Using Aggregate Relocation to Manually Upgrade Controller Hardware
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Using aggregate relocation to upgrade controller hardware on a pair of nodes running ONTAP 9.x

You can nondisruptively upgrade the controller hardware on a pair of nodes running ONTAP 9.x by migrating non-root aggregates from the original nodes to the new nodes in the same cluster. The data hosted on the nodes that are being upgraded is accessible during the upgrade.

**About this task**

This procedure uses a method called aggregate relocation (ARL), which takes advantage of the HA configuration to enable you to move ownership of non-root aggregates from one node to another, if they share storage within the same cluster.

During the procedure, you upgrade the original controller hardware with the replacement controller hardware, relocating the ownership of non-root aggregates. You migrate aggregates multiple times from node to node to ensure that at least one node is serving data from the aggregates throughout the upgrade procedure. You also migrate data logical interfaces (LIFs) and assign the network ports on the new controller to the interface groups as you proceed.

**Important:** This procedure is complex and assumes that you have advanced ONTAP administration skills. You also should read and understand the "How the upgrade using ARL works" and "Guidelines for upgrading controllers with ARL" sections before beginning the upgrade.

In this document, the original nodes are called *node1* and *node2*, and the new nodes are called *node3* and *node4*. During the described procedure, *node1* is replaced by *node3*, and *node2* is replaced by *node4*.

**Attention:** This procedure assumes that the replacement controller hardware is new and has not been used. The steps required to prepare used controllers with the `wipeconfig` command are not included in this procedure. You must contact technical support if the replacement controller hardware was previously used, especially if the controllers were running Data ONTAP in 7-Mode.

The terms *node1*, *node2*, *node3*, and *node4* are used only to distinguish between the original and new nodes. When following the procedure, you must substitute the real names of your original and new nodes. However, in reality, the names of the nodes do not change: *node3* has the name *node1*, and *node4* has the name *node2* after the controller hardware is upgraded.

**Note:** You can use this procedure to upgrade the controller hardware in clusters with more than two nodes; however, you need to perform the procedure separately for each HA pair in the cluster.

This procedure applies both to FAS systems, V-Series systems, AFF systems, and systems with FlexArray Virtualization Software.

FAS systems released after ONTAP 9 can attach to storage arrays if the required license is installed. The existing V-Series systems are supported in Data ONTAP 9. See the V-Series Support Matrix at Hardware Universe at [hwu.netapp.com](http://hwu.netapp.com) for information about the storage array and V-Series models.
This procedure applies both to FAS systems, V-Series systems, AFF systems, and systems with FlexArray Virtualization Software.

**Note:** This document uses the term *systems with FlexArray Virtualization Software* to refer to systems that belong to these new platforms. It uses the term *V-Series system* to refer to the separate hardware systems that can attach to storage arrays.

This procedure applies to MetroCluster 4-node and 8-node configurations running ONTAP 9.5 and earlier. For MetroCluster configurations running ONTAP 9.6 and later, see *Using Aggregate Relocation to Upgrade Controller Hardware Running ONTAP 9.5 or Later*

### Deciding whether to use the aggregate relocation guide

This guide describes how to upgrade the storage controllers in an HA pair with new controllers while keeping all the existing data and disks. This is a complex procedure that should be used only by experienced administrators.

You should use this guide under the following circumstances:

- You do not want to add the new controllers as a new HA pair to the cluster and migrate the data using volume moves.
- You are experienced in administering ONTAP and are comfortable with the risks of working in the diagnostic privilege mode.
- You have a system that uses MetroCluster 4-node and 8-node configurations running ONTAP 9.5 and earlier.

**Note:** You can use NetApp Storage Encryption (NSE) and NetApp Volume Encryption (NVE) with this procedure.

If you prefer a different method of upgrading the controller hardware and are willing to do volume moves, use the *Controller Hardware Upgrade Express Guide* instead. See the ONTAP 9 Documentation Center to access ONTAP 9 product documentation.

**Related information**

- *Controller Hardware Upgrade Express Guide*
- *ONTAP 9 Documentation Center*

### How the upgrade using ARL works

Before you upgrade the nodes using ARL, you should understand how the procedure works. In this document, the procedure is broken down into several stages.

During the procedure, you upgrade the original controller hardware with the replacement controller hardware, one controller at a time, taking advantage of the HA configuration to relocate the ownership of non-root aggregates. All non-root aggregates must undergo two relocations to reach their final destination, which is the correct upgraded node.

Each aggregate has a home owner and current owner. The home owner is the actual owner of the aggregate, and the current owner is the temporary owner.

The following illustration shows the stages of the procedure. The thick, light gray arrows represent the relocation of aggregates and the movement of LIFs, and the thinner black arrows represent the removal of the original nodes. The smaller controller images represent the original nodes, and the larger controller images represent the new nodes.
The following table describes the high-level tasks you perform during each stage and the state of aggregate ownership at the end of the stage. Detailed steps are provided later in the procedure:

<table>
<thead>
<tr>
<th>Stage 1: Preparing for the upgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determining whether the controller has aggregates on internal disk drives. This step is required only if you are upgrading from a controller with internal disk drive.</td>
</tr>
<tr>
<td>2. Preparing the nodes for the upgrade</td>
</tr>
<tr>
<td>3. Rekeying disks for Storage Encryption This task is required only if you are upgrading from a system with self-encrypting drives.</td>
</tr>
<tr>
<td>4. Verifying the SnapMirror relationship state on the cluster and quiesce all relationships between the clusters.</td>
</tr>
<tr>
<td>5. Preparing for netboot</td>
</tr>
</tbody>
</table>

Aggregate ownership at the end of Stage 1:
- Node1 is the home owner and current owner of node1 aggregates.
- Node2 is the home owner and current owner of node2 aggregates.
<table>
<thead>
<tr>
<th>Stage 2: Retiring node1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relocating non-root aggregates from node1 to node2</td>
</tr>
<tr>
<td>2. Moving non-SAN data LIFs owned by node1 to node2</td>
</tr>
<tr>
<td>3. Recording node1 information</td>
</tr>
<tr>
<td>4. Retiring node1</td>
</tr>
</tbody>
</table>

Aggregate ownership at the end of Stage 2:
- Node1 is the home owner of node1 aggregates.
- Node2 is the current owner of node1 aggregates.
- Node2 is the home owner and current owner of node2 aggregates.

<table>
<thead>
<tr>
<th>Stage 3: Bringing up node3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Installing and booting node3</td>
</tr>
<tr>
<td>2. Setting the UTA/UTA2 configuration on node3</td>
</tr>
<tr>
<td>3. Mapping ports from node1 to node3</td>
</tr>
<tr>
<td>4. Verifying the node3 installation</td>
</tr>
<tr>
<td>5. Moving non-SAN data LIFs owned by node1 from node2 to node3 and verifying SAN LIFs on node3</td>
</tr>
<tr>
<td>6. Relocating non-root aggregates from node2 to node3</td>
</tr>
<tr>
<td>7. Moving non-SAN data LIFs owned by node2 to node3</td>
</tr>
</tbody>
</table>

Aggregate ownership at the end of Stage 3:
- Node2 is the home owner of node2 aggregates but not the current owner.
- Node3 is the home owner and current owner of aggregates that originally belonged to node1.
- Node3 is the current owner of aggregates belonging to node2 but not the home-owner.

<table>
<thead>
<tr>
<th>Stage 4: Retiring node2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recording node2 information</td>
</tr>
<tr>
<td>2. Retiring node2</td>
</tr>
</tbody>
</table>

No changes occur in aggregate ownership.

<table>
<thead>
<tr>
<th>Stage 5: Bringing up node4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Installing and booting node4</td>
</tr>
<tr>
<td>2. Setting the UTA/UTA2 configuration on node4</td>
</tr>
<tr>
<td>3. Mapping ports from node2 to node4</td>
</tr>
<tr>
<td>4. Verifying node4 installation</td>
</tr>
<tr>
<td>5. Moving non-SAN data LIFs owned by node2 from node3 to node4 and verifying SAN LIFs on node4</td>
</tr>
<tr>
<td>6. Relocating node2’s non-root aggregates from node3 to node4</td>
</tr>
</tbody>
</table>

Aggregate ownership at the end of Stage 5:
- Node3 is the home owner and current owner of aggregates that originally belonged to node1.
- Node4 is the home owner and current owner of aggregates that originally belonged to node2.
Stage 6: Completing the upgrade
1. Ensuring that the new controllers are set up correctly
2. Setting up Storage Encryption on the new nodes
   This task is required only if you are upgrading to a system with self-encrypting drives.
3. Decommissioning the old system
4. Resume SnapMirror relationship

   **Note:** storage virtual machine (SVM) disaster recovery updates will not be interrupted as per the schedules assigned.

   No changes occur in aggregate ownership.

### Guidelines for upgrading controllers with ARL

To understand whether you can use aggregate relocation (ARL) to upgrade a pair of controllers running ONTAP 9.x depends on the platform and the configuration of both the original and replacement controllers.

**Supported upgrades for ARL**

You can upgrade a pair of nodes using ARL under the following circumstances:

- Both the original controllers and the replacement controllers must be running the same version of ONTAP 9.x before the upgrade.
- The replacement controllers must have equal or higher capacity than the original controllers. Equal or higher capacity refers to attributes, such as the NVRAM size, volume, LUN, or aggregate count limits; it also refers to the maximum volume or aggregate sizes of the new nodes.
- You can upgrade the following type of systems:
  - A FAS system to a FAS system
  - A FAS system to a V-Series system or a system with FlexArray Virtualization Software
  - A V-Series system to a V-Series system or a system with FlexArray Virtualization Software
  - A V-Series system or a system with FlexArray Virtualization Software to a FAS system, provided that the V-Series system or system with FlexArray Virtualization Software has no array LUNs.
  - An AFF system to an AFF system

   **Note:** Before performing an AFF system upgrade, you must upgrade ONTAP to release versions 9.3P12, 9.4P6 or 9.5P1 or later. These release levels are required for a successful upgrade.

- Controller upgrade using ARL is supported on systems configured with SnapLock Enterprise and SnapLock Compliance volumes.

You should verify whether the ARL can be performed on the original and replacement controllers. You should check the size of all defined aggregates and number of disks supported by the original system. Then compare them with the aggregate size and number of disks supported by the new system. This information is available in the Hardware Universe at hwu.netapp.com. The aggregate size and the number of disks supported by the new system must be equal to or greater than the aggregate size and number of disks supported by the original system.

You should validate in the cluster mixing rules whether new nodes can become part of the cluster with the existing nodes, when the original controller is replaced. For more information about cluster mixing rules, see the Hardware Universe at hwu.netapp.com
**Note:** Both systems are either high-availability (HA) or non-HA. Both nodes must either have the personality enabled or disabled; you cannot combine a node with the All Flash Optimized personality enabled with a node that does not have the personality enabled in the same HA pair. If the personalities are different, contact technical support.

**Note:** If the new system has fewer slots than the original system, or if it has fewer or different ports, you might need to add an adapter to the new system. See the Hardware Universe on the NetApp Support Site for details about specific platforms.

**Upgrades not supported for ARL**

You cannot perform the following upgrades:

- To or from controllers that cannot run ONTAP 9.x.
  Controller upgrades for systems running Data ONTAP operating in 7-Mode are available on the NetApp Support Site at mysupport.netapp.com.
- To replacement controllers that do not support the disk shelves connected to the original controllers
  See the Hardware Universe at hwu.netapp.com for disk-support information.
- From controllers with root aggregates or data aggregates on internal drives
  If you want to upgrade controllers with root aggregates or data aggregates on internal disk drives, see the procedure Upgrading a pair of nodes running clustered Data ONTAP by moving volumes in Controller Hardware Upgrade Express Guide

**Note:** If you want to upgrade ONTAP on nodes in a cluster, see the ONTAP 9 Upgrade and Revert/Downgrade Guide at the ONTAP 9 Documentation Center.

**Assumptions and terminology**

This document is written with the following assumptions:

- The replacement controller hardware is new and has not been used.

  **Attention:** Because this procedure assumes that the replacement controller hardware is new and has not been used, the steps required to prepare used controllers with the `wipeconfig` command are not included in this procedure. You must contact technical support if the replacement controller hardware was previously used, especially if the controllers were running Data ONTAP in 7-Mode.

- You read and understand the guidelines for upgrading the pair of nodes.

  **Attention:** Do not try to clear the NVRAM contents. If you need to clear the contents of NVRAM, contact NetApp technical support.

- You are performing the appropriate command before and after the `modify` commands and comparing the output of both `show` commands to verify that the `modify` command was successful.

- If you have a SAN configuration, you have local and partner LIFs for each storage virtual machine (SVM), on the HA pair.
  If you do not have local and partner LIFs for each SVM, you should add the SAN data LIF on the remote and local node for that SVM before beginning the upgrade.

- If you have port sets in a SAN configuration, you must have verified that each bound port set contains at least one LIF from each node in the HA pair.
This procedure uses the term *boot environment prompt* to refer to the prompt on a node from which you can perform certain tasks, such as rebooting the node and printing or setting environmental variables. The prompt is sometimes referred to informally as the *boot loader prompt*.

The boot environment prompt is shown in the following example:

```
LOADER>
```

**Licensing in ONTAP 9.x**

When you set up a cluster, the setup wizard prompts you to enter the cluster-base license key. However, some features require additional licenses, which are issued as *packages* that include one or more features. Each node in the cluster must have its own key for each feature to be used in the cluster.

If you do not have new license keys, currently licensed features in the cluster are available to the new controller. However, using unlicensed features on the controller might put you out of compliance with your license agreement, so you should install the new license key or keys for the new controller after the upgrade is complete.

All license keys are 28 uppercase alphabetic characters in length. You can obtain new 28-character license keys for ONTAP 9 on the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com). The keys are available in the *My Support* section under *Software licenses*. If the site does not have the license keys you need, you can contact your NetApp sales representative.

For detailed information about licensing, see the *System Administration Reference* on the *ONTAP 9 Documentation Center*.

**Storage Encryption**

The original nodes or the new nodes might be enabled for Storage Encryption. In that case, you need to take additional steps in this procedure to verify that Storage Encryption is set up properly.

If you want to use Storage Encryption, all the disk drives associated with the nodes must have self-encrypting disk drives.

**Two-node switchless clusters**

If you are upgrading nodes in a two-node switchless cluster, you can leave the nodes in the switchless cluster while performing the upgrade. You do not need to convert them to a switched cluster.

**Troubleshooting**

If any problems occur while upgrading the controllers, you can refer to the *Troubleshooting* section at the end of the procedure for more information and possible solutions.

If you do not find a solution to the problem you encountered, you should contact technical support.

**Related information**

*Controller Hardware Upgrade Express Guide*

**Required tools and documentation**

You must have specific tools to install the new hardware, and you need to reference other documents during the upgrade process. You also need to record information essential to completing the controller upgrade; a worksheet is provided to record information.

You need the following tools to perform the upgrade:

- Grounding strap
- #2 Phillips screwdriver
Using Aggregate Relocation to Manually Upgrade Controller Hardware
Using aggregate relocation to upgrade controller hardware on a pair of nodes running ONTAP 9.x

<table>
<thead>
<tr>
<th>Document</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONTAP 9 Software Setup Guide</td>
<td>Describes how to set up and configure NetApp systems</td>
</tr>
<tr>
<td>ONTAP 9 System Administration Reference</td>
<td>Describes how to administer ONTAP systems, shows you how to use the CLI interface, how to access the cluster, how to manage nodes, and much more</td>
</tr>
<tr>
<td>ONTAP 9 Upgrade and Revert/Downgrade Guide</td>
<td>Contains instructions for downloading and upgrading ONTAP</td>
</tr>
<tr>
<td>ONTAP 9 Disks and Aggregates Power Guide</td>
<td>Describes how to manage ONTAP physical storage, shows you how to create, expand, and manage aggregates, how to work with Flash Pool aggregates, how to manage disks, and how to manage RAID policies</td>
</tr>
<tr>
<td>ONTAP 9 Logical Storage Management Guide</td>
<td>Describes how to efficiently manage your logical storage resources, using volumes, FlexClone volumes, files and LUNs, FlexCache volumes, deduplication, compression, qtrees, and quotas</td>
</tr>
<tr>
<td>Installation and Setup Instructions for the model of the new nodes</td>
<td>Contains instructions for installing and cabling the new system</td>
</tr>
<tr>
<td>FlexArray Virtualization Installation Requirements and Reference Guide</td>
<td>Contains cabling instructions and other information for FlexArray Virtualization systems</td>
</tr>
<tr>
<td>Hardware Universe at hwu.netapp.com</td>
<td>Contains information about system LEDs and system messages to aid troubleshooting</td>
</tr>
<tr>
<td>The appropriate disk shelf guide</td>
<td>Contains instructions for installing and monitoring disk shelves and replacing disk shelf devices</td>
</tr>
<tr>
<td>ONTAP 9 SAN Administration Guide</td>
<td>Describes how to configure and manage iSCSI and FC protocols for SAN environments</td>
</tr>
<tr>
<td>ONTAP 9 SAN Configuration Guide</td>
<td>Contains information about FC and iSCSI topologies and wiring schemes</td>
</tr>
</tbody>
</table>

The NetApp Support Site also contains documentation about NICs and other hardware that you might use with your system. It also contains the Hardware Universe, which provides information about the hardware that the new system supports. See the ONTAP 9 Documentation Center to access ONTAP 9 product documentation.

ONTAP 9 Documentation Center

Worksheet: Information to collect before and during the controller upgrade
You must gather certain information to successfully upgrade the original nodes. The information includes node IDs, port and LIF details, licensing keys, and IP addresses.

You can use the following worksheet to record information for use later in the procedure:

<table>
<thead>
<tr>
<th>Information needed</th>
<th>When collected</th>
<th>When used</th>
<th>Collected information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model, system ID, serial number of original nodes</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Stage 3: Installing and booting node3 Stage 5: Installing and booting node4 Stage 6: Decommissioning the old system</td>
<td></td>
</tr>
</tbody>
</table>

The worksheet helps you organize the information you need to collect and when you need it, ensuring a smooth process during the upgrade.
<table>
<thead>
<tr>
<th>Information needed</th>
<th>When collected</th>
<th>When used</th>
<th>Collected information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelf and disk information, flash storage details, memory, NVRAM, and adapter cards on original nodes</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Throughout the procedure</td>
<td></td>
</tr>
<tr>
<td>Online aggregates and volumes on original nodes</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Throughout the procedure</td>
<td>to verify that aggregates and volumes remain online except during brief relocation</td>
</tr>
<tr>
<td>Output of commands network port vlan show and network port ifgrp show</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Stage 3: Mapping ports from node1 to node3</td>
<td>Stage 5: Mapping ports from node2 to node4</td>
</tr>
<tr>
<td>(SAN environments only) Default configuration of FC ports</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>When configuring FC ports on the new nodes</td>
<td></td>
</tr>
<tr>
<td>(V-Series systems or systems with FlexArray Virtualization software only) Topology for V-Series systems or systems with FlexArray Virtualization software</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Stage 3: Installing and booting node3</td>
<td>Stage 5: Installing and booting node4</td>
</tr>
<tr>
<td>IP address of SPs</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Stage 6: Ensuring that the new controllers are set up correctly</td>
<td></td>
</tr>
<tr>
<td>License keys</td>
<td>Stage 1: Preparing the nodes for the upgrade</td>
<td>Stage 6: Ensuring that the new controllers are set up correctly</td>
<td></td>
</tr>
<tr>
<td>IP address for the external key management server</td>
<td>Stage 1: Rekeying disks for Storage Encryption</td>
<td>Stage 6: Setting up Storage Encryption on the new nodes</td>
<td></td>
</tr>
<tr>
<td>Name and path of web-accessible directory where you download files to netboot the nodes</td>
<td>Stage 1: Preparing to netboot</td>
<td>Stage 3: Installing and booting node3</td>
<td>Stage 5: Installing and booting node4</td>
</tr>
<tr>
<td>Non-SAN data LIFs owned by node1</td>
<td>Stage 2: Moving non-SAN data LIFs owned by node1 to node2</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Cluster, intercluster, node-management, cluster-management, and physical ports</td>
<td>Stage 2: Recording node1 information</td>
<td>Stage 3: Installing and booting node3</td>
<td>Stage 3: Mapping ports from node1 to node3</td>
</tr>
<tr>
<td>Information needed</td>
<td>When collected</td>
<td>When used</td>
<td>Collected information</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------</td>
<td>-----------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Ports on new nodes</td>
<td>Stage 3: Mapping ports from node1 to node3</td>
<td>Later in the section and in the section Mapping ports from node2 to node4</td>
<td></td>
</tr>
<tr>
<td>Available ports and broadcast domains on node3</td>
<td>Stage 3: Mapping ports from node1 to node3</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Non-SAN data LIFs not owned by node2</td>
<td>Moving non-SAN data LIFs belonging to node1 from node2 to node3 and verifying SAN LIFs on node3</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Non-SAN data LIFs owned by node2</td>
<td>Stage 3: Moving non-SAN data LIFs owned by node2 to node3</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Cluster, intercluster, node-management, cluster-management, and physical ports</td>
<td>Stage 4: Recording node2 information</td>
<td>Stage 5: Installing and booting node4 Stage 5: Mapping ports from node2 to node4</td>
<td></td>
</tr>
<tr>
<td>Cluster network ports on node4</td>
<td>Stage 5: Mapping ports from node2 to node4</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Available ports and broadcast domains on node4</td>
<td>Stage 5: Mapping ports from node2 to node4</td>
<td>Later in the section</td>
<td></td>
</tr>
<tr>
<td>Private and public SSL certificates for the storage system and private SSL certificates for each key management server</td>
<td>Stage 6: Setting up Storage Encryption on the new nodes</td>
<td>Later in the section</td>
<td></td>
</tr>
</tbody>
</table>

**Reconfiguring the FC switch layout for ONTAP 9.1 or later**

If your existing FC switch layout was configured prior to ONTAP 9.1, you must reconfigure the port layout and apply the latest Reference Configuration Files (RCFs). This procedure applies only to MetroCluster FC configurations.

