify the node4 installation](#)
6. [Restore key-manager configuration on node4](#)
7. [Move non-root aggregates and NAS data LIFs owned by node2 from node3 to node4](#)

## Install and boot node4

You must install node4 in the rack, transfer node2's connections to node4, boot node4, and install ONTAP. You must then reassign any of node2's spare disks, any disks belonging to the root volume, and any non-root aggregates that were not relocated to node3 earlier in the process, as outlined in this section.

### About this task

The relocation operation is paused at the beginning of this stage. This process is mostly automated; the operation pauses to allow you to check its status. You must manually resume the operation. In addition, you must verify the NAS data LIFs have successfully moved to node4.

You need to netboot node4 if it does not have the same version of ONTAP 9 that is installed on node2. After you install node4, boot it from the ONTAP 9 image stored on the web server. You can then download the correct files to the boot media device for subsequent system boots, by following the instructions in [Prepare for netboot](#).

### Important:

- If you are upgrading a V-Series system connected to storage arrays or a system with FlexArray Virtualization software that is connected to storage arrays, you must complete [Step 1](#) through [Step 21](#), then leave this section and follow instructions to [Configure FC ports on node4](#) and to [Check and configure UTA/UTA2 ports on node4](#), entering commands in Maintenance mode. You must then return to this section and resume with [Step 23](#).
- However, if you are upgrading a system with storage disks, you must complete this entire section and then proceed to [Set the FC or UTA/UTA2 configuration on node4](#), entering commands at the cluster prompt.

## Steps

1. Make sure that node4 has sufficient rack space.

If node4 is in a separate chassis from node2, you can put node4 in the same location as node3. If node2 and node4 are in the same chassis, then node4 is already in its appropriate rack location.

2. Install node4 in the rack, following the instructions in the *Installation and Setup Instructions* for the node model.
3. Cable node4, moving the connections from node2 to node4.

Cable the following connections, using the instructions in the *Installation and Setup Instructions* or the *FlexArray Virtualization Installation Requirements and Reference* for the node4 platform, the appropriate disk shelf guide, and the *ONTAP 9 High-Availability Configuration Guide*.

Refer to [References](#) to link to the *FlexArray Virtualization Installation Requirements and Reference* and the *ONTAP 9 High-Availability Configuration Guide*.

- Console (remote management port)
- Cluster ports
- Data ports
- Cluster and node management ports
- Storage
- SAN configurations: iSCSI Ethernet and FC switch ports



You might not need to move the interconnect card/FC-VI card or interconnect/FC-VI cable connection from node2 to node4 because most platform models have unique interconnect card models.

For the MetroCluster configuration, you must move the FC-VI cable connections from node2 to node4. If the new host does not have an FC-VI card, you might need to move the FC-VI card.

4. Turn on the power to node4, and then interrupt the boot process by pressing `Ctrl-C` at the console terminal to access the boot environment prompt.



When you boot node4, you might see the following warning message:

```
WARNING: The battery is unfit to retain data during a power outage. This
is likely
        because the battery is discharged but could be due to other
temporary
        conditions.
When the battery is ready, the boot process will complete
and services will be engaged. To override this delay, press 'c'
followed
        by 'Enter'
```

5. If you see the warning message in Step 4, take the following actions:
  - a. Check for any console messages that might indicate a problem other than a low NVRAM battery, and, if necessary, take any required corrective action.
  - b. Allow the battery to charge and the boot process to complete.



**Attention: Do not override the delay; failure to allow the battery to charge could result in a loss of data.**



Refer to [Prepare for netboot](#).

6. Configure the netboot connection by choosing one of the following actions.



You should use the management port and IP as the netboot connection. Do not use a data LIF IP or a data outage might occur while the upgrade is being performed.

| If Dynamic Host Configuration Protocol (DHCP) is... | Then...   |
|---|---|
| Running   | Configure the connection automatically by entering the following command at the boot environment prompt:<br><code>ifconfig e0M -auto</code>   |
| Not running   | Manually configure the connection by entering the following command at the boot environment prompt:<br><code>ifconfig e0M -addr=&lt;filer_addr&gt; -mask=&lt;netmask&gt; -gw=&lt;gateway&gt; dns=&lt;dns_addr&gt; domain=&lt;dns_domain&gt;</code><br><filer_addr> is the IP address of the storage system.<br><netmask> is the network mask of the storage system.<br><gateway> is the gateway for the storage system.<br><dns_addr> is the IP address of a name server on your network.<br><dns_domain> is the Domain Name Service (DNS) domain name. If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL; you need only the server's host name.<br><br><b>Note:</b> Other parameters might be necessary for your interface. Enter <code>help ifconfig</code> at the firmware prompt for details. |

7. Perform netboot on node4:

| For...                     | Then...  |
|----------------------------|--|
| FAS/AFF8000 series systems | <code>netboot http://&lt;web_server_ip/path_to_web-accessible_directory&gt;/netboot/kernel</code>                  |
| All other systems          | <code>netboot http://&lt;web_server_ip/path_to_web-accessible_directory&gt;/&lt;ontap_version&gt;_image.tgz</code> |

The <path\_to\_the\_web-accessible\_directory> should lead to where you downloaded the <ontap\_version>\_image.tgz in Step 1 in the section [Prepare for netboot](#).



