ONTAP upgrade methods

ONTAP 9

NetApp

March 08, 2024

This PDF was generated from https://docs.netapp.com/us-en/ontap/upgrade/concept_upgrade_methods.html on March 08, 2024. Always check docs.netapp.com for the latest.
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ONTAP upgrade methods

ONTAP software upgrade methods

You can perform an automated upgrade of your ONTAP software using System Manager. Alternately, you can perform an automated or manual upgrade using the ONTAP command line interface (CLI). The method you use to upgrade ONTAP depends upon your configuration, your current ONTAP version, and the number of nodes in your cluster. NetApp recommends using System Manager to perform automated upgrades unless your configuration requires a different approach. For example, if you have a MetroCluster configuration with 4 nodes running ONTAP 9.3 or later, you should use System Manager to perform an automated upgrade (sometimes referred to as automated nondisruptive upgrade or ANDU). If you have a MetroCluster configuration with 8 nodes running ONTAP 9.2 or earlier, you should use the CLI to perform a manual upgrade.

An upgrade can be executed using the rolling upgrade process or the batch upgrade process. Both are nondisruptive.

ONTAP rolling upgrades

In the rolling upgrade process, a node is taken offline and upgraded while its partner takes over its storage. When the node upgrade is complete, the partner node gives control back to the original owning node, and the process is repeated on the partner node. Each additional HA pair is upgraded in sequence until all HA pairs are running the target release. The rolling upgrade process is the default for clusters with fewer than 8 nodes.

ONTAP batch upgrades

In the batch upgrade process, the cluster is divided into several batches, each of which contains multiple HA pairs. In the first batch, one node of each HA pair is upgraded, followed by their HA partners. The process is then repeated sequentially for the remaining batches. The batch upgrade process is the default for clusters of 8 nodes or more.

For automated upgrades, ONTAP automatically installs the target ONTAP image on each node, validates the cluster components to ensure that the cluster can be upgraded nondisruptively, and then executes a batch or rolling upgrade in the background based on the number of nodes. For manual upgrades, the administrator manually confirms that each node in the cluster is ready for upgrade, then performs steps to execute a rolling upgrade.

Recommended ONTAP upgrade methods based on configuration

Upgrade methods supported by your configuration are listed in order of recommended usage.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>ONTAP version</th>
<th>Number of nodes</th>
<th>Recommended upgrade method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>9.0 or later</td>
<td>2 or more</td>
<td>• Automated nondisruptive using System Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Automated nondisruptive using the CLI</td>
</tr>
<tr>
<td>Configuration</td>
<td>ONTAP version</td>
<td>Number of nodes</td>
<td>Recommended upgrade method</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-----------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Standard</td>
<td>9.0 or later</td>
<td>Single</td>
<td>Automated disruptive</td>
</tr>
</tbody>
</table>
| MetroCluster  | 9.3 or later  | 8               | • Automated nondisruptive using the CLI  
|               |               |                 | • Manual nondisruptive for 4 or 8 node MetroCluster using the CLI |
| MetroCluster  | 9.3 or later  | 2,4             | • Automated nondisruptive using System Manager  
|               |               |                 | • Automated nondisruptive using the CLI |
| MetroCluster  | 9.2 or earlier| 4, 8            | Manual nondisruptive for 4 or 8 node MetroCluster using the CLI |
| MetroCluster  | 9.2 or earlier| 2               | Manual nondisruptive for 2-node MetroCluster using the CLI |

ANDU using System Manager is the recommended upgrade method for all patch upgrades regardless of configuration.

A manual disruptive upgrade can be performed on any configuration. However, you should not perform a disruptive upgrade unless you can take the cluster offline for the duration of the upgrade. If you are operating in a SAN environment, you should be prepared to shut down or suspend all SAN clients before performing a disruptive upgrade. Disruptive upgrades are performed using the ONTAP CLI.

**Automated upgrades**

**Automated nondisruptive ONTAP upgrade**

When you perform an automated upgrade, ONTAP automatically installs the target ONTAP image on each node, validates that the cluster can be upgraded successfully, and then executes either a batch or rolling upgrade in the background based on the number of nodes in the cluster.

If it is supported by your configuration, you should use System Manager to perform an automated upgrade. If your configuration does not support automated upgrade using System Manager, you can use the ONTAP command line interface (CLI) to perform an automated upgrade.
Modifying the setting of the `storage failover modify-auto-giveback` command option before the start of an automatic nondisruptive upgrade (ANDU) has no impact on the upgrade process. The ANDU process ignores any preset value to this option during the takeover/giveback required for the update. For example, setting `-autogiveback` to false prior to beginning ANDU does not interrupt the automatic upgrade before giveback.

**Before you begin**

- You should **prepare for your upgrade**.
- You should **download the ONTAP software image** for your target ONTAP release.

If you are performing a **direct multi-hop upgrade**, you need to download both of the ONTAP images required for your specific **upgrade path**.

- For each HA pair, each node should have one or more ports on the same broadcast domain.

If you have 8 or more nodes, the batch upgrade method is used in the automatic nondisruptive upgrade. In ONTAP 9.7 and earlier, if the batch method is used, LIFs are migrated to the HA partner of the node being upgraded. If the partners don’t have any ports in the same broadcast domain, then the LIF migration fails.

In ONTAP 9.8 and later, if the batch method is used, LIFs are migrated to the other batch group.

- If you are upgrading ONTAP in a MetroCluster FC configuration, the cluster should be enabled for automatic unplanned switchover.
- If you don’t plan to monitor the progress of the upgrade process, you should **request EMS notifications of errors that might require manual intervention**.
Example 1. Steps

System Manager

1. Validate the ONTAP target image:

   If you are upgrading a MetroCluster configuration, you should validate Cluster A and then repeat the validation process on Cluster B.

   a. Depending on the ONTAP version that you are running, perform one of the following steps:

<table>
<thead>
<tr>
<th>If you are running...</th>
<th>Do this...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONTAP 9.8 or later</td>
<td>Click <strong>Cluster &gt; Overview</strong>.</td>
</tr>
<tr>
<td>ONTAP 9.5, 9.6, and 9.7</td>
<td>Click <strong>Configuration &gt; Cluster &gt; Update</strong>.</td>
</tr>
<tr>
<td>ONTAP 9.4 or earlier</td>
<td>Click <strong>Configuration &gt; Cluster Update</strong>.</td>
</tr>
</tbody>
</table>

   b. In the right corner of the **Overview** pane, click ![icon].

   c. Click **ONTAP Update**.

   d. In the **Cluster Update** tab, add a new image or select an available image.

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add a new software image from a local folder</td>
<td>i. Under <strong>Available Software Images</strong>, click <strong>Add from Local</strong>.</td>
</tr>
<tr>
<td></td>
<td>ii. Browse to the location you saved the software image, select the image, and then click <strong>Open</strong>.</td>
</tr>
<tr>
<td>You should have already downloaded the image</td>
<td>i. Click <strong>Add from Server</strong>.</td>
</tr>
<tr>
<td>to the local client.</td>
<td>ii. In the <strong>Add a New Software Image</strong> dialog box, enter the URL of the HTTP or FTP server to which you downloaded the ONTAP software image from the NetApp Support Site. For anonymous FTP, you must specify the URL in the <strong>ftp://anonymous@ftpserver</strong> format.</td>
</tr>
<tr>
<td></td>
<td>iii. Click <strong>Add</strong>.</td>
</tr>
<tr>
<td>Add a new software image from an HTTP or FTP server</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Select an available image</td>
<td>Choose one of the listed images.</td>
</tr>
</tbody>
</table>

   e. Click **Validate** to run the pre-upgrade validation checks.