**Before you begin**

You must identify the FC switches present in the fabric domain.

You need the admin password and access to an FTP or SCP server.

**About this task**

You must perform this task if your existing FC switch layout was configured prior to ONTAP 9.1 and you are upgrading to a platform model supported in ONTAP 9.1 or later. It is *not* required if you are upgrading from an existing switch layout that was configured for ONTAP 9.1 or later.

This procedure is nondisruptive and takes approximately four hours to complete (excluding rack and stack) when disks are zeroed.
Steps

1. **Sending a custom AutoSupport message prior to reconfiguring switches** on page 13
2. **Verifying the health of the MetroCluster configuration** on page 13
3. **Checking for MetroCluster configuration errors** on page 14
4. **Persistently disabling the switches** on page 14
5. **Determining the new cabling layout** on page 14
6. **Applying RCF files and recabling the switches** on page 15
7. **Persistently enable the switches** on page 15
8. **Verifying switchover, healing, and switchback** on page 16

**Sending a custom AutoSupport message prior to reconfiguring switches**

Before reconfiguring your switches, you should issue an AutoSupport message to notify NetApp technical support that maintenance is underway. Informing technical support that maintenance is underway prevents them from opening a case on the assumption that a disruption has occurred.

**About this task**

This task must be performed on each MetroCluster site.

**Steps**

1. Log in to the cluster.
2. Invoke an AutoSupport message indicating the start of the maintenance:

   ```bash
   system node autosupport invoke -node * -type all -message MAINT=maintenance-window-in-hours
   ``

   *maintenance-window-in-hours* specifies the length of the maintenance window, with a maximum of 72 hours. If the maintenance is completed before the time has elapsed, you can invoke an AutoSupport message indicating the end of the maintenance period:

   ```bash
   system node autosupport invoke -node * -type all -message MAINT=end
   ``

3. Repeat these steps on the partner site.

**Verifying the health of the MetroCluster configuration**

You should check the health of the MetroCluster configuration to verify proper operation.

**Steps**

1. Verify that the MetroCluster components are healthy:

   ```bash
   metrocluster check run
   ```

   ```
   cluster_A::> metrocluster check run
   Last Checked On: 10/1/2017 16:03:37
   Component           Result
   -------------------  ---------
   nodes               ok
   lifs                ok
   config-replication  ok
   aggregates          ok
   4 entries were displayed.
   Command completed. Use the "metrocluster check show -instance" command or sub-commands in "metrocluster check" directory for detailed results. To check if the nodes are ready to do a switchover or switchback operation, run "metrocluster switchover -simulate" or "metrocluster switchback -simulate", respectively.
   ```
2. Verify that there are no health alerts:
   
   `system health alert show`

### Checking for MetroCluster configuration errors

You can use the Config Advisor tool available from the NetApp Support Site to check for common configuration errors.

#### About this task

Config Advisor is a configuration validation and health check tool. You can deploy it at both secure sites and non-secure sites for data collection and system analysis.

**Note:** Support for Config Advisor is limited, and available only online.

#### Steps

1. Download the Config Advisor tool.

   `Config Advisor`

2. Run Config Advisor, reviewing the output and following its recommendations to address any issues.

### Persistently disabling the switches

You must disable the switches in the fabric persistently so that you can modify its configuration.

#### About this task

You disable the switches by running the commands on the switch command line; the commands used for this are not ONTAP commands.

#### Step

Persistently disable the switch:

- For Brocade switches, use the `switchCfgPersistentDisable` command.
- For Cisco switches, use the `suspend` command.

The following command disables a Brocade switch persistently:

```
FC_switch_A_1:admin> switchCfgPersistentDisable
```

The following command disables a Cisco switch:

```
vsan [vsna #] suspend
```

### Determining the new cabling layout

You must determine the cabling for the new controller modules and any new disk shelves to the existing FC switches.

#### About this task

This task must be performed at each MetroCluster site.

#### Step

Use the *Fabric-attached MetroCluster Installation and Configuration Guide* to determine the cabling layout for your switch type, using the port usage for an eight-node MetroCluster configuration.

The FC switch port usage must match the usage described in the guide so that the Reference Configuration Files (RCFs) can be used.

*Fabric-attached MetroCluster installation and configuration*
Note: If your environment cannot be cabled in a way that RCFs can be used, then contact technical support. Do not use this procedure if the cabling cannot use RCFs.

Applying RCF files and recabling the switches
You must apply the appropriate reference configuration (RCF) files to reconfigure your switches to accommodate the new nodes. After you apply the RCF files, you can recable the switches.

Before you begin
The FC switch port usage must match the usage described in the Fabric-attached MetroCluster Installation and Configuration Guide so that the RCFs can be used.

Fabric-attached MetroCluster installation and configuration

Steps
1. Locate the RCF files for your configuration.
   You must use the RCF files that match your switch model.
   NetApp Downloads: MetroCluster Configuration Files for Brocade Switches
   NetApp Downloads: MetroCluster Configuration Files for Cisco Switches
2. Apply the RCF files, following the directions on the Download page and adjusting the ISL settings as needed.
3. Verify that the switch configuration is saved.
4. Cable both of the FC-to-SAS bridges to the FC switches, using the cabling layout you created in the "Determining the new cabling layout" section.
5. Verify that the ports are online:
   • For Brocade switches, use the switchshow command.
   • For Cisco switches, use the show interface brief command.
6. Cable the FC-VI ports from the controllers to the switches.
7. From the existing nodes, verify that the FC-VI ports are online:
   metrocluster interconnect adapter show
   metrocluster interconnect mirror show

Persistently enable the switches
You must enable the switches in the fabric persistently.

Step
Persistently enable the switch:
• For Brocade switches, use the switchCfgPersistentenable command.
• For Cisco switches, use the no suspend command.

The following command persistently enables a Brocade switch:
FC_switch_A_1:admin> switchCfgPersistentenable

The following command enables a Cisco switch:
vsan [vsna #]no suspend
Verifying switchover, healing, and switchback

You should verify the switchover, healing, and switchback operations of the MetroCluster configuration.

Step

Use the procedures for negotiated switchover, healing, and switchback that are mentioned in the MetroCluster Management and Disaster Recovery Guide.

Upgrading the node pair

To upgrade the node pair, you need to prepare the original nodes and then perform a series of steps on both the original and new nodes. You can then decommission the original nodes.

Steps

1. Upgrading the node pair: Stage 1 on page 16
2. Upgrading the node pair: Stage 2 on page 30
3. Upgrading the node pair: Stage 3 on page 39
4. Upgrading the node pair: Stage 4 on page 65
5. Upgrading the node pair: Stage 5 on page 68
6. Upgrading the node pair: Stage 6 on page 90

Upgrading the node pair: Stage 1

During Stage 1, you must prepare the nodes for the upgrade and might need to rekey disks for Storage Encryption. You must also prepare to netboot the new controllers if they do not have the same or later version of ONTAP 9 that is installed on the original controllers.

Steps

1. Determining whether the controller has aggregates on internal disk drives on page 16
2. Preparing the nodes for upgrade on page 18
3. Getting an IP address of an external key management server for storage encryption on page 28
4. Quiescing the SnapMirror relationships on page 29
5. Preparing for netboot on page 29

Determining whether the controller has aggregates on internal disk drives

If you are upgrading controllers with internal disk drives, you need to complete several commands and examine their output to ensure that none of the internal disk drives contains root aggregates or data aggregates.

About this task

If you are not upgrading controllers with aggregates on internal disk drives, skip this section and go to the section Preparing the nodes for the upgrade.

Steps

1. Enter the nodeshell, once for each of the original nodes:
   ```
   system node run -node node-name
   ```
2. Display the internal drives:
   ```
   sysconfig -av
   ```
   The system displays detailed information about the node's configuration, including storage, as seen in the partial output shown in the following example:
node> sysconfig -av
slot 0: SAS Host Adapter 0a (PMC-Sierra PM8001 rev. C, SAS, UP)
Firmware rev: 01.11.06.00
Base WWN: 5:00a098:0008a3b:b0
Phy State:
[0] Enabled, 6.0 Gb/s
[1] Enabled, 6.0 Gb/s
[2] Enabled, 6.0 Gb/s
[3] Enabled, 6.0 Gb/s

<table>
<thead>
<tr>
<th>ID</th>
<th>Vendor</th>
<th>Model</th>
<th>FW</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>00.0</td>
<td>NETAPP</td>
<td>X306_HMARK02TSSM</td>
<td>NA04</td>
<td>1695.4GB (3907029168 512B/sect)</td>
</tr>
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<td>NA04</td>
<td>1695.4GB (3907029168 512B/sect)</td>
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<td>00.8</td>
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<td>NA04</td>
<td>1695.4GB (3907029168 512B/sect)</td>
</tr>
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<td>X306_HMARK02TSSM</td>
<td>NA04</td>
<td>1695.4GB (3907029168 512B/sect)</td>
</tr>
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<td>00.11</td>
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<td>X306_HMARK02TSSM</td>
<td>NA04</td>
<td>1695.4GB (3907029168 512B/sect)</td>
</tr>
</tbody>
</table>
...
Based on the output in Step 4 and Step 6, aggr2 uses three internal drives—0a.00.1, 0a.00.3, and 0a.00.9—and the volumes on aggr2 are vol6, vol5, and vol14. Also, in the output of Step 6, the readout for aggr0 contains the word root at the beginning of the information for the aggregate. That indicates that it contains a root volume.

7. Examine the output of the `aggr status -v` command to identify the volumes belonging to any aggregates that are on an internal drive and whether any of those volumes contain a root volume.

8. Exit the nodeshell by entering the following command on each controller:

   ```
   exit
   ```

9. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the controllers...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not contain any aggregates on internal disk drives</td>
<td>Continue with this procedure.</td>
</tr>
</tbody>
</table>
| Contain aggregates but no volumes on the internal disk drives | Continue with this procedure.  
  **Note:** Before you continue, you must place the aggregates offline, and then destroy the aggregates on the internal disk drives. See the *Disk and Aggregates Power Guide* for information about managing aggregates. |
| Contain non-root volumes on the internal drives | Continue with this procedure.  
  **Note:** Before you continue, you must move the volumes to an external disk shelf, place the aggregates offline, and then destroy the aggregates on the internal disk drives. See the *Disk and Aggregates Power Guide* for information about moving volumes. |
| Contain root volumes on the internal drives | Do not continue with this procedure.  
You can upgrade the controllers by using the procedure *Upgrading the controller hardware on a pair of nodes running clustered Data ONTAP by moving volumes* on the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com). |
| Contain non-root volumes on the internal drives and you cannot move the volumes to external storage | Do not continue with this procedure.  
You can upgrade the controllers by using the procedure *Upgrading the controller hardware on a pair of nodes running clustered Data ONTAP by moving volumes* on the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com). |

**Preparing the nodes for upgrade**

Before you can replace the original nodes, you must ensure that they are in an HA pair, have no missing or failed disks, can access each other's storage, and do not own data LIFs assigned to the
other nodes in the cluster. You also need to collect information about the original nodes and, if the cluster is in a SAN environment, ensure that all the nodes in the cluster are in quorum.

**Steps**

1. Ensure that each of the original nodes has enough resources to adequately support the workload of both nodes during takeover mode.

   Follow the *Best practices for HA pairs* section in the *ONTAP 9 High-Availability Configuration Guide*. Neither of the original nodes should be running at more than 50 percent utilization; if a node is running at less than 50 percent utilization, it can handle the loads for both nodes during the controller upgrade.

2. Complete the following substeps to create a performance baseline for the original nodes:
   a. Make sure that the diagnostic user account is unlocked.

      **Important:** The diagnostic user account is intended only for low-level diagnostic purposes and should be used only with guidance from technical support.

      **Important:** See *System Administration Reference* for information about unlocking the user accounts.

   b. Download the Performance and Statistics Collector (Perfstat Converged) tool from the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com).

   Perfstat Converged tool lets you establish a performance baseline for comparison after the upgrade.

   c. Create a performance baseline, following the instructions on the NetApp Support Site.

3. Open a support case on the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com).

   You can use the case to report any issues that might arise during the upgrade.

4. Verify that NVMEM or NVRAM batteries of node3 and node4 are charged, and charge them if they are not.

   You need to physically check node3 and node4 to see if the NVMEM or NVRAM batteries are charged. Check the *Hardware Universe at hwu.netapp.com* for information about the LEDs for the model of node3 and node4.

   **Attention:** Do not try to clear the NVRAM contents. If there is a need to clear the contents of NVRAM, contact NetApp technical support.

5. Check the version of ONTAP on node3 and node4.

   The new nodes must have the same version of ONTAP 9.x installed on them that is installed on the original nodes. If the new nodes have a different version of ONTAP installed, you need to netboot the new controllers after you install them. See the *ONTAP 9 Upgrade and Revert/Downgrade Guide* for instructions to upgrade ONTAP.

   Information about the version of ONTAP on node3 and node4 should be included in the shipping boxes. The ONTAP version is displayed when the node boots up or you can boot the node to maintenance mode and run the command:

   ```
   version
   ```

6. Check whether you have two or four cluster LIFs on node1 and node 2:

   ```
   network interface show -role cluster
   ```

   The system displays any cluster LIFs, as shown in the following example:
7. If you have two or four cluster LIFs on node1 or node2, make sure that you can ping both cluster LIFs across all the available paths by completing the following substeps:
   a. Enter the advanced privilege level:

       ```
       set -privilege advanced
       ```

       The system displays the following message:

       ```
       Warning: These advanced commands are potentially dangerous; use them only when directed to do so by NetApp personnel.
       do you wish to continue? (y or n):
       ```

   b. Enter `y`.

   c. Ping the nodes and test the connectivity:

       ```
       cluster ping-cluster -node node_name
       ```

       The system displays a message similar to the following example:

       ```
       cluster::*> cluster ping-cluster -node node1
       Host is node1
       Getting addresses from network interface table...
       Local = 10.254.231.102 10.254.91.42
       Remote = 10.254.42.25 10.254.16.228
       Ping status:
       ....
       Basic connectivity succeeds on 4 path(s) Basic connectivity fails on 0 path(s)
       ..............
       Detected 1500 byte MTU on 4 path(s):
       Local 10.254.231.102 to Remote 10.254.16.228
       Local 10.254.231.102 to Remote 10.254.42.25
       Local 10.254.91.42 to Remote 10.254.16.228
       Local 10.254.91.42 to Remote 10.254.42.25
       Larger than PMTU communication succeeds on 4 path(s)
       RPC status:
       2 paths up, 0 paths down (tcp check)
       2 paths up, 0 paths down (udp check)
       ```

       If the node uses two cluster ports, you should see that it is able to communicate on four paths, as shown in the example.

   d. Return to the administrative level privilege:

       ```
       set -privilege admin
       ```

8. Ensure that node1 and node2 are in an HA pair and verify that the nodes are connected to each other, and that takeover is possible:

   ```
   storage failover show
   ```

   The following example shows the output when the nodes are connected to each other and takeover is possible:

   ```
   cluster::> storage failover show
   Node   Partner   Possible State  Description
   ------  --------  ------------------
   node1   node2     true   Connected to node2
   node2   node1     true   Connected to node1
   ```

   Neither node should be in partial giveback. The following example shows that node1 is in partial giveback:

   ```
   cluster::> storage failover show
   Node   Partner   Takeover
   ------  --------  ------
   ```
If either node is in partial giveback, use the `storage failover giveback` command to perform the giveback, and then use the `storage failover show-giveback` command to make sure that no aggregates still need to be given back. See the ONTAP 9 High-Availability Configuration Guide for detailed information about the commands.

9. Ensure that neither node1 nor node2 owns the aggregates for which it is the current owner (but not the home owner):

   ```
   storage aggregate show -node node_name -is-home false -fields owner-name,home-name,state
   ```

   If neither node1 nor node2 owns aggregates for which it is the current owner (but not the home owner), the system will return a message similar to the following example:

   ```
   cluster::> storage aggregate show -node node2 -is-home false -fields owner-name,home-name,state
   There are no entries matching your query.
   ```

   The following example shows the output of the command for a node named node2 that is the home owner, but not the current owner, of four aggregates:

   ```
   cluster::> storage aggregate show -node node2 -is-home false -fields owner-name,home-name,state
   ```

<table>
<thead>
<tr>
<th>aggregate</th>
<th>home-name</th>
<th>owner-name</th>
<th>state</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggr1</td>
<td>node1</td>
<td>node2</td>
<td>online</td>
</tr>
<tr>
<td>aggr2</td>
<td>node1</td>
<td>node2</td>
<td>online</td>
</tr>
<tr>
<td>aggr3</td>
<td>node1</td>
<td>node2</td>
<td>online</td>
</tr>
<tr>
<td>aggr4</td>
<td>node1</td>
<td>node2</td>
<td>online</td>
</tr>
</tbody>
</table>

   4 entries were displayed.

10. Take one of the following actions:

    | If the command in Step 9... | Then... |
    |-----------------------------|---------|
    | Had blank output            | Skip Step 11 on page 21 and go to Step 12 on page 22. |
    | Had output                  | Go to Step 11 on page 21. |

11. If either node1 or node2 owns aggregates for which it is the current owner but not the home owner, complete the following substeps:

    a. Return the aggregates currently owned by the partner node to the home owner node:

       ```
       storage failover giveback -ofnode home_node_name
       ```

    b. Verify that neither node1 nor node2 still owns aggregates for which it is the current owner (but not the home owner):

       ```
       storage aggregate show -nodes node_name -is-home false -fields owner-name,home-name,state
       ```

       The following example shows the output of the command when a node is both the current owner and home owner of aggregates:

       ```
       cluster::> storage aggregate show -nodes node1 -is-home true -fields owner-name,home-name,state
       ```

       | aggregate | home-name | owner-name | state |
       |-----------|-----------|------------|-------|
       | aggr1     | node1     | node1      | online|
12. Ensure that node1 and node2 can access each other's storage and verify that no disks are missing:

```
storage failover show -fields local-missing-disks,partner-missing-disks
```

The following example shows the output when no disks are missing:

```
cluster::> storage failover show -fields local-missing-disks,partner-missing-disks

node     local-missing-disks partner-missing-disks
-------- ------------------- ---------------------
node1    None                None
node2    None                None
```

If any disks are missing, see the ONTAP 9 Disks and Aggregates Power Guide, the ONTAP 9 Logical Storage Management Guide, and the ONTAP 9 High-Availability Configuration Guide on the NetApp Support Site at mysupport.netapp.com to configure storage for the HA pair.