Do not interrupt the boot.

8. From the boot menu, select option (7) Install new software first.

This menu option downloads and installs the new ONTAP image to the boot device.



Disregard the following message: This procedure is not supported for Non-Disruptive Upgrade on an HA pair

The note applies to nondisruptive upgrades of ONTAP, and not upgrades of controllers. Always use netboot to update the new node to the desired image. If you use another method to install the image on the new controller, the wrong image might install. This issue applies to all ONTAP releases.

9. If you are prompted to continue the procedure, enter `y`, and when prompted for the package, enter the URL:

```
http://<web_server_ip/path_to_web-  
accessible_directory>/<ontap_version>_image.tgz
```

10. Complete the following substeps to reboot the controller module:

- a. Enter `n` to skip the backup recovery when you see the following prompt:

```
Do you want to restore the backup configuration now? {y|n}
```

- b. Reboot by entering `y` when you see the following prompt:

```
The node must be rebooted to start using the newly installed  
software. Do you want to reboot now? {y|n}
```

The controller module reboots but stops at the boot menu because the boot device was reformatted, and the configuration data needs to be restored.

11. Select maintenance mode `5` from the boot menu and enter `y` when you are prompted to continue with the boot.
12. Verify that the controller and chassis are configured as HA:

```
ha-config show
```

The following example shows the output of the `ha-config show` command:

```
Chassis HA configuration: ha  
Controller HA configuration: ha
```



System records in a PROM whether they are in an HA pair or stand-alone configuration. The state must be the same on all components within the stand-alone system or HA pair.

13. If the controller and chassis are not configured as HA, use the following commands to correct the configuration:

```
ha-config modify controller ha
```

```
ha-config modify chassis ha
```

If you have a MetroCluster configuration, use the following commands to modify the controller and chassis:

```
ha-config modify controller mcc
```

```
ha-config modify chassis mcc
```

14. Exit maintenance mode:

```
halt
```

Interrupt the autoboot by pressing Ctrl-C at the boot environment prompt.

15. On node3, check the system date, time, and time zone:

```
date
```

16. On node4, check the date by using the following command at the boot environment prompt:

```
show date
```

17. If necessary, set the date on node4:

```
set date <mm/dd/yyyy>
```

18. On node4, check the time by using the following command at the boot environment prompt:

```
show time
```

19. If necessary, set the time on node4:

```
set time <hh:mm:ss>
```

20. If necessary, set the partner system ID on node4:

```
setenv partner- sysid <node2_sysid>
```

a. Save the settings:

```
saveenv
```

21. On the new node, in boot loader, the `partner- sysid` parameter must be set. For node4, `partner- sysid` must be that of node3. Verify the `partner- sysid` for node3:

```
printenv partner- sysid
```

22. Take one of the following actions:

| If your system...                 | Then...                         |
|-----------------------------------|---------------------------------|
| Has disks and no back-end storage | Go to <a href="#">Step 23</a> . |

| If your system...   | Then...   |
|---|---|
| Is a V-Series system or a system with FlexArray Virtualization software connected to storage arrays | <p>a. Go to section <a href="#">Set the FC or UTA/UTA2 configuration on node4</a> and complete the subsections in this section.</p> <p>b. Return to this section and complete the remaining steps, beginning with <a href="#">Step 23</a>.</p> <p><b>Important:</b> You must reconfigure FC onboard ports, CNA onboard ports, and CNA cards before you boot ONTAP on the V-Series or system with FlexArray Virtualization software.</p> |

23. Add the FC initiator ports of the new node to the switch zones.

If required, modify the onboard ports to initiator by referring to the [Configure FC ports on node4](#). See your storage array and zoning documentation for further instructions on zoning.

24. Add the FC initiator ports to the storage array as new hosts, mapping the array LUNs to the new hosts.

See your storage array and zoning documentation for instructions.

25. Modify the worldwide port name (WWPN) values in the host or volume groups associated with array LUNs on the storage array.

Installing a new controller module changes the WWPN values associated with each onboard FC port.

26. If your configuration uses switch-based zoning, adjust the zoning to reflect the new WWPN values.

27. If NetApp Storage Encryption (NSE) is in use on this configuration, the `setenv bootarg.storageencryption.support` command must be set to `true`, and the `kmip.init.maxwait` variable needs to be set to `off` to avoid a boot loop after the node2 configuration is loaded:

```
setenv bootarg.storageencryption.support true

setenv kmip.init.maxwait off
```

28. Boot node into boot menu:

```
boot_ontap menu
```

If you do not have an FC or UTA/UTA2 configuration, execute [Check and configure UTA/UTA2 ports on node4, Step 15](#) so that node4 can recognize node2's disks.

29. For MetroCluster configuration, V-Series systems and systems with FlexArray Virtualization software connected to storage arrays, go to [Check and configure UTA/UTA2 ports on node4, Step 15](#).