   If any errors or warnings are found during validation, they are displayed along with a list of corrective actions. You must resolve all errors before proceeding with the upgrade. It is best
practice to also resolve warnings.

2. Click **Next**.
3. Click **Update**.

Validation is performed again. Any remaining errors or warnings are displayed along with a list of corrective actions. Errors must be corrected before you can proceed with the upgrade. If the validation is completed with warnings, you correct the warnings or choose **Update with warnings**.

By default, ONTAP uses the **batch upgrade process** to upgrade clusters with eight or more nodes. Beginning in ONTAP 9.10.1, if preferred, you can select **Update one HA pair at a time** to override the default and have your cluster upgrade one HA pair at a time using the rolling upgrade process.

For MetroCluster configurations with more than 2 nodes, the ONTAP upgrade process starts simultaneously on the HA pairs at both sites. For a 2-node MetroCluster configuration, the upgrade is started first on the site where the upgrade is not initiated. The upgrade on the remaining site begins after the first upgrade is fully completed.

4. If your upgrade pauses because of an error, click the error message to view the details, then correct the error and **resume the upgrade**.

**After you finish**

After the upgrade is completed successfully, the node reboots, and you are redirected to the System Manager login page. If the node takes a long time to reboot, you should refresh your browser.

**CLI**

1. Validate the ONTAP target software image

   If you are upgrading a MetroCluster configuration you should first execute the following steps on cluster A, then execute the same steps on cluster B.

   a. Delete the previous ONTAP software package:

   ```
   cluster image package delete -version previous_ONTAP_Version
   ```

   b. Load the target ONTAP software image into the cluster package repository:

   ```
   cluster image package get -url location
   ```

   ```
   Package download completed.
   Package processing completed.
   ```

   If you are performing a **direct multi-hop upgrade**, you also need to load the software package for
the intermediate version of ONTAP required for your upgrade. For example, if you are upgrading from 9.8 to 9.13.1, you need to load the software package for ONTAP 9.12.1, and then use the same command to load the software package for 9.13.1.

c. Verify that the software package is available in the cluster package repository:

```
cluster image package show-repository
```

```
cluster1::> cluster image package show-repository
Package Version Package Build Time
----------------- ------------------
9.13.1 MM/DD/YYYY 10:32:15
```

d. Execute the automated pre-upgrade checks:

```
cluster image validate -version package_version_number
```

If you are performing a direct multi-hop upgrade, you only need to use the target ONTAP package for verification. You don't need to validate the intermediate upgrade image separately. For example, if you are upgrading from 9.8 to 9.13.1, use the 9.13.1 package for verification. You don't need to validate the 9.12.1 package separately.

```
cluster1::> cluster image validate -version 9.13.1

WARNING: There are additional manual upgrade validation checks that must be performed after these automated validation checks have completed...
```

e. Monitor the progress of the validation:

```
cluster image show-update-progress
```

f. Complete all required actions identified by the validation.

g. If you are upgrading a MetroCluster configuration, repeat the above steps on cluster B.

2. Generate a software upgrade estimate:

```
cluster image update -version package_version_number -estimate-only
```

If you are upgrading a MetroCluster configuration, you can run this command on either Cluster A or Cluster B. You don’t need to run it on both clusters.
The software upgrade estimate displays details about each component to be updated, as well as the estimated duration of the upgrade.

3. Perform the software upgrade:

```
class cluster image update -version package_version_number
```

- If you are performing a **direct multi-hop upgrade**, use the target ONTAP version for the `package_version_number`. For example, if you are upgrading from ONTAP 9.8 to 9.13.1, use 9.13.1 as the `package_version_number`.

- By default, ONTAP uses the **batch upgrade process** to upgrade clusters with eight or more nodes. If preferred, you can use the `-force-rolling` parameter to override the default process and have your cluster upgraded one node at a time using the rolling upgrade process.

- After completing each takeover and giveback, the upgrade waits for 8 minutes to enable client applications to recover from the pause in I/O that occurs during the takeover and giveback. If your environment requires more or less time for client stabilization, you can use the `-stabilize -minutes` parameter to specify a different amount of stabilization time.

- For MetroCluster configurations with 4 nodes more, the automated upgrade starts simultaneously on the HA pairs at both sites. For a 2-node MetroCluster configuration, the upgrade starts on the site where the upgrade is not initiated. The upgrade on the remaining site begins after the first upgrade is fully completed.

```
class1::> cluster image update -version 9.13.1
Starting validation for this update. Please wait..

It can take several minutes to complete validation...

WARNING: There are additional manual upgrade validation checks...

Pre-update Check Status Error-Action
--------------------- ------ -------------------------------
--------------------------------------------
... 20 entries were displayed

Would you like to proceed with update ? {y|n}: y
Starting update...

cluster-1::>
```

4. Display the cluster update progress:

```
class image show-update-progress
```

If you are upgrading a 4-node or 8-node MetroCluster configuration, the `cluster image show-update-progress` command only displays the progress for the node on which you run the command. You must run the command on each node to see individual node progress.

5. Verify that the upgrade was completed successfully on each node.

```
cluster image show-update-progress
```

```
cluster1::> cluster image show-update-progress

Estimated  Elapsed
Update Phase     Status                   Duration
Duration

Pre-update checks completed                00:10:00
00:02:07
Data ONTAP updates completed                01:31:00
01:39:00
Post-update checks completed                00:10:00
00:02:00
3 entries were displayed.

Updated nodes: node0, node1.
```

6. Trigger an AutoSupport notification:

```
autosupport invoke -node * -type all -message "Finishing_NDU"
```

If your cluster is not configured to send AutoSupport messages, a copy of the notification is saved locally.

7. If you are upgrading a 2-node MetroCluster FC configuration, verify that the cluster is enabled for automatic unplanned switchover.

   a. Check whether automatic unplanned switchover is enabled:

```
metrocluster show
```
If automatic unplanned switchover is enabled, the following statement appears in the command output:

| AUSO Failure Domain | auso-on-cluster-disaster |

d. If the statement does not appear in the output, enable automatic unplanned switchover:

```
metrocluster modify -auto-switchover-failure-domain auso-on-cluster-disaster
```

c. Verify that automatic unplanned switchover has been enabled:

```
metrocluster show
```

**Video: Upgrades made easy**

Take a look at the simplified ONTAP upgrade capabilities of System Manager in ONTAP 9.8.

**ONTAP Upgrades Made Easy**

Get the transformative features you’ve paid for!

**Tech Clip**

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**Related information**

- Launch Active IQ
- Active IQ documentation
Automated disruptive ONTAP upgrade (single-node cluster only)

Beginning with ONTAP 9.2, you can use the ONTAP CLI to perform an automated update of a single-node cluster. Because single-node clusters lack redundancy, updates are always disruptive. Disruptive upgrades cannot be performed using System Manager.

- You must have satisfied upgrade preparation requirements.

Steps

1. Delete the previous ONTAP software package:

   ```
   cluster image package delete -version previous_package_version
   ```

2. Download the target ONTAP software package:

   ```
   cluster image package get -url location
   ```

   ```
   cluster1::> cluster image package get -url http://www.example.com/software/9.7/image.tgz
   Package download completed.
   Package processing completed.
   ```

3. Verify that the software package is available in the cluster package repository:

   ```
   cluster image package show-repository
   ```

   ```
   cluster1::> cluster image package show-repository
   Package Version  Package Build Time
   -----------------   ------------------
   9.7              M/DD/YYYY 10:32:15
   ```

4. Verify that the cluster is ready to be upgraded:

   ```
   cluster image validate -version package_version_number
   ```
cluster1::> cluster image validate -version 9.7

WARNING: There are additional manual upgrade validation checks that must be performed after these automated validation checks have completed...