13. Ensure that node1 and node2 are healthy and eligible to participate in the cluster:

```
cluster show
```

The following example shows the output when both nodes are eligible and healthy:

```
cluster::> cluster show

Node                  Health  Eligibility
--------------------- ------- ------------
node1                 true    true
node2                 true    true
```

14. Set the privilege level to advanced:

```
sel -privilege advanced
```

15. Ensure that node1 and node2 are running the same ONTAP release:

```
system node image show -node node1,node2 -iscurrent true
```

The following example shows the output of the command:

```
cluster::*> system node image show -node node1,node2 -iscurrent true

Node     Image   Default Current Version                        Install Date
-------- ------- ------- ------- ------------------------- -------------------
node1    image1  true    true    9.1 2/7/2017 20:22:06
node2    image1  true    true    9.1 2/7/2017 20:20:48
```

16. Verify that neither node1 nor node2 owns any data LIFs that belong to other nodes in the cluster and check the Current Node and Is Home columns in the output:

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

The following example shows the output when node1 has no LIFs that are home-owned by other nodes in the cluster:

```
cluster::> network interface show -role data -is-home false -curr-node node1

There are no entries matching your query.
```
The following example shows the output when node1 owns data LIFs home-owned by the other node:

```
cluster::> network interface show -role data -is-home false -curr-node node1
Logical    Status     Network            Current       Current Is
Vserver     Interface  Admin/Oper Address/Mask       Node          Port    Home
----------- ---------- ---------- ------------------ ------------- ------- ----
vs0          data1       up/up    172.18.103.137/24   node1         e0d     false
data2        up/up    172.18.103.143/24   node1         e0f     false
2 entries were displayed.
```

17. If the output in Step 15 shows that either node1 or node2 owns any data LIFs home-owned by other nodes in the cluster, migrate the data LIFs away from node1 or node2:

```
network interface revert -vserver * -lif *
```

See the ONTAP 9 Commands: Manual Page Reference for detailed information about the `network interface revert` command.

18. Check whether node1 or node2 owns any failed disks:

```
storage disk show -nodelist node1,node2 -broken
```

If any of the disks have failed, remove them, following instructions in the ONTAP 9 Disks and Aggregates Power Guide.

19. Collect information about node1 and node2 by completing the following substeps and recording the output of each command:

**Note:** You will use this information later in the procedure.

a. Record the model, system ID, and serial number of both nodes:

```
system node show -node node1,node2 -instance
```

**Note:** You will use the information to reassign disks and decommission the original nodes.

b. Enter the following command on both node1 and node2 and record information about the shelves, number of disks in each shelf, flash storage details, memory, NVRAM, and network cards from the output:

```
run -node node_name sysconfig
```

**Note:** You can use the information to identify parts or accessories that you might want to transfer to node3 or node4. If you do not know if the nodes are V-Series systems or have FlexArray Virtualization software, you can learn that also from the output.

c. Enter the following command on both node1 and node2 and record the aggregates that are online on both nodes:

```
storage aggregate show -node node_name -state online
```

**Note:** You can use this information and the information in the following substep to verify that the aggregates and volumes remain online throughout the procedure, except for the brief period when they are offline during relocation.

d. Enter the following command on both node1 and node2 and record the volumes that are offline on both nodes:

```
volume show -node node_name -state offline
```

**Note:** After the upgrade, you will run the command again and compare the output with the output in this step to see if any other volumes have gone offline.

20. Enter the following commands to see if any interface groups or VLANs are configured on node1 or node2:

```
network port vlan show
```
network port ifgrp show

Make note of whether interface groups or VLANs are configured on node1 or node2; you need that information in the next step and later in the procedure.

21. Complete the following substeps on both node1 and node2 to ensure that physical ports can be mapped correctly later in the procedure:
   a. Enter the following command to see if there are failover groups on the node other than clusterwide:

   ```bash
   network interface failover-groups show
   ```

   Failover groups are sets of network ports present on the system. Because upgrading the controller hardware can change the location of physical ports, failover groups can be inadvertently changed during the upgrade.

   The system displays failover groups on the node, as shown in the following example:

   ```bash
   cluster::> network interface failover-groups show
   Failover
   Vserver             Group             Targets
   ------------------- ----------------- ----------
   Cluster             Cluster           node1:e0a, node1:e0b
                      node2:e0a, node2:e0b
   fg_6210_e0c         Default           node1:e0c, node1:e0d
                      node1:e0e, node2:e0c
                      node2:e0d, node2:e0e
   2 entries were displayed.
   ```

   b. If there are failover groups present other than clusterwide, record the failover group names and the ports that belong to the failover groups.

   c. Enter the following command to see if there are any VLANs configured on the node:

   ```bash
   network port vlan show -node node_name
   ```

   VLANs are configured over physical ports. If the physical ports change, then the VLANs will need to be re-created later in the procedure.

   The system displays VLANs configured on the node, as shown in the following example:

   ```bash
   cluster::> network port vlan show
   Network Network
   Node    VLAN Name Port  VLAN ID  MAC Address
   ------  --------- ------- ------- ------------------
   node1   e1b-70    elb     70      00:15:17:76:7b:69
   node2   e1b-70    elb     70      00:15:17:76:7b:69
   ```

   d. If there are VLANs configured on the node, take note of each network port and VLAN ID pairing.

22. Take one of the following actions:

<table>
<thead>
<tr>
<th>If interface groups or VLANS are...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On node1 or node2</td>
<td>Complete Step 22 and Step 23.</td>
</tr>
<tr>
<td>Not on node1 or node2</td>
<td>Go to Step 23.</td>
</tr>
</tbody>
</table>

23. If you do not know if node1 and node2 are in a SAN or non-SAN environment, enter the following command and examine its output:

```bash
network interface show -vserver vserver_name -data-protocol iscsi|fcp
```
cluster::> network interface show -vserver vserver_name -data-protocol iscsi|fcp
There are no entries matching your query.

You can confirm that the node is in a NAS environment by using the command `network interface show` with the `-data-protocol nfs|cifs` parameter.

If either iSCSI or FC is configured for the SVM, the command will display a message similar to the following example:

```
cluster::> network interface show -vserver vserver_name -data-protocol fcp
```

<table>
<thead>
<tr>
<th>Logical Vserver</th>
<th>Interface</th>
<th>Status</th>
<th>Network</th>
<th>Current Node</th>
<th>Current Port</th>
<th>Current Is</th>
</tr>
</thead>
<tbody>
<tr>
<td>vserver_name</td>
<td>vserver</td>
<td>up/down</td>
<td>address</td>
<td>node1</td>
<td>0d</td>
<td>true</td>
</tr>
</tbody>
</table>

24. Verify that all the nodes in the cluster are in quorum by completing the following substeps:
   
a. Enter the advanced privilege level:
   ```
   set -privilege advanced
   ```
   The system displays the following message:
   ```
   Warning: These advanced commands are potentially dangerous; use them only when directed to do so by NetApp personnel. Do you wish to continue? (y or n):
   ```
   b. Enter `y`.
   c. Verify the cluster service state in the kernel, once for each node:
   ```
   cluster kernel-service show
   ```
   The system displays a message similar to the following example:
   ```
   cluster::*> cluster kernel-service show
   Master            Cluster           Quorum        Availability  Operational
   Node              Node              Status        Status        Status
   node1             node1             in-quorum     true          operational
   node2             in-quorum     true          operational
   2 entries were displayed.
   ```
   Nodes in a cluster are in quorum when a simple majority of nodes are healthy and can communicate with each other. For more information, see the *System Administration Reference*
   d. Return to the administrative privilege level:
   ```
   set -privilege admin
   ```
   25. Take one of the following actions:
   
<table>
<thead>
<tr>
<th>If the cluster...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has SAN configured</td>
<td>Go to Step 25.</td>
</tr>
<tr>
<td>Does not have SAN configured</td>
<td>Go to Step 28.</td>
</tr>
</tbody>
</table>
   26. Verify that there are SAN LIFs on node1 and node2 for each SVM that has either SAN iSCSI or FC service enabled by entering the following command and examining its output:
   ```
   network interface show -data-protocol iscsi|fcp -home-node node_name
   ```
   The command displays SAN LIF information for node1 and node2. The following examples show the status in the Status Admin/Oper column as up/up, indicating that SAN iSCSI and FC service are enabled:
   ```
   cluster::> network interface show -data-protocol fcp|iscsi
   Logical    Status     Network                  Current       Current Is
   Vserver    Interface  Admin/Oper Address/Mask             Node          Port    Home
   a_vs_iscsi datal1 up/up      10.228.32.190/21         node1         e0a     true
Alternatively, you can view more detailed LIF information by entering the command `network interface show -instance -data-protocol iscsi|fcp`.

27. Capture the default configuration of any FC ports on the original nodes by entering the following command and recording the output for your systems:

```
ucadmin show
```

The command displays information about all FC ports in the cluster, as shown in the following example:

```
cluster::> ucadmin show

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Current Mode</th>
<th>Current Type</th>
<th>Pending Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>0a</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0b</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0c</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0d</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node2</td>
<td>0a</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node2</td>
<td>0b</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node2</td>
<td>0c</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node2</td>
<td>0d</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node2</td>
<td>0e</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

8 entries were displayed.

You can use the information after the upgrade to set the configuration of FC ports on the new nodes.

28. If you are upgrading a V-Series system or a system with FlexArray Virtualization software, capture information about the topology of the original nodes by entering the following command and recording the output:

```
storage array config show -switch
```

The system displays topology information, as shown in the following example:

```
cluster::> storage array config show -switch

<table>
<thead>
<tr>
<th>LUN</th>
<th>LUN</th>
<th>Node</th>
<th>Group</th>
<th>Count</th>
<th>Array Name</th>
<th>Array Target Port</th>
<th>Target Side</th>
<th>Initiator Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>0</td>
<td>50</td>
<td>IBM_1818FAStT_1</td>
<td>0d</td>
<td>vgbr6510s164:5</td>
<td>vgbr6510s164:4:6</td>
<td>vgbr6510s164:5:1</td>
<td>2b</td>
</tr>
<tr>
<td>node2</td>
<td>0</td>
<td>50</td>
<td>IBM_1818FAStT_1</td>
<td>0d</td>
<td>vgbr6510s164:5</td>
<td>vgbr6510s164:4:6</td>
<td>vgbr6510s164:5:1</td>
<td>0c</td>
</tr>
</tbody>
</table>

7 entries were displayed.

29. Complete the following substeps:

a. Enter the following command on one of the original nodes and record the output:

```
service-processor show -node * -instance
```

The system displays detailed information about the SP on both nodes.

b. Ensure that the SP status is online.

c. Ensure that the SP network is configured.

d. Record the IP address and other information about the SP.

You might want to reuse the network parameters of the remote management devices, in this case the SPs, from the original system for the SPs on the new nodes.

For detailed information about the SP, see the `System Administration Reference` and the `ONTAP 9 Commands: Manual Page Reference`.
30. If you want the new nodes to have the same licensed functionality as the original nodes, enter the following command to see the cluster licenses on the original system:

```plaintext
system license show -owner *
```

The following example shows the site licenses for cluster1:

```plaintext
system license show -owner *
Serial Number: 1-80-000013
Owner: cluster1

Package  Type    Description           Expiration
--------- ------- --------------------- --------------------
Base      site    Cluster Base License  -
NFS       site    NFS License           -
CIFS      site    CIFS License          -
SnapMirror site    SnapMirror License    -
FlexClone site    FlexClone License     -
SnapVault site    SnapVault License     -

6 entries were displayed.
```

Obtain new license keys for the new nodes from the NetApp Support Site at mysupport.netapp.com.

If the site does not have the license keys you need, contact your NetApp sales representative.

32. Check whether the original system has AutoSupport enabled by entering the following command on each node and examining its output:

```plaintext
system node autosupport show -node node1,node2
```

The command output shows whether AutoSupport is enabled, as shown in the following example:

```plaintext
node1         enable    Postmaster    admin@netapp.com mailhost
node2         enable    Postmaster    -                mailhost
```

33. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the original system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has AutoSupport enabled...</td>
<td>a. Go to Step 33.</td>
</tr>
<tr>
<td></td>
<td>b. Go to the section <em>Rekeying disks for Storage Encryption</em>.</td>
</tr>
<tr>
<td>Does not have AutoSupport enabled...</td>
<td>a. Enable AutoSupport, following the instructions in the <em>System Administration Reference</em>.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> AutoSupport is enabled by default when you configure your storage system for the first time. Although you can disable AutoSupport at any time, you should leave it enabled. Enabling AutoSupport can significantly help identify problems and solutions should a problem occur on your storage system.</td>
</tr>
<tr>
<td></td>
<td>b. Go to the <em>Rekeying disks for Storage Encryption</em> section.</td>
</tr>
</tbody>
</table>

34. Verify that AutoSupport is configured with the correct mailhost details and recipient e-mail IDs by entering the following command on both of the original nodes and examining the output:

```plaintext
system node autosupport show -node node_name -instance
```

For detailed information about AutoSupport, see the *System Administration Reference* and the *ONTAP 9 Commands: Manual Page Reference*.

35. Send an AutoSupport message to NetApp for node1 by entering the following command:
system node autosupport invoke -node node1 -type all -message "Upgrading node1 from platform_old to platform_new"

Note: Do not send an AutoSupport message to NetApp for node2 at this point; you do so later in the procedure.

36. Verify that the AutoSupport message was sent by entering the following command and examining its output:

system node autosupport show -node node1 -instance

The fields Last Subject Sent: and Last Time Sent: contain the message title of the last message sent and the time the message was sent.

Getting an IP address of an external key management server for storage encryption
After upgrading, you must immediately configure Storage Encryption and establish a cluster-wide authentication key to replace the previous node-level authentication keys.

Steps
1. Install the necessary client and server SSL certificates required to communicate with key management servers by using the security certificate install command.
2. Configure Storage Encryption on all nodes by using the security key-manager setup command on each node.
3. Add the IP address for each key management server by using the security key-manager add command.
4. Verify that the same key management servers are configured and available on all nodes in the cluster:
   security key-manager show -status
5. Create a new cluster-wide authentication key:
   security key-manager create-key
6. Make a note of the new authentication key ID.
7. Rekey all SEDs with the new authentication key:
   storage encryption disk modify -disk * -data-key-id authentication_key_id

Managing authentication using KMIP servers
With ONTAP 9.5 and later, you can use KMIP servers to manage authentication keys.

Steps
1. Add a new controller:
   security key-manager setup -node new_controller_name
2. Add the key manager:
   security key-manager -add key_management_server_ip_address
3. Verify that the key management servers are configured and available to all nodes in the cluster:
   security key-manager show -status
4. Restore the authentication keys from all linked key management servers to the new node:
   security key-manager restore -node new_controller_name
5. Rekey all self-encrypting disks with the new authentication key:
   storage encryption disk modify -disk * -data-key-id nonMSID AK
6. If you use the Federal Information Processing Standard (FIPS), rekey all self-encrypting disks with the new authentication key:

```
storage encryption disk* modify -disk * -fips-key-id nonMSID AK
```

Managing authentication using an onboard key manager

You can use an onboard key manager to manage authentication keys. If you plan to use an onboard key manager, you must record the passphrase and backup material before the beginning the upgrade.

**Steps**

1. Verify the key management servers are available to all nodes in the cluster using the `security key-manager key show` command.

2. Rekey all self-encrypting disks with the new authentication key:

```
storage encryption disk modify -disk * -data-key-id nonMSID AK
```

3. If you use the Federal Information Processing Standard (FIPS), rekey all self-encrypting disks with the new authentication key:

```
storage encryption disk* modify -disk * -fips-key-id nonMSID AK
```

Quiescing the SnapMirror relationships

Before you netboot the system, you must ensure that all the SnapMirror relationship are quiesced. When a SnapMirror relationship is quiesced, it remains quiesced across reboots and failovers.

**Steps**

1. Verify the SnapMirror relationship state on the destination cluster:

```
Snapmirror show
```

   **Note:** If the state is `Transferring`, you must abort those transfers by using the `snapmirror abort -destination vserver` command. The abort fails if the SnapMirror relationship is not in the `Transferring` state.

2. Quiesce all relationships between the cluster:

```
snapmirror quiesce-destination vserver
```

Preparing for netboot

After you physically rack node3 and node4 later in the procedure, you might need to netboot them. The term *netboot* means you are booting from an ONTAP image stored on a remote server. When preparing for netboot, you must put a copy of the ONTAP 9 boot image onto a web server that the system can access.

**Before you begin**

- Verify that you can access a HTTP server with the system.
- You need to download the necessary system files for your platform and the correct version of ONTAP from the NetApp Support Site at [mysupport.netapp.com](http://mysupport.netapp.com).

**About this task**

You must netboot the new controllers if they do not have the same version of ONTAP 9 installed on them that is installed on the original controllers. After you install each new controller, you boot the system 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.

However, you do not need to netboot the controllers if the same version of ONTAP 9 is installed on them that is installed on the original controllers. If so, you can skip this section and proceed to *Stage 3 Installing and booting node3*. 
Steps

1. Access the NetApp Support Site to download the files used for performing the netboot of the system.

2. Download the appropriate ONTAP software from the software download section of the NetApp Support Site and store the `<ontap_version>_image.tgz` file on a web-accessible directory.

3. Change to the web-accessible directory and verify that the files you need are available.

<table>
<thead>
<tr>
<th>For...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAS/AFF8000 series systems</td>
<td>Extract the contents of the <code>&lt;ontap_version&gt;_image.tgz</code> file to the target directory:</td>
</tr>
<tr>
<td></td>
<td><code>tar -zxvf &lt;ontap_version&gt;_image.tgz</code></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If you are extracting the contents on Windows, use 7-Zip or WinRAR to extract the netboot image.</td>
</tr>
<tr>
<td></td>
<td>Your directory listing should contain a netboot folder with a kernel file:</td>
</tr>
<tr>
<td></td>
<td><code>netboot/kernel</code></td>
</tr>
<tr>
<td>All other systems</td>
<td>Your directory listing should contain the following file:</td>
</tr>
<tr>
<td></td>
<td><code>&lt;ontap_version&gt;_image.tgz</code></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You do not need to extract the contents of the <code>&lt;ontap_version&gt;_image.tgz</code> file.</td>
</tr>
</tbody>
</table>

You will use information in the directories in Stage 3.

Upgrading the node pair: Stage 2

During Stage 2, you relocate the node1 aggregates and LIFs to node2, record node1 information, and then retire node1.

Steps

1. Relocating non-root aggregates from node1 to node2 on page 30
2. Moving NAS data LIFs owned by node1 to node2 on page 32
3. Recording node1 information on page 35
4. Retiring node1 on page 37

Relocating non-root aggregates from node1 to node2

Before you can replace node1 with node3, you need to move the non-root aggregates from node1 to node2 by using the `storage aggregate relocation` command and then verifying the relocation.

Steps

1. Relocate the non-root aggregates by completing the following substeps:
   a. Set the privilege level to advanced:
      ```bash
      set -privilege advanced
      ```
   b. Enter the following command:
      ```bash
      storage aggregate relocation start -node node1 -destination node2 -aggregate-list * -ndo-controller-upgrade true
      ```
   c. When prompted, enter `y`.
Relocation will occur 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 by entering the following command:

```
set -privilege admin
```

2. Check the relocation status by entering the following command on node1:

```
storage aggregate relocation show -node node1
```

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

**Note:** Wait until all non-root aggregates owned by node1 have been relocated to node2 before proceeding to the next step.

3. Take one of the following actions:

<table>
<thead>
<tr>
<th>If relocation...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of all aggregates is successful</td>
<td>Go to Step 4.</td>
</tr>
</tbody>
</table>
| Of any aggregates fails or is vetoed | a. Check the EMS logs for the corrective action.  
   b. Perform the corrective action.  
   c. Relocate any failed or vetoed aggregates by entering the following command:  
     ```
     storage aggregate relocation start -node node1 -destination node2 -aggregate-list * -ndo-controller-upgrade true
     ```
   d. When prompted, enter `y`.  
   e. Return to the admin level by entering the following command:  
     ```
     set -privilege admin
     ```

If necessary, you can force the relocation using one of the following methods:

- Overriding veto checks by using the command `storage aggregate relocation start -override-vetoes true -ndo-controller-upgrade`
- Overriding destination checks by using the command `storage aggregate relocation start -override-destination-checks true -ndo-controller-upgrade`

See the *ONTAP 9 Disks and Aggregates Power Guide* and the *ONTAP 9 Commands: Manual Page Reference* for more information about storage aggregate relocation commands.

4. Verify that all the non-root aggregates are online and their state on node2 by entering the following command:

```
storage aggregate show -node node2 -state online -root false
```

The following example shows that the non-root aggregates on node2 are online:

```
cluster::> storage aggregate show -node node2 state online -root false
```

<table>
<thead>
<tr>
<th>Aggregate</th>
<th>Size</th>
<th>Available</th>
<th>Used%</th>
<th>State</th>
<th>#Vols</th>
<th>Nodes</th>
<th>RAID Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggr_1</td>
<td>744.9GB</td>
<td>744.8GB</td>
<td>0%</td>
<td>online</td>
<td>5</td>
<td>node2</td>
<td>raid_dp, normal</td>
</tr>
<tr>
<td>aggr_2</td>
<td>825.0GB</td>
<td>825.0GB</td>
<td>0%</td>
<td>online</td>
<td>1</td>
<td>node2</td>
<td>raid_dp,</td>
</tr>
</tbody>
</table>
normal

2 entries were displayed.

If the aggregates have gone offline or become foreign on node2, bring them online by using the following command on node2, once for each aggregate:

```
storage aggregate online -aggregate aggr_name
```

5. Verify that all the volumes are online on node2 by entering the following command on node2 and examining its output:

```
volume show -node node2 -state offline
```

If any volumes are offline on node2, bring them online by using the following command on node2, once for each volume:

```
volume online -vserver vserver-name -volume volume-name
```

The `vserver-name` to use with this command is found in the output of the previous `volume show` command.

6. Enter the following command on node2:

```
storage failover show -node node2
```

The output should display the following message:

Node owns partner’s aggregates as part of the nondisruptive controller upgrade procedure.

7. Verify that node1 does not own any non-root aggregates that are online by entering the following command:

```
storage aggregate show -owner-name node1 -ha-policy sfo -state online
```

The output should not display any online non-root aggregates, which have already been relocated to node2.

Moving NAS data LIFs owned by node1 to node2

Before you can replace node1 with node3, you need to move the NAS data LIFs owned by node1 to node2 if you have a two-node cluster, or to a third node if your cluster has more than two nodes. The method you use depends on whether the cluster is configured for NAS or SAN.

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. You must verify that the LIFs are healthy and located on appropriate ports after you bring node3 online.

Steps

1. List all the NAS data LIFs owned by node1 by entering the following command on either node and capturing the output:

```
network interface show -data-protocol nfs|cifs -curr-node node1
```

The system displays the NAS data LIFs on node1 as shown in the following example:

<table>
<thead>
<tr>
<th>Logical Interface</th>
<th>Status</th>
<th>Network Address/ Mask</th>
<th>Current Node</th>
<th>Current Is Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a0a</td>
<td>up/down</td>
<td>10.63.0.53/24</td>
<td>node1</td>
<td>true</td>
</tr>
<tr>
<td>data1</td>
<td>up/</td>
<td>10.63.0.50/18</td>
<td>node1</td>
<td>true</td>
</tr>
<tr>
<td>rads1</td>
<td>up/</td>
<td>10.63.0.51/18</td>
<td>node1</td>
<td>true</td>
</tr>
<tr>
<td>rads2</td>
<td>up/down</td>
<td>10.63.0.52/24</td>
<td>node1</td>
<td>true</td>
</tr>
<tr>
<td>vs1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node1...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has interface groups or VLANs configured</td>
<td>Go to Step 3.</td>
</tr>
<tr>
<td>Does not have interface groups or VLANs configured</td>
<td>Skip Step 3 and go to Step 4.</td>
</tr>
</tbody>
</table>

Use the `network port vlan show` to display information about the network ports attached to VLANs, and use the `network port ifgrp show` to display information about the port interface groups.

3. Take the following steps to migrate any NAS data LIFs hosted on interface groups and VLANs on node1:

   a. Migrate the LIFs hosted on any interface groups and the VLANs on node1 to a port on node2 that is capable of hosting LIFs on the same network as that of the interface groups by entering the following command, once for each LIF:

      ```
      network interface migrate -vserver vserver_name -lif lif_name -destination-node node2 -destination-port netport|ifgrp
      ```

   b. Modify the home port and the home node of the LIFs and VLANs 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 lif_name -home-node node2 -home-port netport|ifgrp
      ```

4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is configured for...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS</td>
<td>Complete Step 5 through Step 8.</td>
</tr>
<tr>
<td>SAN</td>
<td>Disable all the SAN LIFs on the node to take them down for the upgrade:</td>
</tr>
</tbody>
</table>

   ```
   network interface modify -vserver vserver_name -lif lif_name -home-node node_to_upgrade -home-port netport|ifgrp -status-admin down
   ```

5. Migrate NAS data LIFs from node1 to node2 by entering the following command, once for each data LIF:

   ```
   network interface migrate -vserver vserver_name -lif lif_name -destination-node node2 -destination-port data_port
   ```

6. 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 -curr-node node2 -data-protocol nfs|cifs
   ```

7. Enter the following command to modify the home node of the migrated LIFs:

   ```
   network interface modify -vserver vserver_name -lif lif_name -home-node node2 -home-port port_name
   ```

8. Verify whether the LIF is using the port as its home or current port. If the port is not home or current port then go to step 9:

   ```
   network interface show -home-node node2 -home-port port_name
   network interface show -curr-node node_name -curr-port port_name
   ```
9. If the LIFs are using the port as a home port or current port, then modify the LIF to use a different port:

```
network interface migrate -vserver vserver -lif lif_name -destination-node node_name -destination-port port_name
```

```
network interface modify -vserver vserver -lif lif_name -home-node node_name -home-port port_name
```

10. If the ports currently hosting data LIFs are not going to exist on the new hardware, remove them from the broadcast domain now:

```
network port broadcast-domain remove-ports -ipspace Default -broadcast-domain Default -ports node:port
```

11. 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 -home-node nodename -status-admin up
```

Note: For MetroCluster configurations, 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 destination storage virtual machine (SVM). Enter the following command from the corresponding source SVM on the remote site to reallocate the destination LIF to an appropriate port:

```
metrocluster vserver resync -vserver a vserver_name
```

12. Enter the following command and examine its output to verify that there are no data LIFs remaining on node1:

```
network interface show -curr-node node1 -role data
```

13. If you have interface groups or VLANs configured, complete the following substeps:

a. Remove the VLANs from the interface groups by entering the following command:

```
network port vlan delete -node nodename -port ifgrp -vlan-id VLAN_ID
```

b. Enter the following command and examine its output to see if there are any interface groups configured on the node:

```
network port ifgrp show -node nodename -ifgrp ifgrp_name -instance
```

The system displays interface group information for the node as shown in the following example:

```
cluster::> network port ifgrp show -node node1 -ifgrp a0a -instance
Node: node1
Interface Group Name: a0a
Distribution Function: ip
Create Policy: multimode_lacp
MAC Address: 02:a0:98:17:dc:d4
Port Participation: partial
Network Ports: e2c, e2d
Up Ports: e2c
Down Ports: e2d
```

c. If any interface groups are configured on the node, record the names of those groups and the ports assigned to them, and then delete the ports by entering the following command, once for each port:

```
network port ifgrp remove-port -node nodename -ifgrp ifgrp_name -port netport
```
Recording node1 information

Before you can shut down and retire node1, you need to record information about its cluster network, management, and FC ports as well as its NVRAM System ID. You need that information later in the procedure when you map node1 to node3 and reassign disks.

Steps

1. Enter the following command and capture its output:

   ```
   network route show
   ```

   The system displays output similar to the following example:

   ```
   cluster::> network route show
   Vserver     Destination     Gateway         Metric
   ---------      --------------- --------------- ------
   iscsi_vserver 0.0.0.0/0       10.10.50.1      20
   node1        0.0.0.0/0       10.10.20.1      10
   .....        0.0.0.0/0       192.168.1.1     20
   ```

2. Enter the following command and capture its output:

   ```
   vserver services name-service dns show
   ```

   The system displays output similar to the following example:

   ```
   cluster::> vserver services name-service dns show
   Name
   Vserver         State     Domains                             Servers
   ------------------ --------- ----------------------------------- ----------------
   node_1_2        enabled   alpha.beta.gamma.netapp.com         10.10.60.10,
   vs_base1        enabled   alpha.beta.gamma.netapp.com,        10.10.60.10,
   .....        gamma.netapp.com,                   10.10.60.20
   vs_peer1        enabled   alpha.beta.gamma.netapp.com,        10.10.60.10,
   gamma.netapp.com,                   10.10.60.20
   ```

3. Find the cluster network and node-management ports on node1 by entering the following command on either controller:

   ```
   network interface show -curr-node node1 -role cluster,intercluster,node-mgmt,cluster-mgmt
   ```

   The system displays the cluster, intercluster, node-management, and cluster-management LIFs for the node in the cluster, as shown in the following example:

   ```
   cluster::> network interface show -curr-node node1 -role cluster,intercluster,node-mgmt,cluster-mgmt
   Logical    Status     Network            Current       Current Is
   Vserver     Interface  Admin/Oper Address/Mask       Node          Port    Home
   ----------- ---------- ---------- ------------------ ------------- ------- ----
   vserver1    cluster_mgmt up/up    192.168.x.x/24   node1         e0c     true
   node1       intercluster up/up    192.168.x.x/24   node1         e0e     true
   clus1       up/up    169.254.x.x/24   node1         e0a     true
   clus2       up/up    169.254.x.x/24   node1         e0b     true
   mgmt1       up/up    192.168.x.x/24   node1         e0c     true
   ```

   Note: Your system might not have intercluster LIFs.

4. Capture the information in the output of the command in Step 3 to use in the section

   Mapping cluster and node-management ports from node1 to node3.
The output information is required to map the new controller ports to the old controller ports.

5. Enter the following command on node1:

```
network port show -node node1 -type physical
```

The system displays the physical ports on the node as shown in the following example:

```
cluster::> network port show -node node1 -type physical

<table>
<thead>
<tr>
<th>Node</th>
<th>Port</th>
<th>IPspace</th>
<th>Broadcast Domain</th>
<th>Link</th>
<th>MTU</th>
<th>Admin/Oper</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>e0M</td>
<td>Default</td>
<td>172.17.178.19/24</td>
<td>up</td>
<td>1500</td>
<td>auto/100</td>
</tr>
<tr>
<td></td>
<td>e0a</td>
<td>Default</td>
<td>172.17.178.19/24</td>
<td>up</td>
<td>1500</td>
<td>auto/1000</td>
</tr>
<tr>
<td></td>
<td>e0b</td>
<td>Default</td>
<td>-</td>
<td>up</td>
<td>1500</td>
<td>auto/1000</td>
</tr>
<tr>
<td></td>
<td>e1a</td>
<td>Cluster</td>
<td>Cluster</td>
<td>up</td>
<td>9000</td>
<td>auto/10000</td>
</tr>
<tr>
<td></td>
<td>e1b</td>
<td>Cluster</td>
<td>Cluster</td>
<td>up</td>
<td>9000</td>
<td>auto/10000</td>
</tr>
</tbody>
</table>

5 entries were displayed.

6. Record the ports and their broadcast domains.

The broadcast domains will need to be mapped to the new ports on the new controller later in the procedure.

7. Enter the following command on node1:

```
network fcp adapter show -node node1
```

The system displays the FC ports on the node, as shown in the following example:

```
cluster::> fcp adapter show -node node1

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Connection</th>
<th>Established Port Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>0a</td>
<td>ptp</td>
<td>11400</td>
</tr>
<tr>
<td>node1</td>
<td>0c</td>
<td>ptp</td>
<td>11700</td>
</tr>
<tr>
<td>node1</td>
<td>6a</td>
<td>loop</td>
<td>0</td>
</tr>
<tr>
<td>node1</td>
<td>6b</td>
<td>loop</td>
<td>0</td>
</tr>
</tbody>
</table>

4 entries were displayed.

8. Record the ports.

The output information is required to map the new FC ports on the new controller later in the procedure.

9. If you did not do so earlier, check whether there are interface groups or VLANs configured on node1 by entering the following commands:

```
network port ifgrp show
network port vlan show
```

You will use the information in the section Mapping ports from node1 to node3.

10. Take one of the following actions:

<table>
<thead>
<tr>
<th>If you...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded the NVRAM System ID number in the section</td>
<td>Go on to the next section, Retiring node1.</td>
</tr>
<tr>
<td>Preparing the nodes for the upgrade</td>
<td></td>
</tr>
</tbody>
</table>
### If you...  
| Did not record the NVRAM System ID number in the section Preparing the nodes for the upgrade | Complete Step 11 and Step 12 and then go on to the next section, *Retiring node1*. |

### 11. **Enter the following command on either controller:**

```
$ system node show --instance --node node1
```

The system displays information about node1 as shown in the following example:

```
cluster::> system node show --instance --node node1

  Node: node1
  Owner: 
  Location: GD1
  Model: FAS6240
  Serial Number: 700000484678
  Asset Tag: -
  Uptime: 20 days 00:07
  NVRAM System ID: 1873757983
  System ID: 1873757983
  Vendor: NetApp
  Health: true
  Eligibility: true
```

### 12. **Record the NVRAM System ID number to use in the section *Installing and booting node3*.**

#### Retiring node1

To retire node1, you need to disable the HA pair with node2, shut node1 down properly, and remove it from the rack or chassis.

### Steps

1. **Verify the number of nodes in the cluster:**

   ```
   $ cluster show
   ```

   The system displays the nodes in the cluster, as shown in the following example:

   ```
   cluster::> cluster show
   
   Node                  Health  Eligibility
   --------------------- ------- ------------
   node1                 true    true
   node2                 true    true
   2 entries were displayed.
   ```

2. **Disable storage failover, as applicable:**

<table>
<thead>
<tr>
<th>If the cluster is...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A two-node cluster</td>
<td>a. Disable cluster high availability by entering the following command on either node:</td>
</tr>
</tbody>
</table>
   |                       |   ```
   |                       |   cluster ha modify --configured false
   |                       | b. Disable storage failover: |
   |                       |   ```
   |                       |   storage failover modify --node node1 --enabled false
   | A cluster with more than two nodes | Disable storage failover: |
   |                                       |   ```
   |                                       |   storage failover modify --node node1 --enabled false
   |

3. **Verify that storage failover was disabled:**

   ```
   $ storage failover show
   ```
The following example shows the output of the `storage failover show` command when storage failover has been disabled for a node:

```
cluster::> storage failover show

  Takeover     Node           Partner        Possible State Description
              ------------- -------------- -------- -------------------------------------
false        node1          node2          false    Connected to node2, Takeover
false        node2          node1          false    Node owns partner's aggregates as part
of the nondisruptive controller upgrade
procedure. Takeover is not possible: Storage failover is disabled

2 entries were displayed.
```

4. Verify the data LIF status:

   `network interface show -role data -curr-node node2 -home-node node1`

   Look in the Status Admin/Oper column to see if any LIFs are down. If any LIFs are down, consult the "Troubleshooting" section.

5. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A two-node cluster</td>
<td>Go to Step 6.</td>
</tr>
<tr>
<td>A cluster with more than two nodes</td>
<td>Go to Step 8.</td>
</tr>
</tbody>
</table>

6. Access the advanced privilege level on either node:

   `set --privilege advanced`

7. Verify that the cluster HA has been disabled:

   `cluster ha show`

   The system displays the following message:

   ```
   High Availability Configured: false
   ```

   If cluster HA has not been disabled, repeat Step 2.

8. Check whether node1 currently holds epsilon:

   `cluster show`

   Because there is the possibility of a tie in a cluster that has an even number of nodes, one node has an extra fractional voting weight called `epsilon`. See the System Administration Reference for more information.

   **Note:** If you have a four-node cluster, epsilon might be on a node in a different HA pair in the cluster.

   The following example shows that node1 holds epsilon:

   ```
   cluster::*> cluster show
   Node        Health Eligibility Epsilon
   ------------- ------- ----------- --------
   node1       true    true      true
   node2       true    true      false
   ```

9. If node1 holds epsilon, then mark epsilon `false` on the node so that it can be transferred to the node2:
cluster modify -node node1 -epsilon false
10. Transfer epsilon to node2 by marking epsilon true on node2:
cluster modify -node node2 -epsilon true
11. Verify that the change to node2 occurred:
cluster show

<table>
<thead>
<tr>
<th>Node</th>
<th>Health</th>
<th>Eligibility</th>
<th>Epsilon</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>true</td>
<td>true</td>
<td>false</td>
</tr>
<tr>
<td>node2</td>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
</tbody>
</table>

The epsilon for node2 should now be true and the epsilon for node1 should be false.

12. Verify whether the setup is a two-node switchless 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.

13. Return to the admin level:
set -privilege admin

14. Halt node1 from the node1 prompt:

system node halt -node node1

⚠️ **Attention:** If node1 is in same chassis as node2, do not power off the chassis by using the power switch or by pulling the power cable. If you do so, node2, which is serving data, will go down.

15. When the system prompts you to confirm that you want to halt the system, enter y.
The node stops at the boot environment prompt.

16. When node1 displays the boot environment prompt, remove it from the chassis or the rack.
You can decommission node1 after the upgrade is completed. *See Decommissioning the old system.*

**Upgrading the node pair: Stage 3**

During Stage 3, you install and boot node3, map the cluster and node-management ports from node1 to node3, verify the node3 installation, and move data LIFs and SAN LIFs belonging to node1 from node2 to node3. You also relocate all aggregates from node2 to node3, and move the data LIFs and SAN LIFs owned by node2 to node3.

**Steps**
1. *Installing and booting node3* on page 40
2. *Setting the FC or UTA/UTA2 configuration on node3* on page 48
3. *Mapping ports from node1 to node3* on page 55
4. *Verifying the node3 installation* on page 58
5. *Moving NAS data LIFs owned by node1 from node2 to node3 and verifying SAN LIFs on node3* on page 58
6. *Relocating non-root aggregates from node2 to node3* on page 61
7. *Moving NAS data LIFs owned by node2 to node3* on page 63
Installing and booting node3

You need to install node3 in the rack, transfer node1’s connections to node3, boot node3, and install ONTAP. You then need to reassign any of node1’s spare disks, any disks belonging to the root volume, and any non-root aggregates not relocated to node2 earlier.

About this task

You need to netboot node3 if it does not have the same version of ONTAP 9 that is installed on node1. After you install node3, 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. Preparing for netboot on page 29

However, you do not need to netboot node3 if it has the same or a later version of ONTAP 9 that is installed on node1.

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 need to complete Step 1 on page 40 through Step 5 on page 41, leave this section at Step 6 on page 41 and follow instructions in the "Configuring Fibre Channel ports on node3” and "Checking and configuring CNA ports on node3” sections as needed, entering commands in Maintenance mode. You must then return to this section and resume with Step 7 on page 41.

However, if you are upgrading a system with storage disks, you need to complete this entire section and then go to the "Configuring Fibre Channel ports on node3” and "Checking and configuring CNA ports on node3” sections, entering commands at the cluster prompt.

Steps

1. Make sure that you have rack space for node3.
   If node1 and node2 were in separate chassis, you can put node3 in the same rack location as node1. However, if node1 was in the same chassis with node2, then you need to put node3 into its own rack space, preferably close to the location of node1.

2. Install node3 in the rack, following instructions in the Installation and Setup Instructions for your node model.
   
   Note: If you are upgrading to a system with both nodes in the same chassis, install node4 in the chassis as well as node3. If you do not, when you boot node3, the node will behave as if it were in a dual-chassis configuration, and when you boot node4, the interconnect between the nodes will not come up.

3. Cable node3, moving the connections from node1 to node3.
   
   Cable the following connections, using the instructions in the Installation and Setup Instructions or the FlexArray Virtualization Installation Requirements and Reference for the node3 platform, the appropriate disk shelf guide, and the ONTAP 9 High-Availability Configuration Guide.
   
   • Console (remote management port)
   • Cluster ports
   • Data ports
   • Cluster and node management ports
   • Storage
   • SAN configurations: iSCSI Ethernet and FC switch ports
   
   Note: You do not need to move the interconnect card or the cluster interconnect cable connection from node1 to node3 because most platform models have a unique interconnect card model. For the MetroCluster configuration, you need to move the FCVI cable connections from node1 to node3.
4. Turn on the power to node3, and then interrupt the boot process by pressing Ctrl-C at the console terminal to access the boot environment prompt.

If you are upgrading to a system with both nodes in the same chassis, node4 also reboots. However, you can disregard the node4 boot until later.

**Note:** When you boot node3, 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 on page 41, 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.

6. Take one of the following actions:

<table>
<thead>
<tr>
<th>If your system...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has disks and no back-end storage</td>
<td>Skip Step 7 on page 41 through Step 12 on page 42 and go to 13 on page 42.</td>
</tr>
</tbody>
</table>
| Is a V-Series system or a system with FlexArray Virtualization software connected to storage arrays | **a.** Go to the section "Setting the FC or CNA configuration on node3" and complete the subsections in it, "Setting the onboard Fibre Channel configuration on node3" and "Configuring CNA ports on node3", as appropriate to your system.  
**b.** Return to this section and complete the remaining steps, beginning with Step 7 on page 41. **Important:** 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. |

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

   If your system has a tape SAN, then you need zoning for the initiators. See your storage array and zoning documentation for instructions.

8. 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.

9. 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.

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

11. Verify that the array LUNs are now visible to node3:
sysconfig -v
The system displays all the array LUNs visible to each of the FC initiator ports. If the array
LUNs are not visible, you will not be able to reassign disks from node1 to node3 later in this
section.

12. Press Ctrl-C to display the boot menu and select Maintenance mode.
13. At the Maintenance mode prompt, enter the following command:
   halt
   The system stops at the boot environment prompt.
14. Take one of the following actions:
   If the system you are
   upgrading to is in a...
   Then...

   Dual-chassis configuration (with
   controllers in different chassis)  Go to Step 15 on page 42.

   Single-chassis configuration
   (with controllers in the same
   chassis)  
   a. Switch the console cable from node3 to node4.
   b. 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.
      The power should already be on if both controllers are in the same chassis.
      Note: Leave node4 at the boot environment prompt; you will return to
      node4 in the section "Installing and booting node4".
   c. If you see the warning message displayed in Step 4, follow the instructions
      in Step 5.
   d. Switch the console cable back from node4 to node3.
   e. Go to Step 15 on page 42

15. Configure node3 for ONTAP:
   set-defaults

16. If NetApp Storage Encryption (NSE) is in use on this configuration, the setenv
    bootarg.storageencryption.support command must be set to true, and the
    kmip.init.maxwait variable needs to be set to off to avoid a boot loop after the node1
    configuration is loaded:
    setenv bootarg.storageencryption.support true
    setenv kmip.init.maxwait off

17. If the version of ONTAP installed on node3 is the same or later than the version of ONTAP 9
    installed on node1, enter the following command to list and reassign disks to the new node3:
    boot_ontap
    Warning: If this new node has ever been used in
    any other cluster or HA pair, you must run
    wipeconfig before proceeding. Failure to do so
    may result in service outages or data loss. Contact
    technical support if the replacement controller was
    previously used, especially if the controllers were
    running ONTAP running in 7-Mode.

18. Press CTRL-C to display the boot 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 
node3

Go to Step 20 on page 43.

Has the correct or current 
version of ONTAP on node3

Go to Step 25 on page 44

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

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

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

21. Perform netboot on node3:

<table>
<thead>
<tr>
<th>For...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAS/AFF8000 series systems</td>
<td>netboot http://web_server_ip/path_to_web-accessible_directory/netboot/kernel</td>
</tr>
<tr>
<td>All other systems</td>
<td>netboot http://web_server_ip/path_to_web-accessible_directory/&lt;ontap_version&gt;_image.tgz</td>
</tr>
</tbody>
</table>

The `<path_to_web-accessible_directory>` should lead to where you downloaded the `<ontap_version>_image.tgz` in Step 1 in the section *Preparing for netboot* on page 29.

**Note:** 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 ONTAP image to the boot device.
Note: 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.

Note: Always use netboot to update the new node to the desired image. If you use another method to install the image on the new controller, the wrong image might install. This issue applies to all releases of ONTAP.

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}

   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 (5) Maintenance mode boot by entering 5, and then enter y when prompted to continue with the boot.

26. Before continuing, go to the section Setting the FC or UTA/UTA2 configuration on node3 on page 48 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. Find the system ID of node3:

   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                     DR
   HOME
   --------------            -----  ------------- -------------  -------------------
   ----------
   0b.02.23 nst-fas2520-2(536880939) Poo10 KPG2RK6F nst-fas2520-2(536880939)
   0b.02.13 nst-fas2520-2(536880939) Poo10 KPG3DE4F nst-fas2520-2(536880939)
   0b.01.13 nst-fas2520-2(536880939) Poo10 PPG4KLAA nst-fas2520-2(536880939)
   .......
   0a.00.0 (536881109) Poo10 YFKSX6JG (536881109)
   .......

   Note: You may see the message disk show: No disks match option -a. after entering the command. This is not an error message so you can continue with the procedure.

28. Reassign node1's spares, any disks belonging to the root, and any non-root aggregates that were not relocated to node2 earlier in the "Relocating aggregates from node1 to node2" section.
Enter the appropriate form of the disk reassign command based on whether your system has shared disks:

<table>
<thead>
<tr>
<th>Disk type</th>
<th>Run the command</th>
</tr>
</thead>
<tbody>
<tr>
<td>With shared disks</td>
<td><code>disk reassign -s node1_sysid -d node3_sysid -p node2_sysid</code></td>
</tr>
<tr>
<td>Without shared disks</td>
<td><code>disk reassign -s node1_sysid -d node3_sysid</code></td>
</tr>
</tbody>
</table>

For the `node1_sysid` value, use the information captured in the section "Recording node1 information". To obtain the value for `node3_sysid`, use the `sysconfig` command.

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

The `disk reassign` command reassigns only those disks for which `node1_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
```