## Set the FC or UTA/UTA2 configuration on node4

If node4 has onboard FC ports, onboard unified target adapter (UTA/UTA2) ports, or a UTA/UTA2 card, you must configure the settings before completing the rest of the procedure.



## About this task

You might need to complete the [Configure FC ports on node4](#) section, the [Check and configure UTA/UTA2 ports on node4](#), or both sections.



If node4 does not have onboard FC ports, onboard UTA/UTA2 ports, or a UTA/UTA2 card, and you are upgrading a system with storage disks, you can skip to the [Map ports from node2 to node4](#) section.

However, if you have a V-Series system or have FlexArray Virtualization Software and are connected to storage arrays, and node4 does not have onboard FC ports, onboard UTA/ UTA2 ports, or a UTA/UTA2 card, you must return to the section *Install and boot node4* and resume at [Step 22](#). Make sure that node4 has sufficient rack space. If node4 is in a separate chassis from node2, you can put node4 in the same location as node3. If node2 and node4 are in the same chassis, then node4 is already in its appropriate rack location.

## Choices

- [Configure FC ports on node4](#)
- [Check and configure UTA/UTA2 ports on node4](#)

## Configure FC ports on node4

If node4 has FC ports, either onboard or on an FC adapter, you must set port configurations on the node before you bring it into service because the ports are not preconfigured. If the ports are not configured, you might experience a disruption in service.

### Before you begin

You must have the values of the FC port settings from node2 that you saved in the section [Prepare the nodes for upgrade](#).

## About this task

You can skip this section if your system does not have FC configurations. If your system has onboard UTA/UTA2 ports or a UTA/UTA2 adapter, you configure them in [Check and configure UTA/UTA2 ports on node4](#).

**Important:** If your system has storage disks, you must enter the commands in this section at the cluster prompt. If you have a V-Series system or a system with FlexArray Virtualization Software connected to storage arrays, you enter commands in this section in Maintenance mode.

## Steps

1. Take one of the following actions:

| If the system that you are upgrading...  | Then...  |
|--|--|
| Has storage disks  | <code>system node hardware unified-connect show</code> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <code>ucadmin show</code>                              |

The system displays information about all FC and converged network adapters on the system.

2. Compare the FC settings on node4 with the settings that you captured earlier from node1.
3. Take one of the following actions:

| If the system that you are upgrading...  | Then...   |
|--|---|
| Has storage disks  | Modify the FC ports on node4 as needed: <ul style="list-style-type: none"> <li>• To program target ports:               <pre>ucadmin modify -m fc -t target &lt;adapter&gt;</pre> </li> <li>• To program initiator ports:               <pre>ucadmin modify -m fc -t initiator &lt;adapter&gt;</pre> </li> </ul> -t is the FC4 type: target or initiator. |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Modify the FC ports on node4 as needed: <pre>ucadmin modify -m fc -t initiator -f &lt;adapter_port_name&gt;</pre> -t is the FC4 type, target or initiator. <p><b>Note:</b> The FC ports must be programmed as initiators.</p>   |

4. Exit Maintenance mode:

```
halt
```

5. Boot the system from loader prompt:

```
boot_ontap menu
```

6. After you enter the command, wait until the system stops at the boot environment prompt.
7. Select option 5 from the boot menu for maintenance mode.
8. Take one of the following actions:

| If the system that you are upgrading... | Then...   |
|---|---|
| Has storage disks                       | <ul style="list-style-type: none"> <li>• Skip this section and go to <a href="#">Map ports from node2 to node4</a> if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports.</li> </ul> |

| If the system that you are upgrading...  | Then...  |
|--|--|
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <ul style="list-style-type: none"> <li>• Go to <a href="#">Check and configure UTA/UTA2 ports on node4</a> if node4 has a UTA/UTA2 card or UTA/UTA2 onboard ports.</li> <li>• Skip the section <i>Check and configure UTA/UTA2 ports on node4</i> if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports, return to the section <i>Install and boot node4</i>, and resume at <a href="#">Step 23</a>.</li> </ul> |

## Check and configure UTA/UTA2 ports on node4

If node4 has onboard UTA/UTA2 ports or a UTA/UTA2A card, you must check the configuration of the ports and configure them, depending on how you want to use the upgraded system.

### Before you begin

You must have the correct SFP+ modules for the UTA/UTA2 ports.

### About this task

UTA/UTA2 ports can be configured into native FC mode or UTA/UTA2A mode. FC mode supports FC initiator and FC target; UTA/UTA2 mode allows concurrent NIC and FCoE traffic to share the same 10 GbE SFP+ interface and supports FC target.



NetApp marketing materials might use the term UTA2 to refer to CNA adapters and ports. However, the CLI uses the term CNA.

UTA/UTA2 ports might be on an adapter or on the controller with the following configurations:

- UTA/UTA2 cards ordered at the same time as the controller are configured before shipment to have the personality you requested.
- UTA/UTA2 cards ordered separately from the controller are shipped with the default FC target personality.
- Onboard UTA/UTA2 ports on new controllers are configured (before shipment) to have the personality you requested.