5. Monitor the progress of the validation:

cluster image show-update-progress

6. Complete all required actions identified by the validation.

7. Optionally, generate a software upgrade estimate:

cluster image update -version package_version_number -estimate-only

The software upgrade estimate displays details about each component to be updated, and the estimated duration of the upgrade.

8. Perform the software upgrade:

cluster image update -version package_version_number

If an issue is encountered, the update pauses and prompts you to take corrective action. You can use the cluster image show-update-progress command to view details about any issues and the progress of the update. After correcting the issue, you can resume the update by using the cluster image resume-update command.

9. Display the cluster update progress:

cluster image show-update-progress

The node is rebooted as part of the update and cannot be accessed while rebooting.

10. Trigger a notification:

autosupport invoke -node * -type all -message "Finishing Upgrade"

If your cluster is not configured to send messages, a copy of the notification is saved locally.

**Resume ONTAP software upgrade after an error in the automated upgrade process**

If an automated ONTAP software upgrade pauses because of an error, you should
resolve the error and then continue the upgrade. After the error is resolved, you can choose to continue the automated upgrade process or complete the upgrade process manually. If you choose to continue the automated upgrade, don’t perform any of the upgrade steps manually.
Example 2. Steps

**System Manager**

1. Depending on the ONTAP version that you are running, perform one of the following steps:

<table>
<thead>
<tr>
<th>If you are running...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONTAP 9.8 or later</td>
<td>Click Cluster &gt; Overview</td>
</tr>
<tr>
<td>ONTAP 9.7, 9.6, or 9.5</td>
<td>Click Configuration &gt; Cluster &gt; Update.</td>
</tr>
</tbody>
</table>
| ONTAP 9.4 or earlier  | • Click Configuration > Cluster Update.  
                         • In the right corner of the **Overview** pane, click the three blue vertical dots, and select **ONTAP Update**. |

2. Continue the automated upgrade or cancel it and continue manually.

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resume the automated upgrade</td>
<td>Click Resume.</td>
</tr>
<tr>
<td>Cancel the automated upgrade and continue manually</td>
<td>Click Cancel.</td>
</tr>
</tbody>
</table>

**CLI**

1. View the upgrade error:

```
cluster image show-update-progress
```

2. Resolve the error.

3. Resume the upgrade:

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Enter the following command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resume the automated upgrade</td>
<td><code>cluster image resume-update</code></td>
</tr>
<tr>
<td>Cancel the automated upgrade and continue manually</td>
<td><code>cluster image cancel-update</code></td>
</tr>
</tbody>
</table>

**After you finish**

Perform post-upgrade checks.
# Manual upgrades

## Install the ONTAP software package for manual upgrades

After you have downloaded the ONTAP software package for a manual upgrade, you must install it locally before you begin your upgrade.

### Steps

1. Set the privilege level to advanced, entering `y` when prompted to continue: `set -privilege advanced`

   The advanced prompt (`*=>`) appears.

2. Install the image.

<table>
<thead>
<tr>
<th>If you have the following configuration...</th>
<th>Use this command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Non-MetroCluster</td>
<td><code>system node image update -node * -package _location_ -replace -package true -setdefault true -background true</code></td>
</tr>
<tr>
<td>• 2-node MetroCluster</td>
<td><code>system node image update -node * -package -replace -package true -background true -setdefault false</code></td>
</tr>
<tr>
<td>• 4-node MetroCluster</td>
<td><code>system node image update -node * -package location -replace -package true -background true -setdefault false</code></td>
</tr>
<tr>
<td>• 8-node MetroCluster configuration</td>
<td>You must issue this command on both clusters. This command uses an extended query to change the target software image, which is installed as the alternate image on each node.</td>
</tr>
</tbody>
</table>

3. Enter `y` to continue when prompted.

4. Verify that the software image is installed on each node.
This command displays the current status of the software image installation. You should continue to run this command until all nodes report a **Run Status** of **Exited**, and an **Exit Status** of **Success**.

The system node image update command can fail and display error or warning messages. After resolving any errors or warnings, you can run the command again.

This example shows a two-node cluster in which the software image is installed successfully on both nodes:

```
cluster1::*> system node image show-update-progress -node *
There is no update/install in progress
Status of most recent operation:
  Run Status:     Exited
  Exit Status:    Success
  Phase:          Run Script
  Exit Message:   After a clean shutdown, image2 will be set as the default boot image on node0.
There is no update/install in progress
Status of most recent operation:
  Run Status:     Exited
  Exit Status:    Success
  Phase:          Run Script
  Exit Message:   After a clean shutdown, image2 will be set as the default boot image on node1.
2 entries were acted on.
```

**Manual nondisruptive ONTAP upgrade using the CLI (standard configurations)**

Automated upgrade using System Manager is the preferred upgrade method. If System Manager does not support your configuration, you can use the ONTAP command line interface (CLI) to perform a manual nondisruptive upgrade. To upgrade a cluster of two or more nodes using the manual nondisruptive method, you must initiate a failover operation on each node in an HA pair, update the “failed” node, initiate giveback, and then repeat the process for each HA pair in the cluster.

**Before you begin**
You must have satisfied upgrade preparation requirements.

**Updating the first node in an HA pair**
You can update the first node in an HA pair by initiating a takeover by the node’s partner. The partner serves the node’s data while the first node is upgraded.

If you are performing a major upgrade, the first node to be upgraded must be the same node on which you
configured the data LIFs for external connectivity and installed the first ONTAP image.

After upgrading the first node, you should upgrade the partner node as quickly as possible. Do not allow the two nodes to remain in a mixed version state longer than necessary.

**Steps**

1. Update the first node in the cluster by invoking an AutoSupport message:

   ```
   autosupport invoke -node * -type all -message "Starting_NDU"
   ```

   This AutoSupport notification includes a record of the system status just prior to update. It saves useful troubleshooting information in case there is a problem with the update process.

   If the cluster is not configured to send AutoSupport messages, a copy of the notification is saved locally.

2. Set the privilege level to advanced, entering `y` when prompted to continue:

   ```
   set -privilege advanced
   ```

   The advanced prompt (*>>) appears.

3. Set the new ONTAP software image to be the default image:

   ```
   system image modify {-node nodenameA -iscurrent false} -isdefault true
   ```

   The system image modify command uses an extended query to change the new ONTAP software image (which is installed as the alternate image) to the default image for the node.

4. Monitor the progress of the update:

   ```
   system node upgrade-revert show
   ```

5. Verify that the new ONTAP software image is set as the default image:

   ```
   system image show
   ```

   In the following example, image2 is the new ONTAP version and is set as the default image on node0:
cluster1::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node0</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td>node0</td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MM/DD/YYYY TIME</td>
</tr>
</tbody>
</table>

4 entries were displayed.

6. Disable automatic giveback on the partner node if it is enabled:

```
storage failover modify -node nodenameB -auto-giveback false
```

If the cluster is a two-node cluster, a message is displayed warning you that disabling automatic giveback prevents the management cluster services from going online in the event of an alternating-failure scenario. Enter y to continue.

7. Verify that automatic giveback is disabled for node's partner:

```
storage failover show -node nodenameB -fields auto-giveback
```

```
cluster1::> storage failover show -node node1 -fields auto-giveback
node          auto-giveback
-------------- ---------------
node1          false
```

1 entry was displayed.