29. Enter `n`.

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
```

30. Enter `y`.

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
```

31. Enter `y`.

32. 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 node1 aggregate as root to ensure node3 boots from the root aggregate of node1.

```
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 node3 to boot from the root aggregate of node1:

a. Check the RAID, plex, and checksum information for the node1 aggregate:

```
aggr status -r
```

b. Check the status of the node1 aggregate:

```
aggr status
```

c. Bring the node1 aggregate online, if necessary:

```
aggr online root_aggr_from_node1
```

d. Prevent the node3 from booting from its original root aggregate:

```
aggr offline root_aggr_on_node3
```
e. Set the node1 root aggregate as the new root aggregate for node3:

   `aggr options aggr_from_node1 root`

f. Verify that the root aggregate of node3 is offline and the root aggregate for the disks brought over from node1 is online and set to root:

   `aggr status`

   **Note:** Failing to perform the previous substep might cause node3 to boot from the internal root aggregate, or it might cause the system to assume a new cluster configuration exists or prompt you to identify one.

   The following shows an example of the command output:

   ```
   Aggr State         Status                Options
   aggr0_nst_fas8080_15 online raid_dp, aggr root, nosnap=on
                     fast zeroed 64-bit
   aggr0 offline      raid_dp, aggr         diskroot
                     fast zeroed 64-bit
   ```

33. 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:

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

   Systems record 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.

   If the controller and chassis are not configured as **ha**, use the following commands to correct the configuration: `ha-config modify controller ha` and `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` and `ha-config modify chassis mcc`.

34. Destroy the mailboxes on node3:

   ```
   mailbox destroy local
   ```
   The console displays the following message:

   ```
   Destroying mailboxes forces a node to create new empty mailboxes, which clears any takeover state, removes all knowledge of out-of-date plexes of mirrored volumes, and will prevent management services from going online in 2-node cluster HA configurations. Are you sure you want to destroy the local mailboxes?
   ```
35. Enter y at the prompt to confirm that you want to destroy the local mailboxes.

36. Exit Maintenance mode:

   halt
   The system stops at the boot environment prompt.

37. On node2, check the system date, time, and time zone:

   date

38. On node3, check the date by entering the following command at the boot environment prompt:

   show date

39. If necessary, set the date on node3:

   set date mm/dd/yyyy

40. On node3, check the time by entering the following command at the boot environment prompt:

   show time

41. If necessary, set the time on node3:

   set time hh:mm:ss

42. Verify the partner system ID is set correctly as noted in Step 28 on page 44 under -p switch:

   printenv partner-sysid

43. If necessary, set the partner system ID on node3:

   setenv partner-sysid node2_sysid
   a. Save the settings:
      saveenv

44. Access the boot menu by entering the following command at the boot environment prompt:

   boot_ontap menu

45. 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?:

46. Enter y at the prompt.
   The boot proceeds normally, and the system then asks you to confirm the system ID mismatch.
   
   **Note:** The system might reboot twice before displaying the mismatch warning.

47. Confirm the mismatch as shown in the following example:

   WARNING: System id mismatch. This usually occurs when replacing CF or NVRAM cards!
   Override system id (y|n) ? [n] y

   The node might go through one round of reboot before booting normally.

48. Log in to node3.
Setting the FC or UTA/UTA2 configuration on node3
If node3 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 section Configuring FC ports on node3, the section Checking and configuring UTA/UTA2 ports on node3, or both sections.

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

• If node3 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 section Mapping ports from node1 to node3 on page 55.
• However, if you have a V-Series system or a system with FlexArray Virtualization software with storage arrays, and node3 does not have onboard FC ports, onboard UTA/UTA ports, or a UTA/UTA2 card, return to the section Installing and booting node3 and resume the section at Step 7 on page 41.

Choices
• Configuring Fibre Channel ports on node3 on page 48
• Checking and configuring UTA/UTA2 ports on node3 on page 50

Confignging Fibre Channel ports on node3
If node3 has Fibre Channel (FC) ports—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 node1 that you saved in the section Preparing the nodes for the 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 card, you configure them in the next section.

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

Steps
1. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system that you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td>Go to Step 5.</td>
</tr>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
<td>Go to Step 2.</td>
</tr>
</tbody>
</table>

2. Boot node3 and access Maintenance mode by entering the following command:

   boot_ontap maint

3. Take one of the following actions:
<table>
<thead>
<tr>
<th>If the system that you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
</table>
| Has storage disks                       | Enter the following command:  
  `system node hardware unified-connect show` |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Enter the following command:  
  `ucadmin show` |

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

4. Compare the FC settings on node3 with the settings that you captured earlier from node1.

5. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the default FC settings on the new nodes are...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>The same as the ones you that captured on node1</td>
<td>Go to Step 11.</td>
</tr>
<tr>
<td>Different from the ones that you captured on node1</td>
<td>Go to Step 6.</td>
</tr>
</tbody>
</table>

6. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system that you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
</table>
| Has storage disks                       | Modify the FC ports on node3 as needed by entering one of the following commands:  
  - To program target ports: `system node hardware unified-connect modify -type | -t target -adapter port_name`  
  - To program initiator ports: `system node hardware unified-connect modify -type | -t initiator -adapter port_name`  
  `-type` is the FC4 type: target or initiator. |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | Modify the FC ports on node3 as needed by entering the following command:  
  `ucadmin modify -m fc -t initiator -f adapter_port_name`  
  `-t` is the FC4 type, target or initiator.  
  **Note:** The FC ports must be programmed as initiators. |

7. Take one of the following actions:

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

8. Exit Maintenance mode by entering the following command: `halt`

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

10. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization software running clustered Data ONTAP 8.3</td>
<td>Boot node3 and access Maintenance mode by entering the following command at the boot environment prompt: <code>boot_ontap maint</code></td>
</tr>
<tr>
<td>Is not a V-Series system or does not have FlexArray Virtualization software</td>
<td>Boot node3 by entering the following command at the boot environment prompt: <code>boot_ontap</code></td>
</tr>
</tbody>
</table>

11. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system that you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
</table>
| Has storage disks | • If node3 has a UTA/UTA2 card or UTA/UTA2 onboard ports, go to the section Checking and configuring ports on node3.  
  • If node3 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports, skip the section Checking and configuring UTA/UTA2 ports on node3 and go to the section Mapping ports from node1 to node3. |
| Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | • If node3 has a card or onboard ports, go to the section Checking and configuring ports node3.  
  • If node3 does not have a card or onboard ports, skip the section Checking and configuring ports node3, return to the section Installing and booting node3 and resume the section at Step 7. |

**Checking and configuring UTA/UTA2 ports on node3**

If node3 has onboard UTA/UTA2 ports or a UTA/UTA2 card, you must check the configuration of the ports and possibly reconfigure 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**

If you want to use a Unified Target Adapter (UTA/UTA2) port for FC, you must first verify how the port is configured.

**Note:** NetApp marketing materials might use the term UTA2 to refer to CNA adapters and ports. However, the CLI uses the term CNA.
You can use the `ucadmin show` command to verify the current port configuration:

```bash
CLUSTER::> system node hardware unified-connect
```

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Current Mode</th>
<th>Current Type</th>
<th>Pending Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>node1</td>
<td>0e</td>
<td>fc</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0f</td>
<td>fc</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0g</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>node1</td>
<td>0h</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

8 entries were displayed.

UTA/UTA2 ports can be configured into native Fibre Channel (FC) mode or UTA/UTA2 mode. FC mode supports FC initiator and FC target; UTA/UTA2 mode allows concurrent NIC and FCoE traffic sharing the same 10GbE SFP+ interface and supports FC targets.

UTA/UTA2 ports might be found on an adapter or on the controller, and have the following configurations, but you should check the configuration of the UTA/UTA2 ports on the node3 and change it, if necessary:

- UTA/UTA2 cards ordered when the controller is ordered are configured before shipment to have the personality you request.
- 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 request.

**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 V-Series system or have FlexArray Virtualization Software and are connected to storage arrays, you enter commands in this section at the Maintenance mode prompt. You must be in Maintenance mode to configure UTA/UTA2 ports.

**Steps**

1. Check how the ports are currently configured by entering one of the following commands on node3:

```bash
<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td><code>system node hardware unified-connect show</code></td>
</tr>
</tbody>
</table>
```
If the system... Then...

Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays

The system displays output similar to the following examples:

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

```
Node | Adapter | Current Mode | Current Type | Pending Mode | Pending Type | 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-b | 0e      | fc           | initiator    | -            | -            | online
  f-b | 0f      | fc           | initiator    | -            | -            | online
  f-b | 0g      | cna          | target       | -            | -            | online
  f-b | 0h      | cna          | target       | -            | -            | online
```

12 entries were displayed.

```
*> ucadmin show
```

```
Adapter | Current Mode | Current Type | Pending Mode | Pending Type | Status
-------- | ------------ | ------------ | ------------ | ------------ | -----
  0e      | fc           | initiator    | -            | -            | online
  0f      | fc           | initiator    | -            | -            | online
  0g      | cna          | target       | -            | -            | online
  0h      | cna          | target       | -            | -            | online
  0e      | fc           | initiator    | -            | -            | online
  0f      | fc           | initiator    | -            | -            | online
  0g      | cna          | target       | -            | -            | online
  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 `system node hardware unified-connect show` or `ucadmin show` command and determine whether the UTA/UTA2 ports have the personality you want.

4. Take one of the following actions:

If the UTA/UTA2 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 Step 13.

5. Take one of the following actions:
### Using Aggregate Relocation to Manually Upgrade Controller Hardware

Using aggregate relocation to upgrade controller hardware on a pair of nodes running ONTAP 9.x

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks and is running clustered Data ONTAP 8.3</td>
<td>Boot node3 and enter Maintenance mode: <code>boot_ontap maint</code></td>
</tr>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
<td>Go to Step 6.</td>
</tr>
<tr>
<td>You should already be in Maintenance mode.</td>
<td></td>
</tr>
</tbody>
</table>

6. Take one of the following actions:

<table>
<thead>
<tr>
<th>If you are configuring...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports on a UTA/UTA2 card</td>
<td>Go to Step 7.</td>
</tr>
<tr>
<td>Onboard UTA/UTA2 ports</td>
<td>Skip Step 7 and go to Step 8.</td>
</tr>
</tbody>
</table>

7. 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.

8. 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 `cna`.
   - `-t` is the FC4 type, `target` or `initiator`.

   **Note:** You need to use FC initiator for tape drives, FlexArray Virtualization systems, and MetroCluster configurations. You need to use the FC target for SAN clients.

9. Verify the settings:

   ```
   ucadmin show
   ```

10. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td>a. Stop the system: <code>halt</code></td>
</tr>
<tr>
<td></td>
<td>b. Enter the following command: <code>boot_ontap</code></td>
</tr>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays and is running clustered Data ONTAP 8.3</td>
<td>Reboot to Maintenance mode: <code>boot_ontap maint</code></td>
</tr>
</tbody>
</table>

11. Verify the settings:

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td><code>system node hardware unified-connect show</code></td>
</tr>
</tbody>
</table>
If the system... Then...

Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays **ucadmin show**

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

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Mode</th>
<th>Type</th>
<th>Pending Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>f-a</td>
<td>1a</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>1b</td>
<td>fc</td>
<td>target</td>
<td>-</td>
<td>initiator</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2a</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2b</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>
```

4 entries were displayed.

**ucadmin show**

```
1a   fc   initiator   -   -   online
1b   fc   target     -   initiator online
2a   fc   target     cna -   online
2b   fc   target     cna -   online
```

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

If the system... Then...

Has storage disks **network fcp adapter modify -node node_name -adapter adapter_name -state up**

Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays **fcp config adapter_name up**

13. Cable the port.

14. Take one of the following actions:

If the system... Then...

Has storage disks Go to the "Mapping ports from node1 to node3" section.

Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays Return to the "Installing and booting node3" section and resume the section at Step 7.
**Mapping ports from node1 to node3**

You need to make sure that the physical ports on node1 map correctly to the physical ports on node3, which will let node3 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 from the *Hardware Universe* at hwu.netapp.com. You use the information later in this section and in the "Mapping ports from node2 to node4" section.

The software configuration of node3 must match the physical connectivity of node3, 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, which means that when you boot node3, ONTAP will try to host LIFs on the same ports that were used on node1.

Therefore, if the physical ports on node1 do not map directly to the physical ports on node3, then software configuration changes will be required to restore cluster, management, and network connectivity after the boot. In addition, if the cluster ports on node1 do not directly map to the cluster ports on node3, node3 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 node1 cabling information for node1, the ports, broadcast domains, and IPspaces, in the following table:

<table>
<thead>
<tr>
<th>LIF</th>
<th>Node1 ports</th>
<th>Node1 broadcast domains</th>
<th>Node1 IPspaces</th>
<th>Node3 ports</th>
<th>Node3 IPspaces</th>
<th>Node3 broadcast domains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 2</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Node management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
See the "Recording node1 information" section for the steps to obtain this information.

2. Record all the cabling information for node3, the ports, broadcast domains, and IPspaces in
   the previous table using the same procedure in "Recording node1 information" 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:

      `cluster::> set -privilege advanced`

   b. Verify if the setup is a two-node switchless 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. Get node3 into quorum by performing the following steps:
   a. Boot node3. See the "Installing and booting node3" section 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 node3:

      `cluster::> network port show -node node3 -port e0a -fields broadcast-domain`

         node       port broadcast-domain
         ---------- ---- ----------------
         node3      e1a  Cluster

   c. 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 node3:

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

      **Note:** For a MetroCluster configuration, you may 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:

      `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 vserver resync -vserver vserver_name`

d. Migrate the cluster LIFs to the new ports, once for each LIF:
network interface migrate -vserver Cluster -lif lif_name -source-node node3 -destination-node node3 -destination-port port_name

e. Modify the home port of the cluster LIFs:

network interface modify -vserver Cluster -lif lif_name -home-port port_name

f. 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 -broadcast-domain Cluster -ports node:port

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

network port broadcast-domain remove-ports

The following command removes port e0d on node3:

network port broadcast-domain remove-ports -ipspace Cluster -broadcast-domain Cluster -ports node3:e0d

h. Verify that node3 has rejoined quorum:

cluster show -node node3 -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 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-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 6.

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 node1 that no longer exist on node3, 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 fgl as failover targets for LIF data1 on node3:
network interface modify -vserver node3 -lif data1 failover-policy broadcast-domain-wide -failover-group fg1

See the ONTAP 9 Network Management Guide or ONTAP 9 Commands: Manual Page Reference for more information.

10. Verify the changes on node3:

    network port show -node node3

Verifying the node3 installation

After you install and boot node3, you need to verify that it is installed correctly, and that node3 has joined the cluster and can communicate with node2.

Steps

1. Verify that node3 is part of the same cluster as node2 and healthy by entering the following command:

    cluster show

2. Verify that node3 can communicate with node2 and that all LIFs are up by entering the following command:

    network interface show -curr-node node3

3. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a SAN environment</td>
<td>Complete Step 4 and then go to the section Moving NAS data LIFs owned by node1 from node2 to node3 and verifying SAN LIFs on node3.</td>
</tr>
<tr>
<td>Not in a SAN environment</td>
<td>Skip Step 4 and go to the section Moving NAS data LIFs owned by node1 from node2 to node3 and verifying SAN LIFs on node3.</td>
</tr>
</tbody>
</table>

4. Verify that node2 and node3 are in quorum by entering the following command on one of the nodes and examining its output:

    event log show -messagename scsiblade.*

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

<table>
<thead>
<tr>
<th>Time</th>
<th>Node</th>
<th>Severity</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/13/2012 14:03:51</td>
<td>node1</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:51</td>
<td>node2</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:48</td>
<td>node3</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:43</td>
<td>node4</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
</tbody>
</table>

Moving NAS data LIFs owned by node1 from node2 to node3 and verifying SAN LIFs on node3

After you verify the node3 installation and before you relocate aggregates from node2 to node3, you need to move the NAS data LIFs belonging to node1 that are currently on node2 from node2 to node3. You also need to verify the SAN LIFs on node3.

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 node3 online.
Steps

1. List all the NAS data LIFs not owned by node2 by entering the following command on either node and capturing the output:

   ```bash
   network interface show -role data -curr-node node2 -is-home false -home-node node3
   ```

2. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node1...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had interface groups or VLANs configured</td>
<td>Go to Step 3.</td>
</tr>
<tr>
<td>Did not have interface groups or VLANs configured</td>
<td>Skip Step 3 and go to Step 4.</td>
</tr>
</tbody>
</table>

3. Perform the following substeps to migrate any NAS data LIFs hosted on interface groups and VLANs that were originally on node1 from node2 to node3:
   a. Migrate any data LIFs hosted on node2 that previously belonged to node1 on an interface group to a port on node3 that is capable of hosting LIFs on the same network by entering the following command, once for each LIF:

      ```bash
      network interface migrate -vserver vserver_name -lif lif_name -destination-node node3 -destination-port netport|ifgrp
      ```
   b. Modify the home port and home node of the LIF in substep a to the port and node currently hosting the LIFs by entering the following command, once for each LIF:

      ```bash
      network interface modify -vserver vserver_name -lif lif_name -home-node node3 -home-port netport|ifgrp
      ```
   c. Migrate any data LIF hosted on node2 that previously belonged to node1 on a VLAN port to a port on node3 that is capable of hosting LIFs on the same network by entering the following command, once for each LIF:

      ```bash
      network interface migrate -vserver vserver_name -lif lif_name -destination-node node3 -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:

      ```bash
      network interface modify -vserver vserver_name -lif lif_name -home-node node3 -home-port netport|ifgrp
      ```

4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is configured for...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS</td>
<td>Complete Step 5 and Step 6, skip Step 7, and complete Step 8 through Step 11.</td>
</tr>
<tr>
<td>SAN</td>
<td>Disable all the SAN LIFs on the node to take them down for the upgrade by entering the following command:</td>
</tr>
</tbody>
</table>
   |                                   | ```bash
   |                                   | network interface modify -vserver vserver_name -lif lif_name -home-node node_to_upgrade -home-port netport|ifgrp -status-admin down |
   |                                   | ```

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:

   ```bash
   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:
6. Migrate each NAS data LIF to node3 by entering the following command, once for each LIF:

```
network interface migrate -vserver vserver_name -lif lif_name -destination-node node3 -destination-port netport|ifgrp
```