However, you should check the configuration of the UTA/UTA2 ports on node4 and change it, if necessary.



**Attention:** If your system has storage disks, you enter the commands in this section at the cluster prompt unless directed to enter Maintenance mode. If you have a MetroCluster FC system, V-Series system or a system with FlexArray Virtualization software that is connected to storage arrays, you must be in Maintenance mode to configure UTA/UTA2 ports.

### Steps

1. Check how the ports are currently configured by using one of the following commands on node4:

| If the system...  | Then...  |
|-------------------|--|
| Has storage disks | <code>system node hardware unified-connect show</code> |

| If the system...   | Then...                   |
|--|---------------------------|
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <code>ucadmin show</code> |

The system displays output similar to the following example:

```
*> ucadmin show

Node      Adapter  Current  Current  Pending  Pending  Admin
-----  -
f-a       0e       fc       initiator -         -         online
f-a       0f       fc       initiator -         -         online
f-a       0g       cna      target   -         -         online
f-a       0h       cna      target   -         -         online
f-a       0e       fc       initiator -         -         online
f-a       0f       fc       initiator -         -         online
f-a       0g       cna      target   -         -         online
f-a       0h       cna      target   -         -         online
*>
```

- If the current SFP+ module does not match the desired use, replace it with the correct SFP+ module.

Contact your NetApp representative to obtain the correct SFP+ module.

- Examine the output of the `ucadmin show` command and determine whether the UTA/UTA2 ports have the personality you want.
- Take one of the following actions:

| If the CNA ports...                       | Then...   |
|---|---|
| Do not have the personality that you want | Go to <a href="#">Step 5</a> .                                  |
| Have the personality that you want        | Skip Step 5 through Step 12 and go to <a href="#">Step 13</a> . |

- Take one of the following actions:

| If you are configuring... | Then...  |
|---------------------------|--|
| Ports on a UTA/UTA2 card  | Go to <a href="#">Step 7</a>                   |
| Onboard UTA/UTA2 ports    | Skip Step 7 and go to <a href="#">Step 8</a> . |

- If the adapter is in initiator mode, and if the UTA/UTA2 port is online, take the UTA/UTA2 port offline:

```
storage disable adapter <adapter_name>
```

Adapters in target mode are automatically offline in Maintenance mode.

7. If the current configuration does not match the desired use, change the configuration as needed:

```
ucadmin modify -m fc|cna -t initiator|target <adapter_name>
```

- -m is the personality mode, FC or 10 GbE UTA.
- -t is the FC4 type, target or initiator.



You must use FC initiator for tape drives, FlexArray Virtualization systems, and MetroCluster configurations. You must use the FC target for SAN clients.

8. Verify the settings by using the following command and examining its output:

```
ucadmin show
```

9. Verify the settings:

| If the system...   | Then...                   |
|--|---------------------------|
| Has storage disks  | <code>ucadmin show</code> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <code>ucadmin show</code> |

The output in the following examples shows that the FC4 type of adapter "1b" is changing to `initiator` and that the mode of adapters "2a" and "2b" is changing to `cna`:

```
*> ucadmin show
Node  Adapter  Current Mode  Current Type  Pending Mode  Pending Type
Admin Status
-----
-----
f-a   1a       fc           initiator     -             -
online
f-a   1b       fc           target        -             initiator
online
f-a   2a       fc           target        cna           -
online
f-a   2b       fc           target        cna           -
online
4 entries were displayed.
*>
```

10. Place any target ports online by entering one of the following commands, once for each port:

| If the system...   | Then...   |
|--|---|
| Has storage disks  | <code>network fcp adapter modify -node &lt;node_name&gt; -adapter &lt;adapter_name&gt; -state up</code> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <code>fcp config &lt;adapter_name&gt; up</code>   |

11. Cable the port.

12. Take one of the following actions:

| If the system...   | Then...   |
|--|---|
| Has storage disks  | Go to the section <a href="#">Map ports from node2 to node4</a> .                             |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Return to the section <i>Install and boot node4</i> , and resume at <a href="#">Step 23</a> . |

13. Exit Maintenance mode:

```
halt
```

14. Boot node into boot menu:

```
boot_ontap menu
```

If you are upgrading to an A800, go to [Step 23](#).

15. On node4, go to the boot menu, and using 22/7, select the hidden option `boot_after_controller_replacement`. At the prompt, enter node2 to reassign the disks of node2 to node4, as per the following example.

```
LOADER-A> boot_ontap menu ...
*****
*                                     *
* Press Ctrl-C for Boot Menu. *
*                                     *
*****
.
.
Please choose one of the following:

(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
```

- (6) Update flash from backup config.
- (7) Install new software first.
- (8) Reboot node.
- (9) Configure Advanced Drive Partitioning.

Selection (1-9)? 22/7

.

.

(boot\_after\_controller\_replacement) Boot after controller upgrade

(9a) Unpartition all disks and remove their ownership information.

(9b) Clean configuration and initialize node with partitioned disks.

(9c) Clean configuration and initialize node with whole disks.