8. Run the following command twice to determine whether the node to be updated is currently serving any clients

```
system node run -node nodenameA -command uptime
```

The uptime command displays the total number of operations that the node has performed for NFS, SMB, FC, and iSCSI clients since the node was last booted. For each protocol, you must run the command twice to determine whether the operation counts are increasing. If they are increasing, the node is currently serving clients for that protocol. If they are not increasing, the node is not currently serving clients for that protocol.
You should make a note of each protocol that has increasing client operations so that after
the node is updated, you can verify that client traffic has resumed.

The following example shows a node with NFS, SMB, FC, and iSCSI operations. However, the node is
currently serving only NFS and iSCSI clients.

```
cluster1::> system node run -node node0 -command uptime
2:58pm up  7 days, 19:16 800000260 NFS ops, 1017333 CIFS ops, 0 HTTP
ops, 40395 FCP ops, 32810 iSCSI ops
```

```
cluster1::> system node run -node node0 -command uptime
2:58pm up  7 days, 19:17 800001573 NFS ops, 1017333 CIFS ops, 0 HTTP
ops, 40395 FCP ops, 32815 iSCSI ops
```

9. Migrate all of the data LIFs away from the node:

```
network interface migrate-all -node nodenameA
```

10. Verify any LIFs that you migrated:

```
network interface show
```

For more information about parameters you can use to verify LIF status, see the network interface show
man page.

The following example shows that node0’s data LIFs migrated successfully. For each LIF, the fields
included in this example enable you to verify the LIF’s home node and port, the current node and port to
which the LIF migrated, and the LIF’s operational and administrative status.

```
cluster1::> network interface show -data-protocol nfs|cifs -role data
-open-node node0 -fields home-node,curr-node,curr-port,home-port,status-
-admin,status-oper
vserver lif     home-node home-port curr-node curr-port status-oper
status-admin
--------- ------- --------- --------- ------- ------- -----------

vs0     data001 node0     e0a       node1     e0a       up          up
vs0     data002 node0     e0b       node1     e0b       up          up
vs0     data003 node0     e0b       node1     e0b       up          up
vs0     data004 node0     e0a       node1     e0a       up          up
4 entries were displayed.
```

11. Initiate a takeover:
Do not specify the -option immediate parameter, because a normal takeover is required for the node that is being taken over to boot onto the new software image. If you did not manually migrate the LIFs away from the node, they automatically migrate to the node’s HA partner to ensure that there are no service disruptions.

The first node boots up to the Waiting for giveback state.

If AutoSupport is enabled, an AutoSupport message is sent indicating that the node is out of cluster quorum. You can ignore this notification and proceed with the update.

12. Verify that the takeover is successful:

```
storage failover show
```

You might see error messages indicating version mismatch and mailbox format problems. This is expected behavior and it represents a temporary state in a major nondisruptive upgrade and is not harmful.

The following example shows that the takeover was successful. Node node0 is in the Waiting for giveback state, and its partner is in the In takeover state.

```
cluster1::> storage failover show

Takeover
Node        Partner      Possible State Description
----------  -----------  -----------------------------
node0       node1       -                          Waiting for giveback (HA mailboxes)
node1       node0       false                      In takeover
2 entries were displayed.
```

13. Wait at least eight minutes for the following conditions to take effect:
   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in an I/O operation that occurs during takeover.

   The recovery time is client specific and might take longer than eight minutes, depending on the characteristics of the client applications.

14. Return the aggregates to the first node:

```
storage failover giveback -ofnode nodenameA
```

The giveback first returns the root aggregate to the partner node and then, after that node has finished booting, returns the non-root aggregates and any LIFs that were set to automatically revert. The newly
booted node begins to serve data to clients from each aggregate as soon as the aggregate is returned.

15. Verify that all aggregates have been returned:

```
storage failover show-giveback
```

If the Giveback Status field indicates that there are no aggregates to give back, then all aggregates have been returned. If the giveback is vetoed, the command displays the giveback progress and which subsystem vetoed the giveback.

16. If any aggregates have not been returned, perform the following steps:
   a. Review the veto workaround to determine whether you want to address the “veto” condition or override the veto.
   b. If necessary, address the “veto” condition described in the error message, ensuring that any identified operations are terminated gracefully.
   c. Rerun the storage failover giveback command.

   If you decided to override the “veto” condition, set the -override-vetoes parameter to true.

17. Wait at least eight minutes for the following conditions to take effect:
   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in an I/O operation that occurs during giveback.

   The recovery time is client specific and might take longer than eight minutes, depending on the characteristics of the client applications.

18. Verify that the update was completed successfully for the node:
   a. Go to the advanced privilege level:

   ```
   set -privilege advanced
   ```

   b. Verify that update status is complete for the node:

   ```
   system node upgrade-revert show -node nodenameA
   ```

   The status should be listed as complete.

   If the status is not complete, contact technical support.

   c. Return to the admin privilege level:

   ```
   set -privilege admin
   ```

19. Verify that the node’s ports are up:
network port show -node nodenameA

You must run this command on a node that is upgraded to the higher version of ONTAP 9.

The following example shows that all of the node’s ports are up:

```
cluster1::> network port show -node node0

<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></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>node0</td>
<td>e0M</td>
<td>Default</td>
<td>-</td>
<td>up</td>
<td>1500</td>
<td>auto/100</td>
</tr>
<tr>
<td></td>
<td>e0a</td>
<td>Default</td>
<td>-</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>ela</td>
<td>Cluster</td>
<td>Cluster</td>
<td>up</td>
<td>9000</td>
<td>auto/10000</td>
</tr>
<tr>
<td></td>
<td>elb</td>
<td>Cluster</td>
<td>Cluster</td>
<td>up</td>
<td>9000</td>
<td>auto/10000</td>
</tr>
</tbody>
</table>
```

5 entries were displayed.

20. Revert the LIFs back to the node:

```
network interface revert *
```

This command returns the LIFs that were migrated away from the node.

```
cluster1::> network interface revert *
8 entries were acted on.
```

21. Verify that the node’s data LIFs successfully reverted back to the node, and that they are up:

```
network interface show
```

The following example shows that all of the data LIFs hosted by the node have successfully reverted back to the node, and that their operational status is up:
22. If you previously determined that this node serves clients, verify that the node is providing service for each protocol that it was previously serving:

```
cluster1::> system node run -node nodenameA -command uptime
```

The operation counts reset to zero during the update.

The following example shows that the updated node has resumed serving its NFS and iSCSI clients:

```
cluster1::> system node run -node node0 -command uptime
 3:15pm up 0 days, 0:16 129 NFS ops, 0 CIFS ops, 0 HTTP ops, 0 FCP ops, 2 iSCSI ops
```

23. Reenable automatic giveback on the partner node if it was previously disabled:

```
storage failover modify -node nodenameB -auto-giveback true
```

You should proceed to update the node’s HA partner as quickly as possible. If you must suspend the update process for any reason, both nodes in the HA pair should be running the same ONTAP version.

**Updating the partner node in an HA pair**

After updating the first node in an HA pair, you update its partner by initiating a takeover on it. The first node serves the partner’s data while the partner node is upgraded.
1. Set the privilege level to advanced, entering y when prompted to continue:

```
set -privilege advanced
```

The advanced prompt (">") appears.

2. Set the new ONTAP software image to be the default image:

```
system image modify {-node nodenameB -iscurrent false} -isdefault true
```

The system image modify command uses an extended query to change the new ONTAP software image (which is installed as the alternate image) to be the default image for the node.

