



Stage 5. Install and boot node4

AFF and FAS Controller Upgrade

NetApp

February 22, 2022

Table of Contents

- Stage 5. Install and boot node4 1
 - Stage 5. Install and boot node4 1
 - Install and boot node4 1
 - Set the FC or UTA/UTA2 configuration on node4 10
 - Map ports from node2 to node4 17
 - Verify the node4 installation 22
 - Move NAS data LIFs owned by node2 from node3 to node4 and verify SAN LIFs on node4 23
 - Relocate node2’s non-root aggregates from node3 to node4 27

Stage 5. Install and boot node4

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 data LIFs and SAN 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. [Verify the node4 installation](#)
5. [Move NAS data LIFs owned by node2 from node3 to node4 and verify SAN LIFs on node4](#)
6. [Relocate node2's non-root aggregates from node3 to node4](#)

Install and boot node4

You need to install node4 in the rack, transfer node2 connections to node4, and boot node4. You must also reassign any node2 spares, any disks belonging to root, and any non-root aggregates that were not relocated to node3 earlier.

About this task

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](#)

However, you do not need to netboot node4 if it has the same or later version of Data ONTAP 9 that is installed on node2.

Important:

- If you are upgrading a V-Series system or a system with FlexArray Virtualization Software that is connected to storage arrays, you need to complete [Step 1](#) through [Step 7](#), leave this section at [Step 8](#) and follow instructions in [Set the FC or UTA/UTA2 configuration on node4](#) as needed, entering the commands in Maintenance mode. You then need to return to this section and resume the procedure at [Step 9](#).
- However, if you are upgrading a system with storage disks, you need to complete this entire section and then proceed to the section [Set the FC or UTA/UTA2 configuration on node4](#), entering commands at the cluster prompt.

Steps

1. Take one of the following actions:

| If node4 will be in ... | Then... |
|-------------------------------|---|
| A chassis separate from node3 | Go to Step 2 . |
| The same chassis with node3 | Skip Steps 2 and 3 and go to Step 4 . |

2. Make sure that node4 has sufficient rack space.

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

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

The following references help you make proper cable connections. Go to [References](#) to link to them.

- *Installation and Setup Instructions* or *FlexArray Virtualization Installation Requirements and Reference* for the node4 platform
- The appropriate disk shelf procedure
- The *High Availability management* documentation

Cable the following connections:

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



You do 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.

5. Take one of the following actions:

| If node4 is in... | Then... |
|-------------------------------|--------------------------------|
| The same chassis as node3 | Go to Step 8 . |
| A chassis separate from node3 | Go to Step 6 . |

6. Turn on the power to node4, and then interrupt the boot by pressing `Ctrl-C` to access the boot environment prompt.



When you boot node4, you might see the following 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'

7. If you see the warning message in Step 6, 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 finish.



Warning: Do not override the delay. Failure to allow the battery to charge could result in a loss of data.

8. Take one of the following actions:

| If your system... | Then... |
|--|--|
| Has disks and no back-end storage | Skip Step 9 through Step 14 and go to Step 15 . |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <ol style="list-style-type: none">a. Go to the section <i>Set the FC or UTA/UTA2 configuration on node4</i> and complete the sections Configure FC ports on node4 and Check and configure UTA/UTA2 ports on node4, as appropriate to your system.b. Return to this section and complete the remaining steps, beginning with Step 9. <p>Important: You must reconfigure FC onboard ports, UTA/UTA2 onboard ports, and UTA/UTA2 cards before you boot Data ONTAP on the V-Series system.</p> |

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

See your storage array and zoning documentation for instructions.

10. 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.

11. Modify the World Wide 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.

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

13. Verify that the array LUNs are now visible to node4 by entering the following command and examining its output:

```
sysconfig -v
```

The system displays all the array LUNs that are visible to each of the FC initiator ports. If the array LUNs are not visible, you cannot reassign disks from node2 to node4 later in this section.

14. Press **Ctrl-C** to display the boot menu and select Maintenance mode.

15. At the Maintenance mode prompt, enter the following command:

```
halt
```

The system stops at the boot environment prompt.