(9d) Reboot the node.

(9e) Return to main boot menu.

Please choose one of the following:

- (1) Normal Boot.
- (2) Boot without /etc/rc.
- (3) Change password.
- (4) Clean configuration and initialize all disks.
- (5) Maintenance mode boot.
- (6) Update flash from backup config.
- (7) Install new software first.
- (8) Reboot node.
- (9) Configure Advanced Drive Partitioning.

Selection (1-9)? boot\_after\_controller\_replacement

.

This will replace all flash-based configuration with the last backup to disks. Are you sure you want to continue?: yes

.

.

Controller Replacement: Provide name of the node you would like to replace: <name of the node being replaced>

.

.

Changing sysid of node <node being replaced> disks.

Fetches sanown old\_owner\_sysid = 536953334 and calculated old sys id = 536953334

Partner sysid = 4294967295, owner sysid = 536953334

.

.

.

Terminated

```

<node reboots>
.
.
System rebooting...
.
Restoring env file from boot media...
copy_env_file:scenario = head upgrade
Successfully restored env file from boot media...
.
.
System rebooting...
.
.
.
WARNING: System ID mismatch. This usually occurs when replacing a boot
device or NVRAM cards!
Override system ID? {y|n} y
Login: ...

```

16. If the system goes into a reboot loop with the message `no disks found`, this is because it has reset the ports back to the target mode and therefore is unable to see any disks. Continue with [Step 17](#) through [Step 22](#) to resolve this.

17. Press `Ctrl-C` during autoboot to stop the node at the `LOADER>` prompt.

18. At the loader prompt, enter maintenance mode:

```
boot_ontap maint
```

19. In maintenance mode, display all the previously set initiator ports that are now in target mode:

```
ucadmin show
```

Change the ports back to initiator mode:

```
ucadmin modify -m fc -t initiator -f <adapter name>
```

20. Verify that the ports have been changed to initiator mode:

```
ucadmin show
```

21. Exit maintenance mode:

```
halt
```

22. At the loader prompt boot up:

```
boot_ontap
```

Now, on booting, the node can detect all the disks that were previously assigned to it and can boot up as expected.



23. If you are upgrading from a system with external disks to a system that supports internal and external disks (AFF A800 systems, for example), set the node2 aggregate as the root aggregate to ensure node4 boots from the root aggregate of node2. To set the root aggregate, go to the boot menu and select option 5 to enter maintenance mode.



**You must perform the following substeps in the exact order shown; failure to do so might cause an outage or even data loss.**

The following procedure sets node4 to boot from the root aggregate of node2:

- a. Enter maintenance mode:

```
boot_ontap maint
```

- b. Check the RAID, plex, and checksum information for the node2 aggregate:

```
aggr status -r
```

- c. Check the status of the node2 aggregate:

```
aggr status
```

- d. If necessary, bring the node2 aggregate online:

```
aggr_online root_aggr_from_<node2>
```

- e. Prevent the node4 from booting from its original root aggregate:

```
aggr offline <root_aggr_on_node4>
```

- f. Set the node2 root aggregate as the new root aggregate for node4:

```
aggr options aggr_from_<node2> root
```

## Map ports from node2 to node4

You must verify that the physical ports on node2 map correctly to the physical ports on node4, which will allow node4 to communicate with other nodes in the cluster and with the network after the upgrade.

### About this task

Refer to [References](#) to link to the *Hardware Universe* to capture information about the ports on the new nodes. You will use the information later in this section.

The software configuration of node4 must match the physical connectivity of node4 and IP connectivity must be restored before you continue with the upgrade.

Port settings might vary, depending on the model of the nodes. You must make the original node's port and LIF configuration compatible with what you plan the new node's configuration to be. This is because the new node replays the same configuration when it boots, meaning when you boot node4 that Data ONTAP will try to host LIFs on the same ports that were used on node2.

Therefore, if the physical ports on node2 do not map directly to the physical ports on node4, then software configuration changes will be required to restore cluster, management, and network connectivity after the boot. In addition, if the cluster ports on node2 do not directly map to the cluster ports on node4, node4 might not automatically rejoin the quorum when it is rebooted until a software configuration change is made to host the cluster LIFs on the correct physical ports.

### Steps

1. Record all the node2 cabling information for node2, the ports, broadcast domains, and IPspaces, in the table:

| LIF                | Node2 ports | Node2 IPspaces | Node2 broadcast domains | Node4 ports | Node4 IPspaces | Node4 broadcast domains |
|--------------------|-------------|----------------|-------------------------|-------------|----------------|-------------------------|
| Cluster 1          |             |                |                         |             |                |                         |
| Cluster 2          |             |                |                         |             |                |                         |
| Cluster 3          |             |                |                         |             |                |                         |
| Cluster 4          |             |                |                         |             |                |                         |
| Node management    |             |                |                         |             |                |                         |
| Cluster management |             |                |                         |             |                |                         |
| Data 1             |             |                |                         |             |                |                         |
| Data 2             |             |                |                         |             |                |                         |
| Data 3             |             |                |                         |             |                |                         |
| Data 4             |             |                |                         |             |                |                         |
| SAN                |             |                |                         |             |                |                         |
| Intercluster port  |             |                |                         |             |                |                         |

2. Record all the cabling information for node4, the ports, broadcast domains, and IPspaces, in the table.
3. Follow these steps to verify if the setup is a two-node switchless cluster:

- a. Set the privilege level to advanced:

```
cluster::> set -privilege advanced
```

- b. Verify if the setup is a two-node switchless cluster:

```
cluster::> network options switchless-cluster show
```

```
cluster::*> network options switchless-cluster show
Enable Switchless Cluster: false/true
```

The value of this command must match the physical state of the system.