3. Monitor the progress of the update:

```
system node upgrade-revert show
```

4. Verify that the new ONTAP software image is set as the default image:

```
system image show
```

In the following example, `image2` is the new version of ONTAP and is set as the default image on the node:

```
cluster1::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node0</td>
<td>image1</td>
<td>false</td>
<td>false</td>
<td>X.X.X</td>
<td>MM/DD/YYYY</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>true</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY</td>
</tr>
<tr>
<td>node1</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
<td>MM/DD/YYYY</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY</td>
</tr>
</tbody>
</table>

4 entries were displayed.

5. Disable automatic giveback on the partner node if it is enabled:

```
storage failover modify -node nodenameA -auto-giveback false
```

If the cluster is a two-node cluster, a message is displayed warning you that disabling automatic giveback prevents the management cluster services from going online in the event of an alternating-failure scenario.
Enter y to continue.

6. Verify that automatic giveback is disabled for the partner node:

```bash
storage failover show -node nodenameA -fields auto-giveback
```

```
cluster1::> storage failover show -node node0 -fields auto-giveback
node    auto-giveback
-------- --------------
node0    false
1 entry was displayed.
```

7. Run the following command twice to determine whether the node to be updated is currently serving any clients:

```bash
system node run -node nodenameB -command uptime
```

The uptime command displays the total number of operations that the node has performed for NFS, SMB, FC, and iSCSI clients since the node was last booted. For each protocol, you must run the command twice to determine whether the operation counts are increasing. If they are increasing, the node is currently serving clients for that protocol. If they are not increasing, the node is not currently serving clients for that protocol.

**NOTE:** You should make a note of each protocol that has increasing client operations so that after the node is updated, you can verify that client traffic has resumed.

The following example shows a node with NFS, SMB, FC, and iSCSI operations. However, the node is currently serving only NFS and iSCSI clients.

```
cluster1::> system node run -node node1 -command uptime
  2:58pm up 7 days, 19:16 800000260 NFS ops, 1017333 CIFS ops, 0 HTTP ops, 40395 FCP ops, 32810 iSCSI ops

cluster1::> system node run -node node1 -command uptime
  2:58pm up 7 days, 19:17 800001573 NFS ops, 1017333 CIFS ops, 0 HTTP ops, 40395 FCP ops, 32815 iSCSI ops
```

8. Migrate all of the data LIFs away from the node:

```bash
network interface migrate-all -node nodenameB
```

9. Verify the status of any LIFs that you migrated:
network interface show

For more information about parameters you can use to verify LIF status, see the network interface show man page.

The following example shows that node1’s data LIFs migrated successfully. For each LIF, the fields included in this example enable you to verify the LIF’s home node and port, the current node and port to which the LIF migrated, and the LIF’s operational and administrative status.

```
cluster1::> network interface show -data-protocol nfs|cifs -role data
-home-node node1 -fields home-node,curr-node,curr-port,home-port,status-admin,status-oper
vserver lif      home-node home-port curr-node curr-port status-oper status-admin
----------- ------ --------- --------- --------- ----------- -------
vs0     data001 node1     e0a       node0     e0a       up          up
vs0     data002 node1     e0b       node0     e0b       up          up
vs0     data003 node1     e0b       node0     e0b       up          up
vs0     data004 node1     e0a       node0     e0a       up          up
4 entries were displayed.
```

10. Initiate a takeover:

```
storage failover takeover -ofnode nodenameB -option allow-version-mismatch
```

Do not specify the -option immediate parameter, because a normal takeover is required for the node that is being taken over to boot onto the new software image. If you did not manually migrate the LIFs away from the node, they automatically migrate to the node’s HA partner so that there are no service disruptions.

A warning is displayed. You must enter y to continue.

The node that is taken over boots up to the Waiting for giveback state.

If AutoSupport is enabled, an AutoSupport message is sent indicating that the node is out of cluster quorum. You can ignore this notification and proceed with the update.

11. Verify that the takeover was successful:

```
storage failover show
```

The following example shows that the takeover was successful. Node node1 is in the Waiting for giveback state, and its partner is in the In takeover state.
12. Wait at least eight minutes for the following conditions to take effect:

   +
   
   ◦ Client multipathing (if deployed) is stabilized.
   
   ◦ Clients are recovered from the pause in I/O that occurs during takeover.

   The recovery time is client-specific and might take longer than eight minutes, depending on the characteristics of the client applications.

13. Return the aggregates to the partner node:

    storage failover giveback -ofnode nodenameB

    The giveback operation first returns the root aggregate to the partner node and then, after that node has finished booting, returns the non-root aggregates and any LIFs that were set to automatically revert. The newly booted node begins to serve data to clients from each aggregate as soon as the aggregate is returned.

14. Verify that all aggregates are returned:

    storage failover show-giveback

    If the Giveback Status field indicates that there are no aggregates to give back, then all aggregates are returned. If the giveback is vetoed, the command displays the giveback progress and which subsystem vetoed the giveback operation.

15. If any aggregates are not returned, perform the following steps:

   a. Review the veto workaround to determine whether you want to address the “veto” condition or override the veto.
   
   b. If necessary, address the “veto” condition described in the error message, ensuring that any identified operations are terminated gracefully.
   
   c. Rerun the storage failover giveback command.

      If you decided to override the “veto” condition, set the -override-vetoes parameter to true.

16. Wait at least eight minutes for the following conditions to take effect:
- Client multipathing (if deployed) is stabilized.
- Clients are recovered from the pause in an I/O operation that occurs during giveback.

The recovery time is client specific and might take longer than eight minutes, depending on the characteristics of the client applications.

17. Verify that the update was completed successfully for the node:
   a. Go to the advanced privilege level:

   ```bash
   set -privilege advanced
   ```

   b. Verify that update status is complete for the node:

   ```bash
   system node upgrade-revert show -node nodenameB
   ```

   The status should be listed as complete.

   If the status is not complete, from the node, run the system node upgrade-revert upgrade command. If the command does not complete the update, contact technical support.

   c. Return to the admin privilege level:

   ```bash
   set -privilege admin
   ```

18. Verify that the node's ports are up:

   ```bash
   network port show -node nodenameB
   ```

   You must run this command on a node that has been upgraded to ONTAP 9.4.

   The following example shows that all of the node's data ports are up:
19. Revert the LIFs back to the node:

```
cluster1::> network interface revert *
```

This command returns the LIFs that were migrated away from the node.

```
cluster1::> network interface revert *
8 entries were acted on.
```

20. Verify that the node’s data LIFs successfully reverted back to the node, and that they are up:

```
network interface show
```

The following example shows that all of the data LIFs hosted by the node is successfully reverted back to the node, and that their operational status is up:
21. If you previously determined that this node serves clients, verify that the node is providing service for each protocol that it was previously serving:

```
cluster1::> system node run -node nodenameB -command uptime
```

The operation counts reset to zero during the update.

The following example shows that the updated node has resumed serving its NFS and iSCSI clients:

```
cluster1::> system node run -node node1 -command uptime
3:15pm up 0 days, 0:16 129 NFS ops, 0 CIFS ops, 0 HTTP ops, 0 FCP ops, 2 iSCSI ops
```

22. If this was the last node in the cluster to be updated, trigger an AutoSupport notification:

```
autosupport invoke -node * -type all -message "Finishing_NDU"
```

This AutoSupport notification includes a record of the system status just prior to update. It saves useful troubleshooting information in case there is a problem with the update process.

If the cluster is not configured to send AutoSupport messages, a copy of the notification is saved locally.

23. Confirm that the new ONTAP software is running on both nodes of the HA pair:
set -privilege advanced

system node image show

In the following example, image2 is the updated version of ONTAP and is the default version on both nodes:

```
cluster1::*> system node image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current Version</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>node0</td>
<td>image1</td>
<td>false</td>
<td>false</td>
<td>X.X.X MM/DD/YYYY</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>true</td>
<td>Y.Y.Y MM/DD/YYYY</td>
</tr>
<tr>
<td>node1</td>
<td>image1</td>
<td>false</td>
<td>false</td>
<td>X.X.X MM/DD/YYYY</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>true</td>
<td>Y.Y.Y MM/DD/YYYY</td>
</tr>
</tbody>
</table>

4 entries were displayed.
```

24. Reenable automatic giveback on the partner node if it was previously disabled:

```
storage failover modify -node nodenameA -auto-giveback true
```

25. Verify that the cluster is in quorum and that services are running by using the `cluster show` and `cluster ring show` (advanced privilege level) commands.

   You must perform this step before upgrading any additional HA pairs.

26. Return to the admin privilege level:

```
set -privilege admin
```

27. Upgrade any additional HA pairs.

**Manual nondisruptive ONTAP upgrade of a four- or eight-node MetroCluster configuration using the CLI**

A manual upgrade of a four- or eight-node MetroCluster configuration involves preparing for the update, updating the DR pairs in each of the one or two DR groups simultaneously, and performing post-upgrade tasks.

- This task applies to the following configurations:
- Four-node MetroCluster FC or IP configurations running ONTAP 9.2 or earlier
- Eight-node MetroCluster FC configurations, regardless of ONTAP version

- If you have a two-node MetroCluster configuration, do not use this procedure.
- The following tasks refer to the old and new versions of ONTAP.
  - When upgrading, the old version is a previous version of ONTAP, with a lower version number than the new version of ONTAP.
  - When downgrading, the old version is a later version of ONTAP, with a higher version number than the new version of ONTAP.

- This task uses the following high-level workflow:
Differences when updating ONTAP software on an eight-node or four-node MetroCluster configuration

The MetroCluster software upgrade process differs, depending on whether there are eight or four nodes in the MetroCluster configuration.

A MetroCluster configuration consists of one or two DR groups. Each DR group consists of two HA pairs, one HA pair at each MetroCluster cluster. An eight-node MetroCluster includes two DR groups:

For four-node MetroCluster configurations:
1. Upgrade DR Group One:
   a. Upgrade node_A_1 and node_B_1.
   b. Upgrade node_A_2 and node_B_2.

For eight-node MetroCluster configurations, you perform the DR group upgrade procedure twice:
1. Upgrade DR Group One:
   a. Upgrade node_A_1 and node_B_1.
   b. Upgrade node_A_2 and node_B_2.
2. Upgrade DR Group Two:
   a. Upgrade node_A_3 and node_B_3.
   b. Upgrade node_A_4 and node_B_4.
Preparing to upgrade a MetroCluster DR group

Before you upgrade the ONTAP software on the nodes, you must identify the DR relationships among the nodes, send an AutoSupport message that you are initiating an upgrade, and confirm the ONTAP version running on each node.

You must have downloaded and installed the software images.

This task must be repeated on each DR group. If the MetroCluster configuration consists of eight nodes, there are two DR groups. Thereby, this task must be repeated on each DR group.

The examples provided in this task use the names shown in the following illustration to identify the clusters and nodes:

1. Identify the DR pairs in the configuration:

```bash
timeout 300
metrocluster node show -fields dr-partner
```
cluster_A::> metrocluster node show -fields dr-partner

(metrocluster node show)

<table>
<thead>
<tr>
<th>dr-group-id</th>
<th>cluster</th>
<th>node</th>
<th>dr-partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cluster_A</td>
<td>node_A_1</td>
<td>node_B_1</td>
</tr>
<tr>
<td>1</td>
<td>cluster_A</td>
<td>node_A_2</td>
<td>node_B_2</td>
</tr>
<tr>
<td>1</td>
<td>cluster_B</td>
<td>node_B_1</td>
<td>node_A_1</td>
</tr>
<tr>
<td>1</td>
<td>cluster_B</td>
<td>node_B_2</td>
<td>node_A_2</td>
</tr>
</tbody>
</table>

4 entries were displayed.

cluster_A::>

2. Set the privilege level from admin to advanced, entering y when prompted to continue:

```bash
set -privilege advanced
```

The advanced prompt (*>>) appears.

3. Confirm the ONTAP version on cluster_A:

```bash
system image show
```

```
cluster_A::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node_A_1</td>
<td>image1</td>
<td>true</td>
<td>true</td>
<td>X.X.X</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>false</td>
<td>false</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td>node_A_2</td>
<td>image1</td>
<td>true</td>
<td>true</td>
<td>X.X.X</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>false</td>
<td>false</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY TIME</td>
</tr>
</tbody>
</table>

4 entries were displayed.

cluster_A::>

4. Confirm the version on cluster_B:

```bash
system image show
```
cluster_B::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node_B_1</td>
<td>image1</td>
<td>true</td>
<td>true</td>
<td>X.X.X</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>false</td>
<td>false</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td>node_B_2</td>
<td>image1</td>
<td>true</td>
<td>true</td>
<td>X.X.X</td>
<td>MM/DD/YYYY TIME</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>false</td>
<td>false</td>
<td>Y.Y.Y</td>
<td>MM/DD/YYYY TIME</td>
</tr>
</tbody>
</table>

4 entries were displayed.

cluster_B::>

5. Trigger an AutoSupport notification:

```
autosupport invoke -node * -type all -message "Starting_NDU"
```

This AutoSupport notification includes a record of the system status before the upgrade. It saves useful troubleshooting information if there is a problem with the upgrade process.

If your cluster is not configured to send AutoSupport messages, then a copy of the notification is saved locally.

6. For each node in the first set, set the target ONTAP software image to be the default image:

```
system image modify {-node nodename -iscurrent false} -isdefault true
```

This command uses an extended query to change the target software image, which is installed as the alternate image, to be the default image for the node.

7. Verify that the target ONTAP software image is set as the default image on cluster_A:

```
system image show
```

In the following example, image2 is the new ONTAP version and is set as the default image on each of the nodes in the first set:
```
cluster_A::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node_A_1</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
</tr>
<tr>
<td>node_A_2</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
</tr>
</tbody>
</table>

2 entries were displayed.
```

a. Verify that the target ONTAP software image is set as the default image on cluster_B:

```
cluster_B::*> system image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>node_A_1</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
</tr>
<tr>
<td>node_A_2</td>
<td>image1</td>
<td>false</td>
<td>true</td>
<td>X.X.X</td>
</tr>
<tr>
<td></td>
<td>image2</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y</td>
</tr>
</tbody>
</table>

2 entries were displayed.
```

8. Determine whether the nodes to be upgraded are currently serving any clients twice for each node:

```
system node run -node target-node -command uptime
```

The uptime command displays the total number of operations that the node has performed for NFS, CIFS, FC, and iSCSI clients since the node was last booted. For each protocol, you need to run the command twice to determine whether the operation counts are increasing. If they are increasing, the node is currently serving clients for that protocol. If they are not increasing, the node is not currently serving clients for that protocol.
You should make a note of each protocol that has increasing client operations so that after the node is upgraded, you can verify that client traffic has resumed.

This example shows a node with NFS, CIFS, FC, and iSCSI operations. However, the node is currently serving only NFS and iSCSI clients.

Updating the first DR pair in a MetroCluster DR group

You must perform a takeover and giveback of the nodes in the correct order to make the new version of ONTAP the current version of the node.

All nodes must be running the old version of ONTAP.

In this task, node_A_1 and node_B_1 are upgraded.

If you have upgraded the ONTAP software on the first DR group, and are now upgrading the second DR group in an eight-node MetroCluster configuration, in this task you would be updating node_A_3 and node_B_3.