16. Configure node4 for ONTAP:

```
set-defaults
```

17. If FDE is used in this configuration, the `setenv bootarg.storageencryption.support` variable 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
```

18. If the version of ONTAP installed on node4 is the same or later than the version of ONTAP 9 installed on node2, enter the following command:

```
boot_ontap menu
```

19. Take one of the following actions:

| If the system you are upgrading... | Then... |
|---|---------------------------------|
| Does not have the correct or current ONTAP version on node4 | Go to Step 20 . |
| Has the correct or current version of ONTAP on node4 | Go to Step 25 . |

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



You should use the management port and IP address as the netboot connection. Do not use a data LIF IP address 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: <pre>ifconfig e0M -auto</pre> |

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

21. Perform netboot on node4:

| For... | Then... |
|----------------------------|--|
| FAS/AFF8000 series systems | <pre>netboot http://<web_server_ip/path_to_webaccessible_directory> /netboot/kernel</pre> |
| All other systems | <pre>netboot http://<web_server_ip/path_to_webaccessible_directory/ ontap_version>_image.tgz</pre> |

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.

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

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

Disregard the following message:

"This procedure is not supported for NonDisruptive Upgrade on an HA pair"

The note applies to nondisruptive upgrades of Data ONTAP, and not upgrades of controllers.

23. 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
```

24. Complete the following substeps:

- 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.

25. Select maintenance mode 5 from the boot menu and enter `y` when you are prompted to continue with the boot.
26. Before continuing, go to [Set the FC or UTA/UTA2 configuration on node4](#) to make any necessary changes to the FC or UTA/UTA2 ports on the node. Make the changes recommended in those sections, reboot the node, and go into Maintenance mode.
27. Enter the following command and examine the output to find the system ID of node4:

```
disk show -a
```

The system displays the system ID of the node and information about its disks, as shown in the following example:

```
*> disk show -a  
Local System ID: 536881109  
DISK          OWNER                      POOL  SERIAL NUMBER  HOME  
-----  
0b.02.23      nst-fas2520-2 (536880939)  Pool10 KPG2RK6F      nst-  
fas2520-2 (536880939)  
0b.02.13      nst-fas2520-2 (536880939)  Pool10 KPG3DE4F      nst-  
fas2520-2 (536880939)  
0b.01.13      nst-fas2520-2 (536880939)  Pool10 PPG4KLAA      nst-  
fas2520-2 (536880939)  
.....  
0a.00.0        (536881109)  Pool10 YFKSX6JG  
(536881109)  
.....
```


28. Reassign node2's spares, disks belonging to the root, and any non-root aggregates that were not relocated to node3 earlier in section [Relocate non-root aggregates from node2 to node3](#):

| Disk type... | Run the command... |
|-------------------|---|
| With shared disks | <code>disk reassign -s</code> <code><node2_sysid> -d <node4_sysid> -p <node3_sysid></code> |
| Without shared | <code>disks disk reassign -s</code> <code><node2_sysid> -d <node4_sysid></code> |

For the `<node2_sysid>` value, use the information captured in [Step 10](#) of the *Record node2 information* section. For `<node4_sysid>`, use the information captured in [Step 23](#).



The `-p` option is only required in maintenance mode when shared disks are present.

The `disk reassign` command will reassign only those disks for which `<node2_sysid>` is the current owner.

The system displays the following message:

```
Partner node must not be in Takeover mode during disk reassignment from
maintenance mode.
Serious problems could result!!
Do not proceed with reassignment if the partner is in takeover mode.
Abort reassignment (y/n)? n
```

Enter `n` when asked to abort disk reassignment.

When you are asked to abort disk reassignment, you must answer a series of prompts as shown in the following steps:

- a. The system displays the following message:

```
After the node becomes operational, you must perform a takeover and
giveback of the HA partner node to ensure disk reassignment is
successful.
Do you want to continue (y/n)? y
```

- b. Enter `y` to continue.

The system displays the following message:

```
Disk ownership will be updated on all disks previously belonging to
Filer with sysid <sysid>.
Do you want to continue (y/n)? y
```

c. Enter `y` to allow disk ownership to be updated.