- c. Return to the administration privilege level:

```
cluster::*> set -privilege admin
cluster::>
```

4. Follow these steps to place node4 into quorum:

- a. Boot node4. See [Install and boot node4](#) to boot the node if you have not already done so.  
b. Verify that the new cluster ports are in the Cluster broadcast domain:

```
network port show -node <node> -port <port> -fields broadcast-domain
```

The following example shows that port "e0a" is in the Cluster domain on node4:

```
cluster::> network port show -node node4 -port e0a -fields broadcast-
domain
node          port broadcast-domain
-----
node4        e0a  Cluster
```

- c. If the cluster ports are not in the Cluster broadcast-domain, add them with the following command:

```
broadcast-domain add-ports -ip-space Cluster -broadcast-domain Cluster -ports
<node:port>
```

- d. Add the correct ports to the Cluster broadcast domain:

```
network port modify -node -port -ip-space Cluster -mtu 9000
```

This example adds Cluster port "e1b" on node4:

```
network port modify -node node4 -port e1b -ip-space Cluster -mtu 9000
```

- e. Migrate the cluster LIFs to the new ports, once for each LIF:

```
network interface migrate -vserver Cluster -lif <lif_name> -source-node
node4 destination-node node4 -destination-port <port_name>
```

- f. Modify the home port of the cluster LIFs:

```
network interface modify -vserver Cluster -lif <lif_name> -home-port
<port_name>
```

- g. Remove the old ports from the Cluster broadcast domain:

```
network port broadcast-domain remove-ports
```

This command removes port "e0d" on node4:

```
network port broadcast-domain remove-ports -ip-space Cluster -broadcast
```

```
-domain Cluster -ports node4:e0d
```

h. Verify that node4 has rejoined quorum:

```
cluster show -node node4 -fields health
```

5. Adjust the broadcast domains hosting your cluster LIFs and node-management/clustermanagement LIFs. Ensure that each broadcast domain contains the correct ports. A port cannot be moved between broadcast domains if it is hosting or is home to a LIF so you may need to migrate and modify the LIFs as shown in the following steps:

a. Display the home port of a LIF:

```
network interface show -fields home-node,home-port
```

b. Display the broadcast domain containing this port:

```
network port broadcast-domain show -ports <node_name:port_name>
```

c. Add or remove ports from broadcast domains:

```
network port broadcast-domain add-ports  
network port broadcast-domain remove-ports
```

d. Modify a LIF's home port:

```
network interface modify -vserver <vserver> -lif <lif_name> -home-port  
<port_name>
```

6. Adjust the intercluster broadcast domains and migrate the intercluster LIFs, if necessary, using the same commands shown in [Step 5](#).

7. Adjust any other broadcast domains and migrate the data LIFs, if necessary, using the same commands shown in [Step 5](#).

8. If there were any ports on node2 that no longer exist on node4, follow these steps to delete them:

a. Access the advanced privilege level on either node:

```
set -privilege advanced
```

b. To delete the ports:

```
network port delete -node <node_name> -port <port_name>
```

c. Return to the admin level:

```
set -privilege admin
```

9. Adjust all the LIF failover groups:

```
network interface modify -failover-group <failover_group> -failover-policy  
<failover_policy>
```

The following command sets the failover policy to `broadcast-domain-wide` and uses the ports in failover group `fg1` as failover targets for LIF `data1` on node4:

```
network interface modify -vserver node4 -lif data1 failover-policy broadcast-  
domainwide -failover-group fgl
```

Refer to [References](#) to link to the *ONTAP 9 Network Management Guide* or the *ONTAP 9 Commands: Manual Page Reference* and see *Configuring failover settings on a LIF* for more information.

10. Verify the changes on node4:

```
network port show -node node4
```

## Join the quorum when a node has a different set of network ports

The node with the new controller boots and attempts to join the cluster automatically at first; however, if the new node has a different set of network ports, you must perform the following steps to ensure that the node successfully joins the quorum.

### About this task

You can use these instructions for any relevant node. Node3 is used throughout the following sample.