7. Make sure that the data migration is persistent by entering the following command:

```
network interface modify -vserver vserver_name -lif lif_name -home-port netport|ifgrp -home-node node3
```

8. Ensure that the SAN LIFs are on the correct ports on node3 by completing the following substeps:

a. Enter the following command and examine its output:

```
network interface show -data-protocol iscsi|fcp -home-node node3
```

The system returns output similar to the following example:

```
cluster::> net int show -data-protocol iscsi|fcp -home-node node3
```

<table>
<thead>
<tr>
<th>Vserver</th>
<th>Logical Interface</th>
<th>Status</th>
<th>Network Address/Mask</th>
<th>Current Node</th>
<th>Current Home</th>
<th>Current Is Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>vs0</td>
<td>a0a</td>
<td>up/down</td>
<td>10.63.0.53/24</td>
<td>node3</td>
<td>a0a</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>data1</td>
<td>up/up</td>
<td>10.63.0.50/18</td>
<td>node3</td>
<td>e0c</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>rads1</td>
<td>up/up</td>
<td>10.63.0.51/18</td>
<td>node3</td>
<td>e1a</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>rads2</td>
<td>up/down</td>
<td>10.63.0.52/24</td>
<td>node3</td>
<td>e1b</td>
<td>true</td>
</tr>
<tr>
<td>vs1</td>
<td>lif1</td>
<td>up/up</td>
<td>172.17.176.120/24</td>
<td>node3</td>
<td>e0c</td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>lif2</td>
<td>up/up</td>
<td>172.17.176.121/24</td>
<td>node3</td>
<td>e1a</td>
<td>true</td>
</tr>
</tbody>
</table>

b. If node3 has any SAN LIFs or groups of SAN LIFs that are on a port that did not exist on node1 or that need to be mapped to a different port, move them to an appropriate port on node3 by completing the following substeps:

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

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

ii. Remove the LIF from the port set:

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

iii. Enter one of the following commands:

- Move a single LIF by entering the following command:

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

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

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

- Add the LIFs back to the port set:

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

**Note:** You need to ensure that you move SAN LIFs to a port that has the same link speed as the original port.
9. 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 node3 -lif data -status-admin up
```

10. 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 node3 -role data
```

11. 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
```

12. Send a post-upgrade AutoSupport message to NetApp for node1 by entering the following command:

```
system node autosupport invoke -node node3 -type all -message "node1 successfully upgraded from platform_old to platform_new"
```

### Relocating non-root aggregates from node2 to node3

Before you can replace node2 with node4, you must send an AutoSupport message for node2 and then relocate the non-root aggregates that are owned by node2 to node3.

#### Steps

1. Send an AutoSupport message to NetApp for node2:

```
system node autosupport invoke -node node2 -type all -message "Upgrading node2 from platform_old to platform_new"
```

2. Verify that the AutoSupport message was sent:

```
system node autosupport show -node node2 -instance
```

   The fields Last Subject Sent: and Last Time Sent: contain the message title of the last message that was sent and the time when the message was sent.

3. Relocate the non-root aggregates:
   a. Set the privilege level to advanced:
      ```
      set -privilege advanced
      ```
   b. List the aggregates that are owned by node2:
      ```
      storage aggregate show -owner-name node2
      ```
   c. Start aggregate relocation:
      ```
      storage aggregate relocation start -node node2 -destination node3 -aggregate-list * -ndo-controller-upgrade true
      ```
      **Note:** The command locates only non-root aggregates.
   d. When prompted, enter **y**.
      Relocation occurs in the background. It can 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.
   e. Return to the admin privilege level:
      ```
      set -privilege admin
      ```
4. Verify the relocation status of node2:

```
storage aggregate relocation show -node node2
```

The output will display **Done** for an aggregate after it has been relocated.
Note: You must wait until all of the aggregates that are owned by node2 have been relocated to node3 before proceeding to the next step.

5. Take one of the following actions:

<table>
<thead>
<tr>
<th>If relocation of...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>All aggregates was successful</td>
<td>Go to Step 6.</td>
</tr>
</tbody>
</table>
| Any aggregates failed, or was vetoed | a. Display a detailed status message:  
  `storage aggregate show -instance`
  You can also check the EMS logs to see the corrective action that is needed.  
  Note: The `event log show` command lists any errors that have occurred.  
  
b. Perform the corrective action.  
c. Set the privilege level to advanced:  
  `set -privilege advanced`
  
d. Relocate any failed or vetoed aggregates:  
  `storage aggregate relocation start -node node2 -destination node3 -aggregate-list * -ndo-controller-upgrade true`
  
e. When prompted, enter `y`.  
f. Return to the admin privilege level:  
  `set -privilege admin`

If necessary, you can force the relocation by using one of the following methods:

- By overriding veto checks using the `storage aggregate relocation start -override-vetoes true -ndo-controller-upgrade` command
- By overriding destination checks using the `storage aggregate relocation start -override-destination-checks true -ndo-controller-upgrade` command

See the ONTAP 9 Disks and Aggregates Power Guide and the ONTAP 9 Commands: Manual Page Reference for more information about the storage aggregate relocation commands.

6. Verify that all of the non-root aggregates are online on node3:

  `storage aggregate show -node node3 -state offline -root false`

If any aggregates have gone offline or have become foreign, you must bring them online, once for each aggregate:

  `storage aggregate online -aggregate aggr_name`

7. Verify that all of the volumes are online on node3:

  `volume show -node node3 -state offline`

If any volumes are offline on node3, you must bring them online, once for each volume:

  `volume online -vserver vserver-name -volume volume-name`

8. Verify that node2 does not own any online non-root aggregates:

  `storage aggregate show -owner-name node2 -ha-policy sfo -state online`

The command output should not display online non-root aggregates because all of the non-root online aggregates have already been relocated to node3.
Moving NAS data LIFs owned by node2 to node3

After you relocate the aggregates from node2 to node3, you need to move the NAS data LIFs owned by node2 to node3.

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 must verify that the LIFs are healthy and located on the appropriate ports after you move the LIFs from node3 to node4 and bring node4 online.

Steps

1. List all the NAS data LIFs owned by node2 by entering the following command on either node and capturing the output:

   ```
   network interface show -data-protocol nfs|cifs -home-node node2
   ```

   The following example shows the command output for node2:

   ```
   Logical    Status     Network            Current       Current Is
   Vserver     Interface  Admin/Oper Address/Mask       Node          Port    Home
   ----------- ---------- ---------- ------------------ ------------- ------- ----
   vs0          a0a        up/down  10.63.0.53/24      node2         a0a     true
   data1        up/up    10.63.0.50/18      node2         e0c     true
   rads1        up/up    10.63.0.51/18      node2         e1a     true
   rads2        up/down  10.63.0.52/24      node2         e1b     true
   vs1          lif1        up/up    172.17.176.120/24  node2         e0c     true
   lif2        up/up    172.17.176.121/24      node2         e1a     true
   ```

2. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node2...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has interface groups or VLANs configured</td>
<td>Go to Step 3.</td>
</tr>
<tr>
<td>Does not have interface groups or VLANs configured</td>
<td>Skip Step 3 and go to Step 4.</td>
</tr>
</tbody>
</table>

3. Take the following steps to migrate NAS data LIFs hosted on interface groups and VLANs on node2:

   a. Migrate any data LIFs hosted on an interface group on node2 to a port on node3 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 node3 -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 node:

   ```
   network interface modify -vserver vserver_name -lif lif_name -home-node node3 -home-port netport|ifgrp
   ```

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

   ```
   network interface migrate -vserver vserver_name -lif lif_name -destination-node node3 -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 lif_name -home-node node3 -home-port netport|ifgrp

4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is configured for...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS</td>
<td>Complete Step 5 through Step 8.</td>
</tr>
<tr>
<td>SAN</td>
<td>Skip Step 5 through Step 8 and then complete Step 9.</td>
</tr>
<tr>
<td>Both NAS and SAN</td>
<td>Complete Step 5 through Step 9.</td>
</tr>
</tbody>
</table>

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 node3 by entering the following command, once for each LIF:

```
network interface migrate -vserver vserver_name -lif lif_name -destination-node node3 -destination-port netport|ifgrp
```

7. Verify that NAS 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 -curr-node node3 -data-protocol cifs|nfs
```

8. 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. If you have interface groups or VLANs configured, complete the following substeps:
   a. Remove the VLANs from the interface groups by entering the following command:
      
      ```
      network port vlan delete -node node_name -port ifgrp -vlan-id VLAN_ID
      ```
   b. Enter the following command and examine its output to see if there are any interface groups configured on the node:
      
      ```
      network port ifgrp show -node node_name -ifgrp ifgrp_name -instance
      ```
      The system displays interface group information for the node, as shown in the following example:
      
      ```
      cluster::> network port ifgrp show -node node2 -ifgrp a0a -instance
      Node: node2
      Interface Group Name: a0a
      Distribution Function: ip
      Create Policy: multimode_lacp
      MAC Address: MAC_address
      Port Participation: partial
      Network Ports: e2c, e2d
      Up Ports: e2c
      Down Ports: e2d
      ```
   c. If any interface groups are configured on the node, record the names of the interface groups and the ports assigned to them and then delete the ports by entering the following command, once for each port:
      
      ```
      network port ifgrp remove-port -node node_name -ifgrp ifgrp_name -port port_name
      ```
Upgrading the node pair: Stage 4
During Stage 4, you record node2 information and then retire node2.

Steps
1. **Recording node2 information** on page 65
2. **Retiring node2** on page 66

Recording node2 information
Before you can shut down and retire node2, you need to record information about its cluster network, management, and FC ports as well as its NVRAM System ID. You need that information later in the procedure when you map node2 to node4 and reassign disks.

Steps
1. Find the cluster network, node-management, intercluster, and cluster-management ports on node2:

   ```
   network interface show -curr-node node_name -role cluster,intercluster,node-mgmt,cluster-mgmt
   ```

   The system displays the LIFs for that node and other nodes in the cluster, as shown in the following example:

   ```
   Logical  Status     Network            Current       Current Is
   Vserver  Interface  Admin/Oper Address/Mask       Node          Port    Home
   ----------- ---------- ---------- ------------------ ------------- ------- ----
   node2       intercluster up/up    192.168.1.202/24   node2         e0e     true
   clus1        up/up    169.254.xx.xx/24   node2         e0a     true
   clus2        up/up    169.254.xx.xx/24   node2         e0b     true
   mgmt1        up/up    192.168.0.xxx/24   node2         e0c     true
   4 entries were displayed.
   ```

   **Note:** Your system might not have intercluster LIFs. You will have a cluster management LIF only on one node of a node pair. A cluster management LIF was displayed in the example output of Step 1 in the section *Recording node1 port information.*

2. Capture the information in the output to use in the section *Mapping ports from node2 to node4.*

   The output information is required to map the new controller ports to the old controller ports.

3. Determine physical ports on node2:

   ```
   network port show -node node_name -type physical
   ```

   *node_name* is the node which is being migrated.

   The system displays the physical ports on node2, as shown in the following example:

   ```
   Node  Port      IPspace      Broadcast Domain Link  MTU    Admin/Oper
   ------ --------- ------------ ---------------- ----- ------- ------------
   node2  e0M       Default                  up       1500  auto/100
   e0a     Default                        -       up       1500  auto/1000
   e0b     Default                        -       up       1500  auto/1000
   e1a     Cluster  Cluster               Cluster  up       9000  auto/10000
   e1b     Cluster  Cluster               Cluster  up       9000  auto/10000
   5 entries were displayed.
   ```

4. Record the ports and their broadcast domains.

   The broadcast domains will need to be mapped to the ports on the new controller later in the procedure.

5. Determine the FC ports on node2:
network fcp adapter show
The system displays the FC ports on the node2, as shown in the following example:

```
cluster::> network fcp adapter show -node node2

Connection Host
Node Adapter Established Port Address
------------ ------- ----------- ------------
node2 0a  ptp         11400
node2 0c  ptp         11700
node2 6a  loop        0
node2 6b  loop        0
4 entries were displayed.
```

6. Record the ports.
The output information is required to map the new FC ports on the new controller later in the procedure.

7. If you have not done so earlier, check whether there are interface groups or VLANs configured on node2:
   ifgrp show
   vlan show
   You will use the information in the section Mapping ports from node2 to node4.

8. Take one of the following actions:

<table>
<thead>
<tr>
<th>If you...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded NVRAM System ID number in the section Preparing the nodes for the upgrade</td>
<td>Go to the next section, Retiring node2.</td>
</tr>
<tr>
<td>Did not record the NVRAM System ID number in the section Preparing the nodes for the upgrade</td>
<td>Complete Step 9 and Step 10 and then go to the next section, Retiring node2.</td>
</tr>
</tbody>
</table>

9. To display the attributes of node 2, use the
   system node show -instance -node node2
   command.

```
cluster::> system node show -instance -node node2
...
NVRAM System ID: system_ID
...
```

10. Record the NVRAM System ID to use in the section Installing and booting node4.

Retiring node2
To retire node2, you need to shut node2 down properly and remove it from the rack or chassis. If the cluster is in a SAN environment, you also need to delete the SAN LIFs.

Steps
1. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A two-node cluster</td>
<td>Go to Step 2.</td>
</tr>
</tbody>
</table>
If the cluster is... | Description
|----------------|----------------------
| A cluster with more than two nodes | Go to Step 9.

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

   ```
   set -privilege advanced
   ```

3. Verify that the cluster HA has been disabled by entering the following command and examining its output:

   ```
   cluster ha show
   ```

   The system displays the following message:

   High Availability Configured: false

4. Check if node2 currently holds epsilon by entering the following command and examining its output:

   ```
   cluster show
   ```

   The following example shows that node2 holds epsilon:

   ```
   cluster*::> cluster show
   Node                  Health  Eligibility   Epsilon
   --------------------- ------- ------------  ------------
   node1                 true    true          false
   node2                 true    true          true
   ```

   Warning: Cluster HA has not been configured. Cluster HA must be configured on a two-node cluster to ensure data access availability in the event of storage failover. Use the "cluster ha modify -configured true" command to configure cluster HA.

2 entries were displayed.

5. If node2 holds epsilon, mark epsilon as `false` on the node so that it can be transferred to node3 by entering the following command:

   ```
   cluster modify -node node2 -epsilon false
   ```

6. Transfer epsilon to node3 by marking epsilon `true` on node3 by entering the following command:

   ```
   cluster modify -node node3 -epsilon true
   ```

7. Verify if the setup is a two-node switchless 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.

8. Verify if the setup is a two-node switchless 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.

9. Return to the admin level by entering the following command:
set -privilege admin

10. Halt node2 by entering the following command on either controller:

```
system node halt -node node2
```

11. After node2 shuts down completely, remove it from the chassis or the rack.

You can decommission node2 after the upgrade is completed. See Decommissioning the old system.

Upgrading the node pair: Stage 5

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. Installing and booting node4 on page 68
2. Setting the FC or UTA/UTA2 configuration on node4 on page 75
3. Mapping ports from node2 to node4 on page 81
4. Verifying the node4 installation on page 84
5. Moving NAS data LIFs owned by node2 from node3 to node4 and verifying SAN LIFs on node4 on page 85
6. Relocating node2's non-root aggregates from node3 to node4 on page 88

Installing and booting 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. Preparing for netboot on page 29

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 on page 68 through Step 7 on page 69, leave this section at Step 8 on page 69 and follow instructions in the section Setting 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 with Step 9 on page 70.

However, if you are upgrading a system with storage disks, you need to complete this entire section and then proceed to the section Setting the FC or UTA/UTA2 configuration on node4, entering commands at the cluster prompt.

Steps

1. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node4 will be in ...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A chassis separate from node3</td>
<td>Go to Step 2 on page 69.</td>
</tr>
</tbody>
</table>
If node4 will be in...  Then...
The same chassis with node3  Skip Step 2 on page 69 and 3 on page 69 and go to 4 on page 69.

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.
   For systems with disks, cable the following connections using the instructions in the *Installation and Setup Instructions* or the *FlexArray Virtualization Installation Requirements and Reference* for the node4 platform, the appropriate disk shelf guide, and the *ONTAP 9 High-Availability Configuration Guide*:
   - Console (remote-management port)
   - Cluster ports
   - Data ports
   - Cluster and node-management ports
   - Storage
   - SAN configurations: iSCSI Ethernet and FC switch ports
   *Note: 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:

<table>
<thead>
<tr>
<th>If node4 is...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>The same chassis as node3</td>
<td>Go to Step 8 on page 69.</td>
</tr>
<tr>
<td>A chassis separate from node3</td>
<td>Go to Step 6 on page 69.</td>
</tr>
</tbody>
</table>

6. Turn on the power to node4, and then interrupt the boot by pressing Ctrl-C to access the boot environment prompt.
   *Note: 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.
   *Attention: 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... | Description
---|---
Has disks and no back-end storage | Skip Step 9 on page 70 through Step 14 on page 70 and go to Step 15 on page 70.
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays | a. Go to the section Setting the FC or UTA/UTA2 configuration on node4 and complete the subsections in it, Configuring Fibre Channel ports on node4 and Checking and configuring UTA/UTA2 ports on node4, as appropriate to your system. 
b. Return to this section and complete the remaining steps, beginning with Step 9 on page 70.

**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.

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 of the array LUNs 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 by entering the following command:
    ```
    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:
<table>
<thead>
<tr>
<th>If the system you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not have the correct or current ONTAP version on node4</td>
<td>Go to Step 20 on page 71.</td>
</tr>
<tr>
<td>Has the correct or current version of ONTAP on node4</td>
<td>Go to Step 25 on page 72.</td>
</tr>
</tbody>
</table>

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

**Note:** 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.

<table>
<thead>
<tr>
<th>If Dynamic Host Configuration Protocol (DHCP) is...</th>
<th>Then...</th>
</tr>
</thead>
</table>
| Running                                            | Configure the connection automatically by entering the following command at the boot environment prompt: 