29. If you are upgrading from a system with external disks to a system that supports internal and external disks (A800 systems, for example), set node4 as root to ensure it boots from the root aggregate of node2.



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

```
aggr status -r
```

- b. Check the overall status of the node2 aggregate:

```
aggr status
```

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

```
aggr_online root_aggr_from_<node2>
```

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

```
aggr offline <root_aggr_on_node4>
```

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

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

30. Verify that the controller and chassis are configured as `ha` by entering the following command and observing the output:

```
ha-config show
```

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

```
*> ha-config show
Chassis HA configuration: ha
Controller HA configuration: ha
```

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

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 correct the configuration:

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

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

31. Destroy the mailboxes on node4:

```
mailbox destroy local
```

32. Exit Maintenance mode:

```
halt
```

The system stops at the boot environment prompt.

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

```
date
```

34. On node4, check the date at the boot environment prompt:

```
show date
```

35. If necessary, set the date on node4:

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

36. On node4, check the time at the boot environment prompt:

```
show time
```

37. If necessary, set the time on node4:

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

38. Verify the partner system ID is set correctly as noted in [Step 26](#) under option.

```
printenv partner-sysid
```

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

```
setenv partner-sysid <node3_sysid>
```

a. Save the settings:

```
saveenv
```

40. Enter the boot menu at the boot environment prompt:

```
boot_ontap menu
```

41. At the boot menu, select option **(6) Update flash from backup config** by entering 6 at the prompt.

The system displays the following message:

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

42. Enter `y` at the prompt.

The boot proceeds normally, and the system prompts you to confirm the system ID mismatch.



The system might reboot twice before displaying the mismatch warning.

43. Confirm the mismatch.

The node might complete one round of rebooting before booting normally.

44. Log in to node4.

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 [Configure FC ports on node4](#), 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 [Map ports from node2 to node4](#).

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 *Install and boot node4* section and resume at [Step 9](#). 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 | Go to Step 5 . |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Go to Step 2 . |

2. Access Maintenance mode:

```
boot_ontap maint
```

3. 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.

4. Compare the FC settings on the new nodes with the settings that you captured earlier from the original node.
5. 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"> To program target ports: <pre>system node hardware unified-connect modify -type -t target -adapter <port_name></pre> <ul style="list-style-type: none"> To program initiator ports: <pre>system node unified-connect modify type -t initiator -adapter <port_name></pre> <p>-type 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> <pre>ucadmin modify -m fc -t initiator -f <adapter_port_name></pre> <p>-t is the FC4 type, target or initiator.</p> <p>Note: The FC ports need to be programmed as initiators.</p> |

6. Take one of the following actions:

| If the system that you are upgrading... | Then... |
|--|--|
| Has storage disks | <p>Verify the new settings by entering the following command and examining the output:</p> <pre>system node unified-connect show</pre> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <p>Verify the new settings by entering the following command and examining the output:</p> <pre>ucadmin show</pre> |

7. Take one of the following actions:

| If the default FC settings on the new nodes are... | Then... |
|---|---------------------------------|
| The same as the ones you that captured on the original nodes | Go to Step 11 . |
| Different from the ones that you captured on the original nodes | Go to Step 8 . |

8. Exit Maintenance mode:

halt

9. After you enter the command, wait until the system stops at the boot environment prompt.

10. Take one of the following actions:

| If the system that you are upgrading... | Then... |
|---|--|
| Is a V-Series system or has FlexArray Virtualization software running Data ONTAP 8.3.0 or later | Access Maintenance mode by entering the following command at the boot environment prompt: <code>boot_ontap maint</code> |
| Is not a V-Series system and does not have FlexArray Virtualization software | Boot node4 by entering the following command at the boot environment prompt: <code>boot_ontap</code> |

11. Take one of the following actions:

| If the system that you are upgrading... | Then... |
|--|---|
| Has storage disks | <ul style="list-style-type: none">Go to Check and configure UTA/UTA2 ports on node4 if node4 has a UTA/UTA2A card or UTA/UTA2 onboard ports.Skip the section and go to Map ports from node2 to node4 if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports. |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <ul style="list-style-type: none">Go to Check and configure UTA/UTA2 ports on node4 if node4 has a UTA/ UTA2 card or UTA/UTA2 onboard ports.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 the section at Step 9. |

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> |
| 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 Mode | Current Type | Pending Mode | Pending Type | Admin Status |
|------|---------|--------------|--------------|--------------|--------------|--------------|
| 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.