### Steps

1. Verify that the new cluster ports are in the Cluster broadcast domain by entering the following command and checking the output:

```
network port show -node node -port port -fields broadcast-domain
```

The following example shows that port "e1a" is in the Cluster domain on node3:

```
cluster::> network port show -node node3 -port e1a -fields broadcast-  
domain  
node    port    broadcast-domain  
-----  ----  -  
node3   e1a    Cluster
```

2. Add the correct ports to the Cluster broadcast domain by entering the following command and checking the output:

```
network port modify -node -port -ipSpace Cluster -mtu 9000
```

This example adds Cluster port "e1b" on node3:

```
network port modify -node node3 -port e1b -ipSpace Cluster -mtu 9000
```

3. Migrate the cluster LIFs to the new ports, once for each LIF, using the following command:

```
network interface migrate -vserver Cluster -lif <lif_name> -source-node node3  
destination-node node3 -destination-port <port_name>
```

4. Modify the home port of the cluster LIFs as follows:

```
network interface modify -vserver Cluster -lif <lif_name> -home-port
<port_name>
```

5. If the cluster ports are not in the Cluster broadcast-domain, add them with the following command:

```
network port broadcast-domain add-ports -ipSPACE Cluster -broadcastdomain
Cluster ports node:port
```

6. Remove the old ports from the Cluster broadcast domain. You can use for any relevant node. The following command removes port "e0d" on node3:

```
network port broadcast-domain remove-ports network port broadcast-domain
remove-ports ipSPACE Cluster -broadcast-domain Cluster -ports node3:e0d
```

7. Verify the node has rejoined quorum as follows:

```
cluster show -node node3 -fields health
```

8. Adjust the broadcast domains hosting your cluster LIFs and node-management/cluster management LIFs. Ensure that each broadcast domain contains the correct ports. A port cannot be moved between broadcast domains if it is hosting or is home to a LIF, so you might need to migrate and modify the LIFs as follows:

a. Display the home port of a LIF:

```
network interface show -fields home-node,home-port
```

b. Display the broadcast domain containing this port:

```
network port broadcast-domain show -ports <node_name:port_name>
```

c. Add or remove ports from broadcast domains:

```
network port broadcast-domain add-ports network port broadcast-domain
remove-port
```

d. Modify a home port of a LIF:

```
network interface modify -vserver <vserver-name> -lif <lif_name> -home-port
<port_name>
```

Adjust the intercluster broadcast domains and migrate the intercluster LIFs, if necessary. The data LIFs remain unchanged.

## Verify the node4 installation

After you install and boot node4, you need to verify that it is installed correctly, that it is part of the cluster, and that it can communicate with node3.

### About this task

At this point in the procedure, the operation will have paused as node4 joins quorum.

## Steps

1. Verify that node4 has joined quorum:

```
cluster show -node node4 -fields health
```

2. Verify that node4 is part of the same cluster as node3 and healthy by entering the following command:

```
cluster show
```

3. Check the status of the operation and verify that the configuration information for node4 is the same as node2:

```
system controller replace show-details
```

If the configuration is different for node4, a system disruption might occur later in the procedure.

4. Check that the replaced controller is configured correctly for MetroCluster configuration and not in switch-over mode.



**Attention:** At this stage MetroCluster configuration will not be in a normal state and you might have errors to resolve. See [Verify the health of the MetroCluster configuration](#).

## Re-create VLANs, interface groups, and broadcast domains on node4

After you confirm that node4 is in quorum and can communicate with node3, you must re-create node2's VLANs, interface groups, and broadcast domains on node4. You must also add the node3 ports to the newly re-created broadcast domains.

### About this task

For more information on creating and re-creating VLANs, interface groups, and broadcast domains, go to [References](#) and link to the *ONTAP 9 Network Management Guide*.

## Steps

1. Re-create the VLANs on node4 using the node2 information recorded in the [Relocate non-root aggregates and NAS data LIFs from node2 to node3](#) section:

```
network port vlan create -node <node4> -vlan <vlan-names>
```

2. Re-create the interface groups on node4 using the node2 information recorded in the [Relocate non-root aggregates and NAS data LIFs from node2 to node3](#) section:

```
network port ifgrp create -node <node4> -ifgrp <port_ifgrp_names>-distr-func
```

3. Re-create the broadcast domains on node4 using the node2 information recorded in the [Relocate non-root aggregates and NAS data LIFs from node2 to node3](#) section:

```
network port broadcast-domain create -ipSpace Default -broadcast-domain  
<broadcast_domain_names> -mtu <mtu_size> -ports  
<node_name:port_name,node_name:port_name>
```

4. Add the node4 ports to the newly re-created broadcast domains:

```
network port broadcast-domain add-ports -broadcast-domain
<broadcast_domain_names> -ports <node_name:port_name,node_name:port_name>
```

## Restore key-manager configuration on node4

If you are using NetApp Volume Encryption (NVE) to encrypt volumes on the system you are upgrading, the encryption configuration must be synchronized to the new nodes. Encrypted volumes are taken offline when ARL is complete for node1 aggregates from node2 to node4.

