



## **Stage 5. Install and boot node4**

### **Upgrade controllers**

NetApp

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# Stage 5. Install and boot node4

## Overview

During Stage 5, you install and boot node4, map the cluster and node-management ports from node2 to node4, and verify the node4 installation. If required, you set the FC or UTA/UTA2 configuration on node4 and confirm that node4 has joined quorum. You also relocate node2 NAS data LIFs and non-root aggregates from node3 to node4 and verify the SAN LIFs exist on 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. [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 the node2 connections to to node4, boot node4, and install ONTAP. You must then reassign any spare disks on node2, 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 enable you to check its status. You must manually resume the operation. In addition, you must verify that 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 document, and *High Availability management*.

Refer to [References](#) to link to the *FlexArray Virtualization Installation Requirements and Reference* and *High Availability management*.

- 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 must 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: <code>ifconfig e0M -auto</code>
Not running	<p>Manually configure the connection by entering the following command at the boot environment prompt:</p> <pre>ifconfig e0M -addr=<i>filer_addr</i> -mask=<i>netmask</i> - gw=<i>gateway</i> -dns=<i>dns_addr</i> -domain=<i>dns_domain</i></pre> <p><i>filer_addr</i> is the IP address of the storage system (mandatory).  <i>netmask</i> is the network mask of the storage system (mandatory).  <i>gateway</i> is the gateway for the storage system (mandatory).  <i>dns_addr</i> is the IP address of a name server on your network (optional).  <i>dns_domain</i> 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.</p> <p>NOTE: Other parameters might be necessary for your interface. Enter <code>help ifconfig</code> at the firmware prompt for details.</p>

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 incorrect image might install. This issue applies to all ONTAP releases. The netboot procedure combined with option (7) `Install new software` wipes the boot media and places the same ONTAP version on both image partitions.

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 must 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. In boot loader, set the partner system ID on node4:

```
setenv partner-sysid node3_sysid
```

For node4, partner-sysid must be that of node3.


Save the settings:

```
saveenv
```

21. Verify the partner-sysid for node4:

```
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> .
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> <div>  <p>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> </div>

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 you have NetApp Storage Encryption (NSE) drives installed, perform the following steps.



If you have not already done so earlier in the procedure, see the Knowledge Base article [How to tell if a drive is FIPS certified](#) to determine the type of self-encrypting drives that are in use.

- a. Set `bootarg.storageencryption.support` to true or false:

If the following drives are in use...	Then...
NSE drives that conform to FIPS 140-2 Level 2 self-encryption requirements	<code>setenv bootarg.storageencryption.support <b>true</b></code>
NetApp non-FIPS SEDs	<code>setenv bootarg.storageencryption.support <b>false</b></code>



You cannot mix FIPS drives with other types of drives on the same node or HA pair. You can mix SEDs with non-encrypting drives on the same node or HA pair.

- b. Contact NetApp Support for assistance with restoring the onboard key management information.



28. Boot node into boot menu:

```
boot_ontap menu
```

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

29. For MetroCluster configurations, 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](#).



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	<p>Modify the FC ports on node4 as needed:</p> <ul style="list-style-type: none"><li>• To program target ports: <code>ucadmin modify -m fc -t target adapter</code></li><li>• To program initiator ports: <code>ucadmin modify -m fc -t initiator adapter</code></li></ul> <p>-t is the FC4 type: target or initiator.</p>
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	<p>Modify the FC ports on node4 as needed:</p> <p><code>ucadmin modify -m fc -t initiator -f adapter_port_name</code></p> <p>-t is the FC4 type, target or initiator.</p> <div> The FC ports must be programmed as initiators.</div>

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>
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 10GbE 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>
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
*>
```

2. 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.

3. Examine the output of the `ucadmin show` command and determine whether the UTA/UTA2 ports have the personality you want.
4. 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> .

5. 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> .