- Examine the output of the `system node hardware unified-connect show` or `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 Step 5 . |
| Have the personality that you want | Skip Step 5 through Step 12 and go to Step 13 . |

- Take one of the following actions:

| If the system... | Then... |
|--|--|
| Has storage disks and is running Data ONTAP 8.3 | Boot node4 and enter maintenance mode: <code>boot_ontap maint</code> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Go to Step 6 . You should already be in Maintenance mode. |

- Take one of the following actions:

| If you are configuring... | Then... |
|---------------------------|--|
| Ports on a UTA/UTA2A card | Go to Step 7 . |
| Onboard UTA/UTA2 ports | Skip Step 7 and go to Step 8 . |

- 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.

- If the current configuration does not match the desired use, enter the following command to 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 need to use FC initiator for tape drives and FlexArray Virtualization systems. You need to use the FC target for SAN clients.

- Verify the settings by entering the following command and examining its output:

```
ucadmin show
```

- Perform one of the following actions:

| If the system... | Then... |
|--|---|
| Has storage disks | <p>a. Enter the following command:</p> <pre>halt</pre> <p>The system stops at the boot environment prompt.</p> <p>b. Enter the following command:</p> <pre>boot_ontap</pre> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays and is running Data ONTAP 8.3 | <p>Reboot to Maintenance mode:</p> <pre>boot_ontap maint</pre> |

11. Verify the settings:

| If the system... | Then... |
|--|--|
| Has storage disks | <p>Enter the following command:</p> <pre>system node hardware unified-connect show</pre> |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | <p>Enter the following command:</p> <pre>ucadmin show</pre> |

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`.

```
cluster1::> system node hardware unified-connect 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.

```
*> 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.
*>
```

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

13. Cable the port.

14. Perform one of the following actions:

| If the system... | Then... |
|--|--|
| Has storage disks | Go to Map ports from node2 to node4 . |
| 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 the section at Step 9 . |

Map ports from node2 to node4

You need to make sure that the physical ports on node2 map correctly to the physical ports on node4, which will let node4 communicate with other nodes in the cluster and with the network after the upgrade.

Before you begin

You must already have information about the ports on the new nodes, to access this information refer to [References](#) to link to the *Hardware Universe*. You 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.

About this task

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 may not automatically rejoin 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 this table:

| LIF | Node2 ports | Node2 IPspaces | Node2 broadcast domains | Node4 ports | Node4 IPspaces | Node4 broadcast domains |
|--------------------|-------------|----------------|-------------------------|-------------|----------------|-------------------------|
| Cluster 1 | | | | | | |
| Cluster 2 | | | | | | |
| Cluster 3 | | | | | | |
| Cluster 4 | | | | | | |
| Cluster 5 | | | | | | |
| Cluster 6 | | | | | | |
| Node management | | | | | | |
| Cluster management | | | | | | |
| Data 1 | | | | | | |
| Data 2 | | | | | | |
| Data 3 | | | | | | |
| Data 4 | | | | | | |
| SAN | | | | | | |
| Intercluster port | | | | | | |

See the "Recording node2 information" section for the steps to obtain this information.

2. Record all the cabling information for node4, the ports, broadcast domains, and IPspaces, in the previous table using the same procedure in the [Record node2 information](#) section for the steps to obtain this information.
3. Follow these steps to verify if the setup is a two-node switchless cluster:
 - a. Set the privilege level to advanced:
 - b. Verify if the setup is a two-node switchless cluster:

```
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. Get node4 into quorum by performing the following steps:

- a. Boot node4. See [Install and boot node 4](#) 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     e1a  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
```



For a MetroCluster configuration, you might not be able to change the broadcast domain of a port because it is associated with a port hosting the LIF of a sync-destination SVM and see errors similar to, but not restricted, to the following:

```
command failed: This operation is not permitted on a Vserver that is
configured as the destination of a MetroCluster Vserver relationship.
```

Enter the following command from the corresponding sync-source SVM on the remote site to reallocate the sync-destination LIF to an appropriate port:

```
metrocluster vsync resync -vsync <vsync_name>
```

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

```
network interface migrate -vsync 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 -vsync 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 -ipaddress 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/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 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 -vsync <vsync_name> -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-  
domain-wide -failover-group fg1
```

For more information, refer to [References](#) to link to *Network Management* or the *ONTAP 9 Commands: Manual Page Reference*, and go to *Configuring failover settings on a LIF*.

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. If necessary, 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.

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.

Steps

1. At the system prompt, log in to node4.
2. Verify that node4 is both part of the same cluster as node3 and healthy:

```
cluster show
```

3. Verify that node4 can communicate with node3 and that all LIFs are up:

```
network interface show -curr-node <node4>
```

4. Take one of the following actions:

| If node4 is... | Then... |
|----------------------------------|---|
| In a chassis separate from node3 | Connect the HA interconnect between the nodes by completing the following steps: <ol style="list-style-type: none">a. Connect the top interconnect port of node3 to the top interconnect port of node4.b. Connect the bottom interconnect port of node3 to the bottom interconnect port of node4.c. Go to Step 5. |
| In the same chassis as node3 | Go to Step 5 . You do not need to manually connect the HA interconnect between the nodes; in same-chassis configurations, the HA interconnect is connected automatically through the backplane. |

5. Take one of the following actions:

| If the cluster is... | Then... |
|--------------------------|--|
| In a SAN environment | Complete Step 6 and go to the section Move NAS data LIFs owned by node2 from node3 to node4 and verify SAN LIFs on node4 . |
| Not in a SAN environment | Skip Step 6 go to the section Move NAS data LIFs owned by node2 from node3 to node4 and verify SAN LIFs on node4 . |

6. Verify that both node3 and node4 are in quorum by entering the following command on one of the nodes:


```
event log show -messagename scsiblade.*
```

The following example shows the output when the nodes in the cluster are in quorum:

```
cluster::> event log show -messagename scsiblade.*
Time                Node    Severity    Event
-----
8/13/2012 14:03:51  node1    INFORMATIONAL scsiblade.in.quorum: The scsi-
blade ...
8/13/2012 14:03:51  node2    INFORMATIONAL scsiblade.in.quorum: The scsi-
blade ...
8/13/2012 14:03:48  node3    INFORMATIONAL scsiblade.in.quorum: The scsi-
blade ...
8/13/2012 14:03:43  node4    INFORMATIONAL scsiblade.in.quorum: The scsi-
blade ...
```

Move NAS data LIFs owned by node2 from node3 to node4 and verify SAN LIFs on node4

After you verify the node4 installation and before you relocate node2 aggregates from node3 to node4, you need to move the NAS data LIFs owned by node2 currently on node3 from node3 to node4. You also need to verify the SAN LIFs 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 verify that the LIFs are healthy and located on appropriate ports after you bring node4 online.

Steps

1. List all the NAS data LIFs that are not owned by node3 by entering the following command on either node and capturing the output:

```
network interface show -role data -curr-node node3 -is-home false
```

2. Take one of the following actions:

| If node2... | Description |
|---|--|
| Had interface groups or VLANs configured | Go to Step 3 . |
| Did not have interface groups or VLANs configured | Skip Step 3 and go to Step 4 . |

3. Take the following steps to migrate any NAS data LIFs hosted on interface groups and VLANs that originally were on node2 from node3 to node4.
 - a. Migrate any LIFs hosted on node3 that previously belonging to node2 on an interface group to a port on node4 that is capable of hosting LIFs on the same network by entering the following command,

once for each LIF:

```
network interface migrate -vserver <vserver_name> -lif <lif_name>
-destination-node node4 -destination-port <netport|ifgrp>
```

- b. Modify the home port and home node of the LIFs in [Substep a](#) to the port and node currently hosting the LIFs by entering the following command, once for each LIF:

```
network interface modify -vserver <vserver_name> -lif <datalif_name> -home
-node node4 home-port <netport|ifgrp>
```

- c. Migrate any LIFs hosted on node3 that previously belonged to node2 on a VLAN port to a port on node4 that is capable of hosting LIFs on the same network by entering the following command, once for each LIF:

```
network interface migrate -vserver <vserver_name> -lif <datalif_name>
-destination-node node4 -destination-port <netport|ifgrp>
```

- d. Modify the home port and home node of the LIFs in [Substep c](#) to the port and node currently hosting the LIFs by entering the following command, once for each LIF:

```
network interface modify -vserver <vserver_name> -lif <datalif_name> -home
-node <node4> home-port <netport|ifgrp>
```

4. Take one of the following actions:

| If the cluster is configured for... | Then... |
|-------------------------------------|---|
| NAS | Complete Step 5 through Step 8 , skip Step 9 , and complete Step 10 through Step 13 . |
| SAN | Skip Step 5 through Step 8 , and complete Step 9 through Step 13 . |
| Both NAS and SAN | Complete Step 5 through Step 13 . |

5. If you have data ports that are not the same on your platforms, enter the following command to add the ports to the broadcast domain:

```
network port broadcast-domain add-ports -ipspace <IPspace_name> -broadcast
-domain mgmt ports <node:port>
```

The following example adds port "e0a" on node "6280-1" and port "e0i" on node "8060-1" to broadcast domain mgmt in the IPspace Default:

```
cluster::> network port broadcast-domain add-ports -ipspace Default
-broadcast-domain mgmt -ports 6280-1:e0a, 8060-1:e0i
```

6. Migrate each NAS data LIF to node4 by entering the following command, once for each LIF:

```
network interface migrate -vserver <vserver-name> -lif <datalif-name>
-destination-node <node4> -destination-port <netport|ifgrp> -home-node <node4>
```

7. Make sure that the data migration is persistent:

```
network interface modify -vserver <vserver_name> -lif <datalif_name> -home
-port <netport|ifgrp>
```

8. Verify the status of all links as up by entering the following command to list all the network ports and examining its output:

```
network port show
```

The following example shows the output of the `network port show` command with some LIFs up and others down:

```
cluster::> network port show
```

| (Mbps) | | | | | | Speed |
|----------------------------|-------|---------|------------------|-------|-------|------------|
| Node | Port | IPspace | Broadcast Domain | Link | MTU | Admin/Oper |
| ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| node3 | | | | | | |
| | a0a | Default | - | up | 1500 | auto/1000 |
| | e0M | Default | 172.17.178.19/24 | up | 1500 | auto/100 |
| | e0a | Default | - | up | 1500 | auto/1000 |
| | e0a-1 | Default | 172.17.178.19/24 | up | 1500 | auto/1000 |
| | e0b | Default | - | up | 1500 | auto/1000 |
| | e1a | Cluster | Cluster | up | 9000 | auto/10000 |
| | e1b | Cluster | Cluster | up | 9000 | auto/10000 |
| node4 | | | | | | |
| | e0M | Default | 172.17.178.19/24 | up | 1500 | auto/100 |
| | e0a | Default | 172.17.178.19/24 | up | 1500 | auto/1000 |
| | e0b | Default | - | up | 1500 | auto/1000 |
| | e1a | Cluster | Cluster | up | 9000 | auto/10000 |
| | e1b | Cluster | Cluster | up | 9000 | auto/10000 |
| 12 entries were displayed. | | | | | | |

9. If the output of the `network port show` command displays network ports that are not available in the new node and are present in the old nodes, delete the old network ports by completing the following substeps:

- a. Enter the advanced privilege level by entering the following command:

```
set -privilege advanced
```

- b. Enter the following command, once for each old network port:

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

- c. Return to the admin level by entering the following command:

```
set -privilege admin
```

10. Ensure that the SAN LIFs are on the correct ports on node4 by completing the following substeps:

a. Enter the following command:

```
network interface show -data-protocol iscsi|fcip -home-node node4
```

The system returns output similar to the following example:

```
cluster::> network interface show -data-protocol iscsi|fcip -home-node
node4
```

| | 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 |

b. If node4 has any SAN LIFs or groups of SAN LIFs that are on a port that did not exist on node2, move them to an appropriate port on node4 by entering one of the following commands:

i. Set the LIF status to down:

```
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:

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

- Move all the LIFs on a single nonexistent or incorrect port to a new port:

```
network interface modify {-home-port <port_on_node2> -home-node
```

```
<node2> -role data} -home-port <new_home_port_on_node4>
```

- 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.