### Steps

1. To synchronize encryption configuration for Onboard Key Manager, run the following command at the cluster prompt:

| For this ONTAP version... | Use this command...                          |
|---------------------------|--|
| ONTAP 9.6 or 9.7          | security key-manager onboard sync            |
| ONTAP 9.5                 | security key-manager setup -node <node_name> |

2. Enter the cluster-wide passphrase for the Onboard Key Manager.

## Move non-root aggregates and NAS data LIFs owned by node2 from node3 to node4

After you verify the node4 installation and before you relocate aggregates from node3 to node4, you need to move the NAS data LIFs belonging to node2 that are currently on node3 from node3 to node4. You also need to verify the SAN LIFs exist on node4.

### About this task

Remote LIFs handle traffic to SAN LUNs during the upgrade procedure. Moving SAN LIFs is not necessary for cluster or service health during the upgrade. SAN LIFs are not moved unless they need to be mapped to new ports. You will verify that the LIFs are healthy and located on appropriate ports after you bring node4 online.

### Steps

1. Resume the relocation operation:

```
system controller replace resume
```

The system performs the following tasks:

- Cluster quorum check
- System ID check
- Image version check
- Target platform check
- Network reachability check

The operation pauses at this stage in the network reachability check.



2. Manually verify that the network and all VLANs, interface groups, and broadcast domains have been configured correctly.
3. Resume the relocation operation:

```
system controller replace resume
```

To complete the "Network Reachability" phase, ONTAP network configuration must be manually adjusted to match the new physical network configuration of the hardware. This includes assigning network ports to the correct broadcast domains, creating any required ifgrps and VLANs, and modifying the home-port parameter of network interfaces to the appropriate ports. Refer to the "Using aggregate relocation to upgrade controller hardware on a pair of nodes running ONTAP 9.x" documentation, Stages 3 and 5. Have all of these steps been manually completed? [y/n]

4. Enter `y` to continue.
5. The system performs the following checks:
  - Cluster health check
  - Cluster LIF status check

After performing these checks, the system relocates the non-root aggregates and NAS data LIFs owned by node2 to the new controller, node4.

The system pauses once the resource relocation is complete.

6. Check the status of the aggregate relocation and NAS data LIF move operations:

```
system controller replace show-details
```

7. Manually verify that the non-root aggregates and NAS data LIFs have been successfully relocated to node4.

If any aggregates fail to relocate or are vetoed, you must manually relocate the aggregates, or override either the vetoes or destination checks, if necessary. See the section [Relocate failed or vetoed aggregates](#) for more information.

8. Ensure that the SAN LIFs are on the correct ports on node4 by completing the following substeps:
  - a. Enter the following command and examine its output:

```
network interface show -data-protocol iscsi|fcp -home-node <node4>
```

The system returns output similar to the following example:

```
cluster::> net int show -data-protocol iscsi|fc -home-node node3
      Logical      Status      Network      Current Current Is
Vserver Interface  Admin/Oper  Address/Mask  Node      Port      Home
-----
vs0
  a0a             up/down    10.63.0.53/24  node3     a0a      true
  data1          up/up      10.63.0.50/18  node3     e0c      true
  rads1          up/up      10.63.0.51/18  node3     e1a      true
  rads2          up/down    10.63.0.52/24  node3     e1b      true
vs1
  lif1           up/up      172.17.176.120/24 node3     e0c      true
  lif2           up/up      172.17.176.121/24 node3     e1a      true
```

- b. If node4 has any SAN LIFs or groups of SAN LIFs that are on a port that did not exist on node2 or that need to be mapped to a different port, move them to an appropriate port on node4 by completing the following substeps:

- i. Set the LIF status to down by entering the following command:

```
network interface modify -vserver <vserver_name> -lif <lif_name> -status
-admin down
```

- ii. Remove the LIF from the port set:

```
portset remove -vserver <vserver_name> -portset <portset_name> -port-name
<port_name>
```

- iii. Enter one of the following commands:

- Move a single LIF by entering the following command:

```
network interface modify -vserver <vserver_name> -lif <lif_name> -home
-port <new_home_port>
```

- Move all the LIFs on a single nonexistent or incorrect port to a new port by entering the following command:

```
network interface modify {-home-port <port_on_node1> -home-node
<node1> -role data} -home-port <new_home_port_on_node3>
```

- Add the LIFs back to the port set:

```
portset add -vserver <vserver_name> -portset <portset_name> -port-name
<port_name>
```



You need to ensure that you move SAN LIFs to a port that has the same link speed as the original port.

- c. Modify the status of all LIFs to `up` so the LIFs can accept and send traffic on the node by entering the following command:

```
network interface modify -home-port <port_name> -home-node <node4> -lif data
-statusadmin up
```

- d. Enter the following command and examine its output to verify that LIFs have been moved to the correct ports and that the LIFs have the status of `up` by entering the following command on either node and examining the output:

```
network interface show -home-node <node4> -role data
```

- e. If any LIFs are down, set the administrative status of the LIFs to `up` by entering the following command, once for each LIF:

```
network interface modify -vserver <vserver_name> -lif <lif_name> -status
-admin up
```

9. Resume the operation to prompt the system to perform the required post-checks:

```
system controller replace resume
```

The system performs the following post-checks:

- Cluster quorum check
- Cluster health check
- Aggregates reconstruction check
- Aggregate status check
- Disk status check
- Cluster LIF status check

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