6. 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 10GbE 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 <i>node_name</i> -adapter <i>adapter_name</i> -state up</code>
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	<code>fcp config <i>adapter_name</i> 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.

## Expand the console output 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.
Fetched 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
```



If you are upgrading from a system that supports external disks to a system that also supports external disks, go to [Step 22](#).

If you are upgrading from a system that uses external disks to a system that supports both internal and external disks, for example, an AFF A800 system, go to [Step 23](#).

22. At the loader prompt, boot up:

```
boot_ontap menu
```

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

When the cluster nodes you are replacing use root volume encryption, ONTAP software is unable to read the volume information from the disks. Restore the keys for the root volume:

a. Return to the special boot menu:

```
LOADER> boot_ontap 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.
- (10) Set Onboard Key Manager recovery secrets.
- (11) Configure node for external key management.

Selection (1-11)? 10

b. Select **(10) Set Onboard Key Manager recovery secrets**

c. Enter `y` at the following prompt:

```
This option must be used only in disaster recovery procedures. Are you sure?
(y or n): y
```

d. At the prompt, enter the key-manager passphrase.

e. Enter the backup data when prompted.



You must have obtained the passphrase and backup data in the [Prepare the nodes for upgrade](#) section of this procedure.

f. After the system boots to the special boot menu again, run option **(1) Normal Boot**



You might encounter an error at this stage. If an error occurs, repeat the substeps in [Step 22](#) until the system boots normally.

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 confirm that 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 enable 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 -ipspace Cluster -broadcast-domain Cluster -ports
node:port
```

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

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

This example adds Cluster port "e1b" on node4:

```
network port modify -node node4 -port e1b -ipspace 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 -ipspace 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. Confirm 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 fg1
```

Refer to [References](#) to link to *Network Management* 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
```

11. Each cluster LIF must be listening on port 7700. Verify that the cluster LIFs are listening on port 7700:

```
::> network connections listening show -vserver Cluster
```

Port 7700 listening on cluster ports is the expected outcome as shown in the following example for a two-node cluster:

```
Cluster::> network connections listening show -vserver Cluster
Vserver Name      Interface Name:Local Port      Protocol/Service
-----
Node: NodeA
Cluster           NodeA_clus1:7700              TCP/ctlopcp
Cluster           NodeA_clus2:7700              TCP/ctlopcp
Node: NodeB
Cluster           NodeB_clus1:7700              TCP/ctlopcp
Cluster           NodeB_clus2:7700              TCP/ctlopcp
4 entries were displayed.
```

12. For each cluster LIF that is not listening on port 7700, set the administrative status of the LIF to down and then up:

```
::> net int modify -vserver Cluster -lif cluster-lif -status-admin down; net  
int modify -vserver Cluster -lif cluster-lif -status-admin up
```

Repeat step 11 to verify that the cluster LIF is now listening on port 7700.

## 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 confirm 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. Confirm 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 vservice-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 must 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 *Network Management*.

### 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 Aggregate Encryption (NAE) or NetApp Volume Encryption (NVE) to encrypt volumes on the system you are upgrading, the encryption configuration must be synchronized to the new nodes. If you

do not restore key-manager, when you relocate the node2 aggregates from node3 to node4 by using ARL, encrypted volumes will be taken offline.

### 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	<code>security key-manager onboard sync</code>
ONTAP 9.5	<code>security key-manager setup -node <i>node_name</i></code>

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 must 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. Confirm 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|fc -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 vs0 -lif lif1 -status
-admin down
```

- ii. Remove the LIF from the port set:

```
portset remove -vserver vs0 -portset portset1 -port-name
lif1
```

- iii. Enter one of the following commands:

- Move a single LIF by entering the following command:

```
network interface modify -vserver vs0 -lif lif1 -home
-port port2
```

- 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 port1 -home-node node1
-role data} -home-port port2 -home-node node2
```

- Add the LIFs back to the port set:

```
portset add -vserver vs0 -portset portset1 -port-name
lif1
```



You must confirm 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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