```
ifconfig e0M -auto
```

| Not running                                        | Manually configure the connection by entering the following command at the boot environment prompt: 

```
ifconfig e0M -addr=filer_addr mask=netmask -gw=gateway -dns=dns_addr domain=dns_domain
```

* filer_addr is the IP address of the storage system.
* netmask is the network mask of the storage system.
* gateway is the gateway for the storage system.
* dns_addr is the IP address of a name server on your network.
* 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.

**Note:** Other parameters might be necessary for your interface. Enter `help ifconfig` at the firmware prompt for details.

21. Perform netboot on node4:

<table>
<thead>
<tr>
<th>For...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAS/AFF8000 series systems</td>
<td>netboot http://web_server_ip/path_to_web-accessible_directory/netboot/kernel</td>
</tr>
<tr>
<td>All other systems</td>
<td>netboot http://web_server_ip/path_to_web-accessible_directory/&lt;ontap_version&gt;_image.tgz</td>
</tr>
</tbody>
</table>

The `path_to_the_web-accessible_directory` should lead to where you downloaded the `<ontap_version>_image.tgz` in Step 1 in the section `Preparing for netboot` on page 29.

**Note:** 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 Non-Disruptive 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}

   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 (5) Maintenance mode boot by entering 5, and then enter y when prompted to continue with the boot.

26. Before continuing, go to the section Setting the FC or UTA/UTA2 configuration on node4 on page 75 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)    Pool0  KPG2RK6F        nst-fas2520-2(536880939)
0b.02.13  nst-fas2520-2(536880939)    Pool0  KPG3DE4F        nst-fas2520-2(536880939)
0b.01.13  nst-fas2520-2(536880939)    Pool0  PPG4KLAA        nst-fas2520-2(536880939)
......
0a.00.0                   (536881109)    Pool0  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 the "Relocating aggregates from node2 to node3" section:

<table>
<thead>
<tr>
<th>Disk type</th>
<th>Run the command</th>
</tr>
</thead>
<tbody>
<tr>
<td>With shared disks</td>
<td>disk reassign -s node2_sysid -d node4_sysid -p node3_sysid</td>
</tr>
<tr>
<td>Without shared disks</td>
<td>disk reassign -s node2_sysid -d node4_sysid</td>
</tr>
</tbody>
</table>

For the node2_sysid value, use the information captured in Step 10 of the "Recording node2 port information" section. For node4_sysid, use the information captured in Step 23.

**Note:** 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

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

a. Enter n when asked to abort disk reassignment.

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. Bring the node2 aggregate online, if necessary:

   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` and `ha-config modify chassis ha`.

If you have a MetroCluster configuration, use the following commands to correct the configuration: `ha-config modify controller mcc` and `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.

   **Note:** 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.
Setting 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 Configuring FC ports on node4 section, the Checking and configuring UTA/UTA2 ports on node4 section, 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 section Mapping ports from node2 to node4 on page 81. 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 Installing and booting node4 and resume the section at Step 9 on page 70. 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
- Configuring Fibre Channel ports on node4 on page 75
- Checking and configuring UTA/UTA2 ports on node4 on page 77

Configuring Fibre Channel ports on node4
If node4 has Fibre Channel (FC) ports 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 Preparing the nodes for the 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 the next section.

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:

<table>
<thead>
<tr>
<th>If the system that you are upgrading...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td>Go to Step 5.</td>
</tr>
<tr>
<td>Is a V-Series system or has</td>
<td>Go to Step 2.</td>
</tr>
<tr>
<td>FlexArray Virtualization Software and</td>
<td></td>
</tr>
<tr>
<td>is connected to storage arrays</td>
<td></td>
</tr>
</tbody>
</table>

2. Access Maintenance mode by entering the following command:

   boot_ontap maint

3. Take one of the following actions:
### If the system that you are upgrading...

<table>
<thead>
<tr>
<th>Has storage disks</th>
<th>Enter the following command: <code>system node hardware unified-connect show</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
<td>Enter the following command: <code>ucadmin show</code></td>
</tr>
</tbody>
</table>

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

#### Step 4.

Compare the FC settings on the new nodes with the settings that you captured earlier from the original node.

#### Step 5.

Take one of the following actions:

### If the system that you are upgrading...

<table>
<thead>
<tr>
<th>Has storage disks</th>
<th>Modify the FC ports on node4 as needed by entering one of the following commands:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• To program target ports: `system node hardware unified-connect modify -type</td>
</tr>
<tr>
<td></td>
<td>• To program initiator ports: `system node unified-connect modify -type</td>
</tr>
</tbody>
</table>

- `type` is the FC4 type, target or initiator.

<table>
<thead>
<tr>
<th>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</th>
<th>Modify the FC ports on node4 as needed by entering the following command: <code>ucadmin modify -m fc -t initiator -f adapter_port_name</code></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- <code>t</code> is the FC4 type, target or initiator.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The FC ports need to be programmed as initiators.</td>
</tr>
</tbody>
</table>

#### Step 6.

Take one of the following actions:

### If the system that you are upgrading...

<table>
<thead>
<tr>
<th>Has storage disks</th>
<th>Verify the new settings by entering the following command and examining the output: <code>system node unified-connect show</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>A V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
<td>Verify the new settings by entering the following command and examining the output: <code>ucadmin show</code></td>
</tr>
</tbody>
</table>

#### Step 7.

Take one of the following actions:

### If the default FC settings on the new nodes are...

| The same as the ones you that captured on the original nodes | Proceed to Step 11. |
If the default FC settings on the new nodes are...
Then...

Different from the ones that you captured on the original nodes
Go to Step 8.

8. Exit Maintenance mode by entering the following command:
   \texttt{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 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:
    \texttt{boot\_ontap maint}

    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:
    \texttt{boot\_ontap}

11. Take one of the following actions:

    If the system that you are upgrading...
    Then...

    Has storage disks
    • Go to \textit{Configuring UTA/UTA2 ports on node4} if node4 has a UTA/UTA2A card or UTA/UTA2 onboard ports.
    • Skip the section and go to \textit{Mapping 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
    • Go to the section \textit{Configuring UTA/UTA2 ports node4} if node4 has a UTA/UTA2 card or UTA/UTA2 onboard ports.
    • Skip the section \textit{Configuring UTA/UTA2 ports node4} if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports, return to the section \textit{Installing and booting node4}, and resume the section at Step 9.

\textbf{Checking and configuring 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.

\textbf{Before you begin}

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

\textbf{About this task}

UTA/UTA2 ports can be configured into native Fibre Channel (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.

\textbf{Note:} 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 request.
• 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 request.

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

**Important:** 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 V-Series system or a system with FlexArray Virtualization software that is connected to storage arrays, you enter commands in this section in Maintenance mode. You must be in Maintenance mode to configure UTA/UTA2 ports.

**Steps**

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

<table>
<thead>
<tr>
<th>If the system...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
</tr>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter the following command:</td>
</tr>
<tr>
<td><code>system node hardware unified-connect show</code></td>
</tr>
<tr>
<td><code>ucadmin show</code></td>
</tr>
</tbody>
</table>

The system displays output similar to the following examples:

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

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Current Mode</th>
<th>Current Type</th>
<th>Pending Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>f-a</td>
<td>0e</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0f</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0g</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0h</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-b</td>
<td>0e</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-b</td>
<td>0f</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-b</td>
<td>0g</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-b</td>
<td>0h</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

8 entries were displayed.
```

```
*> ucadmin show

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Current Mode</th>
<th>Current Type</th>
<th>Pending Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>f-a</td>
<td>0e</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0f</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0g</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0h</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0e</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0f</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0g</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>0h</td>
<td>cna</td>
<td>target</td>
<td>-</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

*> |
```

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 `system node hardware unified-connect show` or `ucadmin show` command and determine whether the UTA/UTA2 ports have the personality you want.

4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the CNA ports...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not have the personality that you want</td>
<td>Go to Step 5.</td>
</tr>
<tr>
<td>Have the personality that you want</td>
<td>Skip Step 5 through Step 12 and go Step 13.</td>
</tr>
</tbody>
</table>

5. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks and is running Data ONTAP 8.3</td>
<td>Boot node4 and enter Maintenance mode by entering the following command: <code>boot_ontap maint</code></td>
</tr>
<tr>
<td>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</td>
<td>Go to Step 6. You should already be in Maintenance mode.</td>
</tr>
</tbody>
</table>

6. Take one of the following actions:

<table>
<thead>
<tr>
<th>If you are configuring...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports on a UTA/UTA2A card</td>
<td>Go to Step 7.</td>
</tr>
<tr>
<td>Onboard UTA/UTA2 ports</td>
<td>Skip Step 7 and go to Step 8.</td>
</tr>
</tbody>
</table>

7. If the adapter is in initiator mode, and if the UTA/UTA2 port is online, take the UTA/UTA2 port offline by entering the following command:

   `storage disable adapter adapter_name`

   Adapters in target mode are automatically offline in Maintenance mode.

8. 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.

   **Note:** You need to use FC initiator for tape drives, FlexArray Virtualization systems, and MetroCluster. You need to use the FC target for SAN clients.

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

   `ucadmin show`

10. Take one of the following actions:
### If the system...  
Then...

<table>
<thead>
<tr>
<th>Has storage disks</th>
<th>a. Enter the following command:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>halt</code></td>
</tr>
<tr>
<td></td>
<td>The system stops at the boot environment prompt.</td>
</tr>
<tr>
<td></td>
<td>b. Enter the following command:</td>
</tr>
<tr>
<td></td>
<td><code>boot_ontap</code></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays and is running Data ONTAP 8.3</th>
<th>Reboot to Maintenance mode by entering the following command:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>boot_ontap maint</code></td>
</tr>
</tbody>
</table>

### 11. Verify the settings by entering one of the following commands:

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td>Enter the following command:</td>
</tr>
<tr>
<td></td>
<td><code>system node hardware unified-connect show</code></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays</th>
<th>Enter the following command:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>ucadmin show</code></td>
</tr>
</tbody>
</table>

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*.

```bash
cluster1::> system node hardware unified-connect show
```

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Mode</th>
<th>Type</th>
<th>Current Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>f-a</td>
<td>1a</td>
<td>fc</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>1b</td>
<td>fc</td>
<td>fc</td>
<td>-</td>
<td>target</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2a</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2b</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

4 entries were displayed.

```bash
*> ucadmin show
```

<table>
<thead>
<tr>
<th>Node</th>
<th>Adapter</th>
<th>Mode</th>
<th>Type</th>
<th>Current Mode</th>
<th>Pending Type</th>
<th>Admin Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>f-a</td>
<td>1a</td>
<td>fc</td>
<td>fc</td>
<td>initiator</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>1b</td>
<td>fc</td>
<td>fc</td>
<td>-</td>
<td>target</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2a</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
<tr>
<td>f-a</td>
<td>2b</td>
<td>fc</td>
<td>target</td>
<td>cna</td>
<td>-</td>
<td>online</td>
</tr>
</tbody>
</table>

4 entries were displayed.

*>

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

<table>
<thead>
<tr>
<th>If the system...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has storage disks</td>
<td><code>network fcp adapter modify -node node_name -adapter adapter_name -state up</code></td>
</tr>
</tbody>
</table>
Mapping 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

Capture information about the ports on the new nodes from the Hardware Universe at hww.netapp.com. You will use the information later in this section.

About this task

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 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:

<table>
<thead>
<tr>
<th>LIF</th>
<th>Node2 ports</th>
<th>Node2 IPspaces</th>
<th>Node2 broadcast domains</th>
<th>Node4 ports</th>
<th>Node4 IPspaces</th>
<th>Node4 broadcast domains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIF</td>
<td>Node2 ports</td>
<td>Node2 IPspaces</td>
<td>Node2 broadcast domains</td>
<td>Node4 ports</td>
<td>Node4 IPspaces</td>
<td>Node4 broadcast domains</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>----------------</td>
<td>-------------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Node management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cluster management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercluster port</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 "Recording 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:

```
    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
```

4. Get node4 into quorum by performing the following steps:
   a. Boot node4. See "Installing and booting 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 e1a Cluster
```
c. If the cluster ports are not in the Cluster broadcast-domain, add them with the following command:

   ```command
   broadcast-domain add-ports -ipspace Cluster -broadcast-domain Cluster -ports node:port
   ```

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

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

   This example adds Cluster port e1b on node4:

   ```command
   network port modify -node node4 -port e1b -ipspace Cluster -mtu 9000
   ```

   **Note:** For a MetroCluster configuration, you may 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:

   ```error
   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:

   ```command
   metrocluster vserver resync -vserver vserver_name
   ```

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

   ```command
   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:

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

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

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

   This command removes port e0d on node4:

   ```command
   network port broadcast-domain remove-ports -ipspace Cluster -broadcast-domain Cluster -ports node4:e0d
   ```

   h. Verify that node4 has rejoined quorum:

   ```command
   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:

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

   b. Display the broadcast domain containing this port:

   ```command
   network port broadcast-domain show -ports node_name:port_name
   ```

   c. Add or remove ports from broadcast domains:

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

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

   d. Modify a LIF’s home port:

   ```command
   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 6.

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
   ```

10. Verify the changes on node4:

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

### Verifying 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 by entering the following command:

   ```
   cluster show
   ```
3. Verify that node4 can communicate with node3 and that all LIFs are up by entering the following command:

   ```
   network interface show -curr-node node4
   ```
4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node4 is...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a chassis separate from node3</td>
<td>Connect the HA interconnect between the nodes by completing the following steps:</td>
</tr>
<tr>
<td></td>
<td><strong>a.</strong> Connect the top interconnect port of node3 to the top interconnect port of node4.</td>
</tr>
<tr>
<td></td>
<td><strong>b.</strong> Connect the bottom interconnect port of node3 to the bottom interconnect port of node4.</td>
</tr>
<tr>
<td></td>
<td><strong>c.</strong> Go to Step 5.</td>
</tr>
<tr>
<td>In the same chassis as node3</td>
<td>Go to Step 5.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>
5. Take one of the following actions:

<table>
<thead>
<tr>
<th>If the cluster is...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a SAN environment</td>
<td>Complete Step 6 and go to the section <em>Moving non-SAN data LIFs owned by node2 from node3 to node4 and verifying SAN LIFs on node4.</em></td>
</tr>
<tr>
<td>Not in a SAN environment</td>
<td>Skip Step 6 go to the section <em>Moving non-SAN data LIFs owned by node2 from node3 to node4 and verifying SAN LIFs on node4.</em></td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Time</th>
<th>Node</th>
<th>Severity</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/13/2012 14:03:51</td>
<td>node1</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:51</td>
<td>node2</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:48</td>
<td>node3</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
<tr>
<td>8/13/2012 14:03:43</td>
<td>node4</td>
<td>INFORMATIONAL</td>
<td>scsiblade.in.quorum: The scsi-blade...</td>
</tr>
</tbody>
</table>

### Moving NAS data LIFs owned by node2 from node3 to node4 and verifying 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:

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

2. Take one of the following actions:

<table>
<thead>
<tr>
<th>If node2...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had interface groups or VLANs configured</td>
<td>Go to Step 3.</td>
</tr>
<tr>
<td>Did not have interface groups or VLANs configured</td>
<td>Skip Step 3 and go to Step 4.</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>If the cluster is configured for...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS</td>
<td>Complete Step 5 through Step 8, skip Step 9, and complete Step 10 through Step 13.</td>
</tr>
<tr>
<td>SAN</td>
<td>Skip Step 5 through Step 8, and complete Step 9 through Step 13.</td>
</tr>
<tr>
<td>Both NAS and SAN</td>
<td>Complete Step 5 through Step 13.</td>
</tr>
</tbody>
</table>

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 by entering the following command:

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

<table>
<thead>
<tr>
<th>Node</th>
<th>Port</th>
<th>IPspace</th>
<th>Broadcast Domain</th>
<th>Link</th>
<th>MTU</th>
<th>Admin/Oper</th>
</tr>
</thead>
<tbody>
<tr>
<td>node3</td>
<td>a0a</td>
<td>Default</td>
<td>-</td>
<td>up</td>
<td>1500</td>
<td>auto/1000</td>
</tr>
</tbody>
</table>
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:
      ```shell
      set -privilege advanced
      ```
   b. Enter the following command, once for each old network port:
      ```shell
      network port delete -node node_name -port port_name
      ```
   c. Return to the admin level by entering the following command:
      ```shell
      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:
       ```shell
       network interface show -data-protocol iscsi|fcp -home-node node4
       ```
       The system returns output similar to the following example:

       | Vserver | Logical Interface | Status | Network Address/Mask | Current Node | Current Is 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 by entering the following command:
          ```shell
          network interface modify -vserver vserver_name -lif lif_name -status-admin down
          ```
       ii. Remove the LIF from the port set:
           ```shell
           portset remove -vserver vserver_name -portset portset_name -port-name port_name
           ```
       iii. Enter one of the following commands:
To move a single LIF, enter the following command:
```
network interface modify -lif lif_name -home-port new_home_port
```

To move all the LIFs on a single nonexistent or incorrect port to a new port, enter the following command:
```
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
```

**Note:** 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
```

**Relocating 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 by entering the following command:
```
set -privilege admin
```
3. Check the relocation status by entering the following command:
```
storage aggregate relocation show -node node3
```

The output will display **Done** for an aggregate after it has been relocated.
Note: Wait until all the node2 aggregates have been relocated to node4 before proceeding to the next step.

4. Take one of the following actions:

<table>
<thead>
<tr>
<th>If relocation of...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>All aggregates was successful</td>
<td>Go to Step 5.</td>
</tr>
</tbody>
</table>
| Any aggregates failed, or were vetoed | a. Check the EMS logs for the corrective action.  
b. Perform the corrective action.  
c. Access the advanced privilege level by entering the following command on either node: 
  ```bash
  set -privilege advanced
  ```  
d. Relocate any failed or vetoed aggregates by entering the following command: 
  ```bash
  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 failed or vetoed aggregates.  
e. When prompted, enter y.  
f. Return to the admin level by entering the following command: 
  ```bash
  set -privilege admin
  ```  
If necessary, you can force the relocation using one of the following methods: 
- Overriding veto checks by using the command 
  ```bash
  storage aggregate relocation start -override-vetoes -ndo-controller-upgrade
  ```  - Overriding destination checks by using the command 
  ```bash
  storage aggregate relocation start -override-destination-checks -ndo-controller-upgrade
  ```

See the ONTAP 9 Disks and Aggregates Power Guide and the ONTAP 9 Commands: Manual Page Reference for more information about storage aggregate relocation commands.