1. If MetroCluster Tiebreaker software is enabled, disabled it.
2. For each node in the HA pair, disable automatic giveback:
   
   ```
   storage failover modify -node target-node -auto-giveback false
   ```

   This command must be repeated for each node in the HA pair.

3. Verify that automatic giveback is disabled:

   ```
   storage failover show -fields auto-giveback
   ```

   This example shows that automatic giveback has been disabled on both nodes:
4. Ensure that I/O is not exceeding ~50% for each controller and that CPU utilization is not exceeding ~50% per controller.

5. Initiate a takeover of the target node on cluster_A:

   Do not specify the -option immediate parameter, because a normal takeover is required for the nodes that are being taken over to boot onto the new software image.

   a. Take over the DR partner on cluster_A (node_A_1):

   ```
   storage failover takeover -ofnode node_A_1
   ```

   The node boots up to the "Waiting for giveback" state.

   If AutoSupport is enabled, then an AutoSupport message is sent indicating that the nodes are out of cluster quorum. You can ignore this notification and proceed with the upgrade.

   b. Verify that the takeover is successful:

   ```
   storage failover show
   ```

   The following example shows that the takeover is successful. Node_A_1 is in the "Waiting for giveback" state and node_A_2 is in the "In takeover" state.

   ```
   cluster1::> storage failover show
   Node       Partner       Possible State Description
   -------------- -------------- ------------
   node_A_1       node_A_2       -       Waiting for giveback (HA mailboxes)
   node_A_2       node_A_1       false   In takeover
   2 entries were displayed.
   ```

6. Take over the DR partner on cluster_B (node_B_1):

   Do not specify the -option immediate parameter, because a normal takeover is required for the nodes that
are being taken over to boot onto the new software image.

a. Take over node_B_1:

```
storage failover takeover -ofnode node_B_1
```

The node boots up to the "Waiting for giveback" state.

If AutoSupport is enabled, then an AutoSupport message is sent indicating that the nodes are out of cluster quorum. You can ignore this notification and proceed with the upgrade.

b. Verify that the takeover is successful:

```
storage failover show
```

The following example shows that the takeover is successful. Node_B_1 is in the "Waiting for giveback" state and node_B_2 is in the "In takeover" state.

```
cluster1::> storage failover show
  Takeover
  Node           Partner        Possible State Description
  -------------- -------------- --------
  node_B_1       node_B_2       -        Waiting for giveback (HA mailboxes)
  node_B_2       node_B_1       false    In takeover

2 entries were displayed.
```

7. Wait at least eight minutes to ensure the following conditions:
   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in I/O that occurs during takeover.

   The recovery time is client-specific and might take longer than eight minutes depending on the characteristics of the client applications.

8. Return the aggregates to the target nodes:

After upgrading MetroCluster IP configurations to ONTAP 9.5 or later, the aggregates will be in a degraded state for a short period before resynchronizing and returning to a mirrored state.

a. Give back the aggregates to the DR partner on cluster_A:

```
storage failover giveback -ofnode node_A_1
```
b. Give back the aggregates to the DR partner on cluster_B:

```bash
storage failover giveback -ofnode node_B_1
```

The giveback operation first returns the root aggregate to the node and then, after the node has finished booting, returns the non-root aggregates.

9. Verify that all aggregates have been returned by issuing the following command on both clusters:

```bash
storage failover show-giveback
```

If the Giveback Status field indicates that there are no aggregates to give back, then all aggregates have been returned. If the giveback is vetoed, the command displays the giveback progress and which subsystem vetoed the giveback.

10. If any aggregates have not been returned, do the following:

   a. Review the veto workaround to determine whether you want to address the “veto” condition or override the veto.

   b. If necessary, address the “veto” condition described in the error message, ensuring that any identified operations are terminated gracefully.

   c. Reenter the storage failover giveback command.

      If you decided to override the “veto” condition, set the -override-vetoes parameter to true.

11. Wait at least eight minutes to ensure the following conditions:

   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in I/O that occurs during giveback.

   The recovery time is client-specific and might take longer than eight minutes depending on the characteristics of the client applications.

12. Set the privilege level from admin to advanced, entering y when prompted to continue:

```bash
set -privilege advanced
```

The advanced prompt (*>>) appears.

13. Confirm the version on cluster_A:

```bash
system image show
```

The following example shows that System image2 should is the default and current version on node_A_1:
14. Confirm the version on cluster_B:

```
--  system image show
Node  Image  Default  Current  Date
------ ------- ------- -------- -------------------
node_B_1
  image1 false false X.X.X MM/DD/YYYY TIME
  image2 true  true Y.Y.Y MM/DD/YYYY TIME
node_B_2
  image1 false true X.X.X MM/DD/YYYY TIME
  image2 true false Y.Y.Y MM/DD/YYYY TIME
4 entries were displayed.
```

**Updating the second DR pair in a MetroCluster DR group**

You must perform a takeover and giveback of the node in the correct order to make the new version of ONTAP the current version of the node.

You should have upgraded the first DR pair (node_A_1 and node_B_1).

In this task, node_A_2 and node_B_2 are upgraded.

If you have upgraded the ONTAP software on the first DR group, and are now updating the second DR group...
in an eight-node MetroCluster configuration, in this task you are updating node_A_4 and node_B_4.

1. Migrate all of the data LIFs away from the node:

   network interface migrate-all -node nodenameA

2. Initiate a takeover of the target node on cluster_A:

   Do not specify the -option immediate parameter, because a normal takeover is required for the nodes that are being taken over to boot onto the new software image.

   a. Take over the DR partner on cluster_A:

      storage failover takeover -ofnode node_A_2 -option allow-version-mismatch

      The allow-version-mismatch option is not required for upgrades from ONTAP 9.0 to ONTAP 9.1 or for any patch upgrades.

      The node boots up to the "Waiting for giveback" state.

      If AutoSupport is enabled, then an AutoSupport message is sent indicating that the nodes are out of cluster quorum. You can ignore this notification and proceed with the upgrade.

   b. Verify that the takeover is successful:

      storage failover show

      The following example shows that the takeover is successful. Node_A_2 is in the "Waiting for giveback" state and node_A_1 is in the "In takeover" state.

      cluster1::> storage failover show

      Node Partner Possible State Description
      ------------- -------------- --------
      node_A_1     node_A_2     false   In takeover
      node_A_2     node_A_1     -        Waiting for giveback (HA mailboxes)
      2 entries were displayed.

3. Initiate a takeover of the target node on cluster_B:

   Do not specify the -option immediate parameter, because a normal takeover is required for the nodes that are being taken over to boot onto the new software image.
a. Take over the DR partner on cluster_B (node_B_2):

<table>
<thead>
<tr>
<th>If you are upgrading from...</th>
<th>Enter this command...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONTAP 9.2 or ONTAP 9.1</td>
<td>storage failover takeover -ofnode node_B_2</td>
</tr>
<tr>
<td>ONTAP 9.0 or Data ONTAP 8.3.x</td>
<td>storage failover takeover -ofnode node_B_2 -option allow-version-mismatch</td>
</tr>
</tbody>
</table>

The node boots up to the "Waiting for giveback" state.

The allow-version-mismatch option is not required for upgrades from ONTAP 9.0 to ONTAP 9.1 or for any patch upgrades.

b. Verify that the takeover is successful:

    storage failover show

The following example shows that the takeover is successful. Node_B_2 is in the "Waiting for giveback" state and node_B_1 is in the "In takeover" state.

```bash
cluster1::> storage failover show

Takeover
Node      Partner    Possible State Description
---------- ----------- --------------------------
node_B_1   node_B_2  false    In takeover
node_B_2   node_B_1  -         Waiting for giveback (HA mailboxes)
```

2 entries were displayed.