11. 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 -vserver <vserver_name> -home-port <port_name> -home  
-node <node4> lif <lif_name> -status-admin up
```

12. Verify that any SAN 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
```

13. 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
```

Relocate node2's non-root aggregates from node3 to node4

Having relocated node2's non-root aggregates to node3, you now must relocate them from node3 to node4.

Steps

1. Enter the following command on either controller, and examine the output to identify which non-root aggregates to relocate:

```
storage aggregate show -owner-name <node3> -home-id <node2_system_id>
```

2. Relocate the aggregates by completing the following substeps:

- a. Access the advanced privilege level by entering the following command on either node:

```
set -privilege advanced
```

- b. Enter the following command:

```
storage aggregate relocation start -node <node3> -destination <node4>  
-aggregate-list <aggr_name1, aggr_name2...> -ndo-controller-upgrade true
```

The aggregate list is the list of aggregates owned by node4 that you obtained in [Step 1](#).

- c. When prompted, enter `y`.

Relocation occurs in the background. It could take anywhere from a few seconds to a couple of minutes to relocate an aggregate. The time includes both client outage and non-outage portions. The command does not relocate any offline or restricted aggregates.

d. Return to the admin level:

```
set -privilege admin
```

3. Check the relocation status:

```
storage aggregate relocation show -node <node3>
```

The output will display `Done` for an aggregate after it has been relocated.



Wait until all the node2 aggregates have been relocated to node4 before proceeding to the next step.

4. Take one of the following actions:

| If relocation of... | Then... |
|-------------------------------|--------------------------------|
| All aggregates was successful | Go to Step 5 . |

| If relocation of... | Then... |
|---------------------------------------|--|
| Any aggregates failed, or were vetoed | <p>a. Check the EMS logs for the corrective action.</p> <p>b. Perform the corrective action.</p> <p>c. Access the advanced privilege level by entering the following command on either node:</p> <pre>set -privilege advanced</pre> <p>d. Relocate any failed or vetoed aggregates:</p> <pre>storage aggregate relocation start -node <node3> destination <node4> -aggregate-list <aggr_name1, aggr_name2...> ndo-controller- upgrade true</pre> <p>The aggregate list is the list of failed or vetoed aggregates.</p> <p>e. When prompted, enter <i>y</i>.</p> <p>f. Return to the admin level by entering the following command:</p> <pre>set -privilege admin</pre> <p>If necessary, you can force the relocation using one of the following methods:</p> <ul style="list-style-type: none"> • Overriding veto checks: <pre>storage aggregate relocation start -override -vetoes -ndo-controller-upgrade</pre> • Overriding destination checks: <pre>storage aggregate relocation start -override -destination-checks -ndocontroller-upgrade</pre> <p>For more information about storage aggregate relocation commands refer to References to link to <i>Disk and aggregate management with the CLI</i> and the <i>ONTAP 9 Commands: Manual Page Reference</i>.</p> |

5. Verify that all node2 non-root aggregates are online and their state on node4:

```
storage aggregate show -node <node4> -state offline -root false
```

The node2 aggregates were listed in the output of the command in [Step 1](#).

6. If any aggregate has gone offline or become foreign, bring it online by using the following command for each aggregate:

```
storage aggregate online -aggregate <aggr_name>
```

7. Verify that all the volumes in node2 aggregates are online on node4:

```
volume show -node <node4> -state offline
```

8. If any volumes are offline on node4, bring them online:

```
volume online -vserver <vserver-name> -volume <volume_name>
```

9. Send a post-upgrade AutoSupport message to NetApp for node4:

```
system node autosupport invoke -node <node4> -type all -message "<node2>  
successfully upgraded from <platform_old> to <platform_new>"
```


Copyright Information

Copyright © 2022 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.