5. Verify that all node2 non-root aggregates are online and their state on node4 by entering the following command:

```bash
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:

```bash
storage aggregate online -aggregate aggr_name
```

7. Verify that all the volumes in node2 aggregates are online on node4 by entering the following command:

```bash
volume show -node node4 -state offline
```

8. If any volumes are offline on node4, bring them online by entering the following command:

```bash
volume online -vserver vserver-name -volume volume_name
```

9. Send a post-upgrade AutoSupport message to NetApp for node4 by entering the following command:

```bash
system node autosupport invoke -node node4 -type all -message "node2 successfully upgraded from platform_old to platform_new"
```
Upgrading the node pair: Stage 6

During stage 6, ensure that the new nodes are set up correctly. If one of the new nodes has a unified target adapter, you must restore any port configurations and might need to change the personality of the adapter. You also should set up Storage Encryption if the new nodes are encryption-enabled. You also should decommission the old nodes.

Steps

1. Ensuring that the new controllers are set up correctly on page 90
2. Setting up Storage Encryption on the new controller module on page 92
3. Setting up NetApp Volume Encryption on the new controller module on page 93
4. Decommissioning the old system on page 94
5. Resuming SnapMirror operations on page 94

Ensuring that the new controllers are set up correctly

To ensure correct setup, you must enable the HA pair. You must also verify that node3 and node4 can access each other’s storage and that neither owns data LIFs belonging to other nodes on the cluster. In addition, you must ensure that node3 owns node1’s aggregates and that node4 owns node2’s aggregates, and that the volumes for both nodes are online.

Steps

1. Enable storage failover by entering the following command on one of the nodes:
   
   storage failover modify -enabled true -node node3

2. Verify that storage failover is enabled by entering the following command:
   
   storage failover show

   The following example shows the output of the command when storage failover is enabled:

   ```
   cluster::> storage failover show
<table>
<thead>
<tr>
<th>Node</th>
<th>Partner</th>
<th>Takeover</th>
<th>Possible</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>node3</td>
<td>node4</td>
<td>true</td>
<td>true</td>
<td></td>
<td>Connected to node4</td>
</tr>
<tr>
<td>node4</td>
<td>node3</td>
<td>true</td>
<td>true</td>
<td></td>
<td>Connected to node3</td>
</tr>
</tbody>
</table>
   ```

3. Take one of the following actions:

   - If the cluster is a two-node cluster:
     
     Enable cluster high availability by entering the following command on either node:
     
     ```
     cluster ha modify -configured true
     ```

   - If the cluster is a cluster with more than two nodes:
     
     Go to Step 4.

4. Verify that node3 and node4 belong to the same cluster by entering the following command and examining the output:
   
   ```
   cluster show
   ```

5. Verify that node3 and node4 can access each other’s storage by entering the following command and examining the output:
   
   ```
   storage failover show -fields local-missing-disks,partner-missing-disks
   ```

6. Verify that neither node3 nor node4 owns data LIFs home-owned by other nodes in the cluster by entering the following command and examining the output:
   
   ```
   network interface show
   ```
If either node3 or node4 owns data LIFs home-owned by other nodes in the cluster, use the network interface revert command to revert the data LIFs to their home-owner.

7. Verify that node3 owns the aggregates from node1 and that node4 owns the aggregates from node2 by entering the following commands:

```bash
storage aggregate show -owner-name node3
storage aggregate show -owner-name node4
```

8. Determine whether any volumes are offline by entering the following commands:

```bash
volume show -node node3 -state offline
volume show -node node4 -state offline
```

9. If any volumes are offline, compare them with the list of offline volumes that you captured in substep 18d of the section Preparing the nodes for the upgrade, and bring any online any of the offline volumes, as required, by entering the following command, once for each volume:

```bash
volume online -vserver vserver-name -volume volume_name
```

10. Install new licenses for the new nodes by entering the following commands for each node:

```bash
system license add -license-code license_code,license_code,license_code...
```

The `license-code` parameter accepts a list of 28 upper-case alphabetic character keys. You can add one license at a time, or you can add or multiple licenses at once, each license key separated by a comma.

11. If NetApp Storage Encryption (NSE) was in use on the configuration and you set the `setenv bootarg.storageencryption.support` command to `true` with the `kmip.init.maxwait` variable off (in Step 16 on page 42), you need to reset the variable:

```bash
set diag; systemshell -node nodename -command sudo kenv -u -p kmip.init.maxwait
```

12. To remove all of the old licenses from the original nodes, enter one of the following commands:

```bash
system license clean-up -unused -expired
system license delete -serial-number node_serial_number -package licensable_package
```

- To delete all expired licenses, enter:

```bash
system license clean-up -expired
```

- To delete all unused licenses, enter:

```bash
system license clean-up -unused
```

- To delete a specific license from a cluster, enter the following commands on the nodes:

```bash
system license delete -serial-number <node1 serial number> -package *
```

```bash
system license delete -serial-number <node2 serial number> -package *
```

The following output is displayed:

```
Warning: The following licenses will be removed:
<list of each installed package>
Do you want to continue? [y|n]: y
```

Enter y to remove all of the packages.

13. Verify that the licenses are properly installed by entering the following command and examining its output:

```bash
system license show
```

You might want to compare the output with the output that you captured in Step 29 of the “Preparing the nodes for the upgrade” section.

14. Configure the SPs by performing the following command on both nodes:
system service-processor network modify -node node_name

See the System Administration Reference for information about the SPs and the ONTAP 9 Commands: Manual Page Reference for detailed information about the system service-processor network modify command.

15. Take the following actions on one of the new nodes:
   a. Enter advanced privilege level by entering the following command:
      ```bash
      set -privilege advanced
      ```
   b. Enter the following command:
      ```bash
      storage failover modify -node node_name -cifs-ndo-duration default|medium|low
      ```
      • Enter medium if the system will have workloads in which 50 percent to 75 percent of the operations will be 4 KB or smaller.
      • Enter low if the system will have workloads in which 75 percent to 100 percent of the operations will be 4 KB or smaller.
   c. Return to the admin level by entering the following command:
      ```bash
      set -privilege admin
      ```
   d. Reboot the system to ensure that the changes take effect.

16. If you want to set up a switchless cluster on the new nodes, follow the instructions in Transitioning to a two-node switchless cluster on the NetApp Support Site.

After you finish

If Storage Encryption is enabled on node3 and node4, complete the section Setting up Storage Encryption on the new nodes. Otherwise, complete the section Decommissioning the old system.

Setting up Storage Encryption on the new controller module

If the replaced controller or the HA partner of the new controller uses Storage Encryption, you must configure the new controller module for Storage Encryption, including installing SSL certificates and setting up key management servers.

About this task

This procedure includes steps that are performed on the new controller module. You must enter the command on the correct node.

Steps

1. Verify that the key management servers are still available, their status, and their authentication key information:
   ```bash
   security key-manager show -status
   security key-manager query
   ```
2. Add the key management servers listed in the previous step to the key management server list in the new controller:
   a. Add the key management server:
      ```bash
      security key-manager -add key_management_server_ip_address
      ```
   b. Repeat the previous step for each listed key management server.
      You can link up to four key management servers.
   c. Verify that the key management servers were added successfully:
      ```bash
      security key-manager show
      ```
3. On the new controller module, run the key management setup wizard to set up and install the key management servers.
You must install the same key management servers that are installed on the existing controller module.

a. Launch the key management server setup wizard on the new node:
   
   ```
   security key-manager setup -node new_controller_name
   ```

b. Complete the steps in the wizard to configure key management servers.

4. Restore authentication keys from all linked key management servers to the new node:
   
   ```
   security key-manager restore -node new_controller_name
   ```

### Setting up NetApp Volume Encryption on the new controller module

If the replaced controller or the HA partner of the new controller uses NetApp Volume Encryption, you must configure the new controller module for NetApp Volume Encryption.

#### About this task

This procedure includes steps that are performed on the new controller module. You must enter the command on the correct node.

#### Steps

1. Verify that the key management servers are still available, their status, and their authentication key information:

<table>
<thead>
<tr>
<th>For this ONTAP version...</th>
<th>Use this command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONTAP 9.6 and later</td>
<td>security key-manager key query -node node</td>
</tr>
<tr>
<td>ONTAP 9.5 and earlier</td>
<td>security key-manager key show</td>
</tr>
</tbody>
</table>

2. Add the key management servers listed in the previous step to the key management server list in the new controller:

   a. Add the key management server:

      ```
      security key-manager -add key_management_server_ip_address
      ```

   b. Repeat the previous step for each listed key management server.

      You can link up to four key management servers.

   c. Verify the that the key management servers were added successfully:

      ```
      security key-manager show
      ```

3. On the new controller module, run the key management setup wizard to set up and install the key management servers.

   You must install the same key management servers that are installed on the existing controller module.

   a. Launch the key management server setup wizard on the new node:

      ```
      security key-manager setup -node new_controller_name
      ```

   b. Complete the steps in the wizard to configure key management servers.

4. Restore authentication keys from all linked key management servers to the new node:

<table>
<thead>
<tr>
<th>For...</th>
<th>Use this command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Key Manager (EKM)</td>
<td>security key-manager external restore</td>
</tr>
<tr>
<td></td>
<td>This command needs the OKM passphrase</td>
</tr>
</tbody>
</table>

   | Onboard Key Manager (OKM) | security key-manager onboard sync |
5. Use the `volume online` command to bring any offline volumes online after restoring the authentication keys.

**Decommissioning the old system**

After upgrading, you can decommission the old system through the NetApp Support Site. Decommissioning the system tells NetApp that the system is no longer in operation and removes it from support databases.

**Steps**

1. Navigate to the NetApp Support Site at `mysupport.netapp.com` and log in.
2. Select **Products > My Products** from the menu.
3. On the **View Installed Systems** page, choose which **Selection Criteria** you want to use to display information about your system.
   You can choose one of the following to locate your system:
   - Serial Number (located on the back of the unit)
   - Serial Numbers for My Location
4. Click **Go!**
   A table displays cluster information, including serial numbers.
5. Locate the cluster in the table and select **Decommission this system** from the Product Tool Set drop-down menu.

**Resuming SnapMirror operations**

You can resume SnapMirror transfers that were quiesced before upgrade and resume the SnapMirror relationships. The updates are on schedule once the upgrade is completed.

**Steps**

1. Verify the SnapMirror status on the destination:
   ```bash
   snapmirror show
   ```
2. Resume the SnapMirror relationship:
   ```bash
   snapmirror resume -destination-vserver vserver name
   ```

**Troubleshooting**

You might encounter a failure while upgrading the node pair. The node might crash, aggregates might not relocate, or LIFs might not migrate. The cause of the failure and its solution depend on when the failure occurred during the upgrade procedure.

Refer to the table describing the different phases of the procedure in the section *How the upgrade using ARL works* on page 4. The information about failures that can occur is listed by the phase of the procedure.

**Aggregate relocation failures**

Aggregate relocation (ARL) might fail at different points during the upgrade.

**Checking for aggregate relocation failure**

During the procedure, ARL might fail in Stage 2, Stage 3, or Stage 5.

**Steps**

1. Enter the following command: `storage aggregate relocation show` and examine its output.
The `storage aggregate relocation show` command shows you which aggregates were successfully relocated and which ones were not, along with the causes of failure.

2. Check the console for any EMS messages.

3. Take one of the following actions:
   - Take the appropriate corrective action, depending on the output of the `storage aggregate relocation show` command and the output of the EMS message.
   - Force relocation of the aggregate or aggregates by using the `override-vetoes` option or the `override-destination-checks` option of the `storage aggregate relocation start` command.

For detailed information about the `storage aggregate relocation start`, `override-vetoes`, and `override-destination-checks` options, see the *ONTAP 9 Commands: Manual Page Reference*.

**Aggregates originally on node1 are owned by node 4 after completion of the upgrade**

At the end of the upgrade procedure, node3 should be the new home node of aggregates that originally had node1 as the home node. You can relocate them after the upgrade.

**About this task**

Aggregates might fail to relocate properly, having node1 as their home node instead of node3 under the following circumstances:

- During Stage 3, when aggregates are relocated from node2 to node3.
  Some of the aggregates being relocated have node1 as their home node. For example, such an aggregate could be called `aggr_node_1`. If relocation of `aggr_node_1` fails during Stage 3, and relocation cannot be forced, then the aggregate will be left behind on node2.
- After Stage 4, when node2 is replaced with node4.
  When node2 is replaced, `aggr_node_1` will come online with node4 as its home node instead of node3.

You can fix the incorrect ownership problem after Stage 6 once storage failover has been enabled by completing the following steps:

**Steps**

1. Enter the following command to get a list of aggregates:
   ```
   storage aggregate show -nodes node4 -is-home true
   ```
   To identify aggregates that were not correctly relocated, refer to the list of aggregates with the home owner of node1 that you obtained in the section *Preparing the nodes for the upgrade* and compare it with output of the above command.

2. Compare the output of Step 1 with the output you captured for node1 in the section *Preparing the nodes for the upgrade* and note any aggregates that were not correctly relocated.

3. Relocate the aggregates left behind on node4 by entering the following command:
   ```
   storage aggregate relocation start -node node4 -aggr aggr_node_1 -destination node3
   ```
   Do not use the `-ndo-controller-upgrade` parameter during this relocation.

4. Enter the following command to verify that node3 is now the home owner of the aggregates:
   ```
   storage aggregate show -aggregate aggr1,aggr2,aggr3... -fields home-name aggr1,aggr2,aggr3... is the list of aggregates that had node1 as the original home owner.
   ```
   Aggregates that do not have node3 as home owner can be relocated to node3 using the same relocation command in Step 3.
Reboots, panics, or power cycles
The system might crash – reboot, panic or go through a power cycle – during different stages of the upgrade. The solution to these problems depends on when they occur.

Reboots, panics, or power cycles during Stage 2
Crashes can occur before, during, or immediately after Stage 2, during which you relocate aggregates from node1 to node2, move data LIFs and SAN LIFs owned by node1 to node2, record node1 information, and retire node1.

Node1 or node2 crashes before Stage 2 with HA still enabled
If either node1 or node2 crashes before Stage 2, no aggregates have been relocated yet and the HA configuration is still enabled.

About this task
Takeover and giveback can proceed normally.

Steps
1. Check the console for EMS messages that the system might have issued, and take the recommended corrective action.
2. Continue with the node-pair upgrade procedure.

Node1 crashes during or just after Stage 2 with HA still enabled
Some or all aggregates have been relocated from node1 to node2, and HA is still enabled. Node2 will take over node1’s root volume and any non-root aggregates that were not relocated.

About this task
Ownership of aggregates that were relocated looks the same as the ownership of non-root aggregates that were taken over because home owner has not changed.

When node1 enters the waiting for giveback state, node2 will give back all the node1 non-root aggregates.

Steps
1. Complete Step 1 in the section Relocating non-root aggregates from node1 to node2 on page 30 again.
2. Continue with the node-pair upgrade procedure.

Node1 crashes after Stage 2 while HA is disabled
Node2 will not take over but it is still serving data from all non-root aggregates.

Steps
1. Bring up node1.
2. Continue with the node-pair upgrade procedure.
   You might see some changes in the output of the storage failover show command, but that is typical and does not affect the procedure. See the troubleshooting section Unexpected storage failover show command output.

Node2 fails during or after Stage 2 with HA still enabled
Node1 has relocated some or all of its aggregates to node2. HA is enabled.

About this task
Node1 will take over all of node2’s aggregates as well any of its own aggregates that it had relocated to node2. When node2 enters the Waiting for Giveback state, node1 gives back all of node2’s aggregates.
Steps
1. Complete Step 1 in the section *Relocating non-root aggregates from node1 to node2 again.*
2. Continue with the node-pair upgrade procedure.

**Node2 crashes after Stage 2 and after HA is disabled**
Node1 will not take over.

Steps
1. Bring up node2.
   A client outage will occur for all aggregates while node2 is booting up.
2. Continue with rest of the node pair upgrade procedure.

**Reboots, panics, or power cycles during Stage 3**
Failures can occur during or immediately after Stage 3, during which you install and boot node3, map ports from node1 to node3, move data LIFs and SAN LIFs belonging to node1 and node2 to node3, and relocate all aggregates from node2 to node3.

**Node2 crash during Stage 3 with HA disabled and before relocating any aggregates**
Node3 will not take over following a node2 crash as HA is already disabled.

Steps
1. Bring up node2.
   A client outage will occur for all aggregates while node2 is booting up.
2. Continue with the node-pair upgrade procedure.

**Node2 crashes during Stage 3 after relocating some or all aggregates**
Node2 has relocated some or all of its aggregates to node3, which will serve data from aggregates that were relocated. HA is disabled.

About this task
There will be client outage for aggregates that were not relocated.

Steps
1. Bring up node2.
2. Relocate the remaining aggregates by completing Step 1 through Step 3 in the section *Relocating aggregates from node2 to node3.*
3. Continue with the node-pair upgrade procedure.

**Node3 crashes during Stage 3 and before node2 has relocated any aggregates**
Node2 does not take over but it is still serving data from all non-root aggregates.

Steps
1. Bring up node3.
2. Continue with the node-pair upgrade procedure.

**Node3 crashes during Stage 3 during aggregate relocation**
If node3 crashes while node2 is relocating aggregates to node3, node2 will abort the relocation of any remaining aggregates.

About this task
Node2 continues to serve remaining aggregates, but aggregates that were already relocated to node3 encounter client outage while node3 is booting.

Steps
1. Bring up node3.
2. Complete Step 3 again in the section Relocating all aggregates from node2 to node3.
3. Continue with the node-pair upgrade procedure.

**Node3 fails to boot after crashing in Stage 3**
Because of a catastrophic failure, node3 cannot be booted following a crash during Stage 3.

**Step**
Contact technical support.

**Node2 crashes after Stage 3 but before Stage 5**
Node3 continues to serve data for all aggregates. The HA pair is disabled.

**Steps**
1. Bring up node2.
2. Continue with the node-pair upgrade procedure.

**Node3 crashes after Stage 3 but before Stage 5**
Node3 crashes after Stage 3 but before Stage 5. The HA pair is disabled.

**Steps**
1. Bring up node3.
   
   There will be a client outage for all aggregates.
2. Continue with the node-pair upgrade procedure.

**Reboots, panics, or power cycles during Stage 5**
Crashes can occur during Stage 5, the stage in which you install and boot node4, map ports from node2 to node4, move data LIFs and SAN LIFs belonging to node2 from node3 to node4, and relocate all of node2's aggregates from node3 to node4.

**Node3 crashes during Stage 5**
Node3 has relocated some or all of node2's aggregates to node4. Node4 does not take over but continues to serve non-root aggregates that node3 already relocated. The HA pair is disabled.

**About this task**
There is an outage for the rest of the aggregates until node3 boots again.

**Steps**
1. Bring up node3.
2. Relocate the remaining aggregates that belonged to node2 by repeating Step 1 through Step 3 in the section Relocating node2's non-root aggregates from node3 to node4.
3. Continue with the node pair upgrade procedure.

**Node4 crashes during Stage 5**
Node3 has relocated some or all of node2's aggregates to node4. Node3 does not take over but continues to serve non-root aggregates that node3 owns as well as those that were not relocated. HA is disabled.

**About this task**
There is an outage for non-root aggregates that were already relocated until node4 boots again.

**Steps**
1. Bring up node4.
2. Relocate the remaining aggregates that belonged to node2 by again completing Step 1 through Step 3 in Relocating node2's non-root aggregates from node3 to node4.
3. Continue with the node-pair upgrade procedure.
Issues that can arise in multiple stages of the procedure

Some issues can occur during different stages of the procedure.

**Unexpected storage failover show command output**

During the procedure, if the node that hosts all data aggregates panics or is rebooted accidentally, you might see unexpected output for the `storage failover show` command before and after the reboot, panic, or power cycle.

**About this task**

You might see unexpected output from the `storage failover show` command in Stage 2, Stage 3, Stage 4, or Stage 5.

The following example shows the expected output of the `storage failover show` command if there are no reboots or panics on the node that hosts all the data aggregates:

```
cluster::> storage failover show

Takeover       Partner         Possible  State Description
--------------  --------------  --------  -------------------------------------
node1           node2           false     Unknown
node2           node1           false     Node owns partner aggregates as part
                                      of the non-disruptive head upgrade
                                      procedure., Takeover is not
                                      possible: Storage failover is
disabled

2 entries were displayed.
```

The following example shows the output of the `storage failover show` command after a reboot or panic:

```
cluster::> storage failover show

Takeover       Partner         Possible  State Description
--------------  --------------  --------  -------------------------------------
node1           node2           -         Unknown
node2           node1           false     Waiting for node1, Partial
giveback, Takeover is not possible: Storage failover is
disabled

2 entries were displayed.
```

Although the output says that a node is in partial giveback and that storage failover is disabled, you can disregard this message.

**Step**

No action is required; continue with the node-pair upgrade procedure.

**LIF migration failure**

After you migrate them, LIFs might not come online after migration in Stage 2, Stage 3, or Stage 5.

**Steps**

1. Ensure that port MTU size is the same as that of the source node.

   For example, if the cluster port MTU size is 9000 on the source node, it should be 9000 on the destination node.

2. Check the physical connectivity of the network cable if the physical state of the port is down.
LIFS are on invalid ports after upgrade

After the upgrade is completed, the FC logical interfaces (LIFs) might be left on incorrect ports if you have a MetroCluster configuration. You can perform a resync operation to reassign the LIFs to the correct ports.

Step

Enter the `metrocluster vserver resync` command to reallocate the LIFs to the correct ports.

```
metrocluster vserver resync -vserver vserver_name fcp-mc.headupgrade.test.vs
```
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