4. Wait at least eight minutes to ensure the following conditions:
   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in I/O that occurs during takeover.
The recovery time is client-specific and might take longer than eight minutes depending on the characteristics of the client applications.

5. Return the aggregates to the target nodes:

After upgrading MetroCluster IP configurations to ONTAP 9.5, the aggregates will be in a degraded state for a short period before resynchronizing and returning to a mirrored state.

a. Give back the aggregates to the DR partner on cluster_A:

```bash
storage failover giveback -ofnode node_A_2
```

b. Give back the aggregates to the DR partner on cluster_B:

```bash
storage failover giveback -ofnode node_B_2
```

The giveback operation first returns the root aggregate to the node and then, after the node has finished booting, returns the non-root aggregates.

6. Verify that all aggregates have been returned by issuing the following command on both clusters:

```bash
storage failover show-giveback
```

If the Giveback Status field indicates that there are no aggregates to give back, then all aggregates have been returned. If the giveback is vetoed, the command displays the giveback progress and which subsystem vetoed the giveback.

7. If any aggregates have not been returned, do the following:

   a. Review the veto workaround to determine whether you want to address the “veto” condition or override the veto.
   
   b. If necessary, address the “veto” condition described in the error message, ensuring that any identified operations are terminated gracefully.
   
   c. Reenter the storage failover giveback command.

      If you decided to override the “veto” condition, set the -override-vetoes parameter to true.

8. Wait at least eight minutes to ensure the following conditions:

   - Client multipathing (if deployed) is stabilized.
   - Clients are recovered from the pause in I/O that occurs during giveback.

   The recovery time is client-specific and might take longer than eight minutes depending on the characteristics of the client applications.

9. Set the privilege level from admin to advanced, entering y when prompted to continue:

```bash
set -privilege advanced
```
The advanced prompt (\*) appears.

10. Confirm the version on cluster_A:

```
    system image show
```

The following example shows that System image2 (target ONTAP image) is the default and current version on node_A_2:

```
cluster_B::*> system image show
     Is   Is                 Install
    Node    Image Default Current Version    Date
    -------- ------- ------- ------- ---------- -------------------
     node_A_1
        image1  false  false    X.X.X     MM/DD/YYYY TIME
        image2  true    true     Y.Y.Y     MM/DD/YYYY TIME
     node_A_2
        image1  false  false    X.X.X     MM/DD/YYYY TIME
        image2  true    true     Y.Y.Y     MM/DD/YYYY TIME

4 entries were displayed.
```

cluster_A::>

11. Confirm the version on cluster_B:

```
    system image show
```

The following example shows that System image2 (target ONTAP image) is the default and current version on node_B_2:

```
cluster_B::*> system image show
     Is   Is                 Install
    Node    Image Default Current Version    Date
    -------- ------- ------- ------- ---------- -------------------
     node_B_1
        image1  false  false    X.X.X     MM/DD/YYYY TIME
        image2  true    true     Y.Y.Y     MM/DD/YYYY TIME
     node_B_2
        image1  false  false    X.X.X     MM/DD/YYYY TIME
        image2  true    true     Y.Y.Y     MM/DD/YYYY TIME

4 entries were displayed.
```

cluster_A::>
12. For each node in the HA pair, enable automatic giveback:

```
storage failover modify -node target-node -auto-giveback true
```

This command must be repeated for each node in the HA pair.

13. Verify that automatic giveback is enabled:

```
storage failover show -fields auto-giveback
```

This example shows that automatic giveback has been enabled on both nodes:

```
cluster_x::> storage failover show -fields auto-giveback
node auto-giveback
-------- -------------
node_x_1 true
node_x_2 true
2 entries were displayed.
```

**Nondisruptive upgrade of a two-node MetroCluster configuration in ONTAP 9.2 or earlier**

How you upgrade a two-node MetroCluster configuration varies based on your ONTAP version. If you are running ONTAP 9.2 or earlier, you should use this procedure to perform a manual nondisruptive upgrade which includes initiating a negotiated switchover, updating the cluster at the “failed” site, initiating switchback, and then repeating the process on the cluster at the other site.

If you have a two-node MetroCluster configuration running ONTAP 9.3 or later, perform an automated upgrade using System Manager.

**Steps**

1. Set the privilege level to advanced, entering y when prompted to continue:

```
set -privilege advanced
```

The advanced prompt (">”) appears.

2. On the cluster to be upgraded, install the new ONTAP software image as the default:

```
system node image update -package package_location -setdefault true
-replace-package true
```
cluster_B::*> system node image update -package http://www.example.com/NewImage.tgz -setdefault true -replace-package true

3. Verify that the target software image is set as the default image:

system node image show

The following example shows that NewImage is set as the default image:

cluster_B::*> system node image show

<table>
<thead>
<tr>
<th>Node</th>
<th>Image</th>
<th>Default</th>
<th>Current Version</th>
<th>Install</th>
</tr>
</thead>
<tbody>
<tr>
<td>node_B_1</td>
<td>OldImage</td>
<td>false</td>
<td>true</td>
<td>X.X.X MM/DD/YYYY TIME</td>
</tr>
<tr>
<td></td>
<td>NewImage</td>
<td>true</td>
<td>false</td>
<td>Y.Y.Y MM/DD/YYYY TIME</td>
</tr>
</tbody>
</table>

2 entries were displayed.

4. If the target software image is not set as the default image, then change it:

system image modify {-node * -iscurrent false} -isdefault true

5. Verify that all cluster SVMs are in a health state:

metrocluster vserver show

6. On the cluster that is not being updated, initiate a negotiated switchover:

metrocluster switchover

The operation can take several minutes. You can use the metrocluster operation show command to verify that the switchover is completed.

In the following example, a negotiated switchover is performed on the remote cluster (“cluster_A”). This causes the local cluster (“cluster_B”) to halt so that you can update it.
cluster_A::> metrocluster switchover

Warning: negotiated switchover is about to start. It will stop all the data

Vservers on cluster "cluster_B" and automatically re-start them on cluster "cluster_A". It will finally gracefully shutdown cluster "cluster_B".
Do you want to continue? {y|n}: y

7. Verify that all cluster SVMs are in a health state:

```
metrocluster vserver show
```

8. Resynchronize the data aggregates on the “surviving” cluster:

```
metrocluster heal -phase aggregates
```

After upgrading MetroCluster IP configurations to ONTAP 9.5 or later, the aggregates will be in a degraded state for a short period before resynchronizing and returning to a mirrored state.

```
cluster_A::> metrocluster heal -phase aggregates
[Job 130] Job succeeded: Heal Aggregates is successful.
```

9. Verify that the healing operation was completed successfully:

```
metrocluster operation show
```

```
cluster_A::> metrocluster operation show
Operation: heal-aggregates
State: successful
Start Time: MM/DD/YYYY TIME
End Time: MM/DD/YYYY TIME
Errors: -
```

10. Resynchronize the root aggregates on the “surviving” cluster:

```
metrocluster heal -phase root-aggregates
```
11. Verify that the healing operation was completed successfully:

```
metrocluster operation show
```

```
cluster_A::> metrocluster operation show
Operation: heal-root-aggregates
State: successful
Start Time: MM/DD/YYYY TIME
End Time: MM/DD/YYYY TIME
Errors: -
```

12. On the halted cluster, boot the node from the LOADER prompt:

```
boot_ontap
```

13. Wait for the boot process to finish, and then verify that all cluster SVMs are in a health state:

```
metrocluster vserver show
```

14. Perform a switchback from the “surviving” cluster:

```
metrocluster switchback
```

15. Verify that the switchback was completed successfully:

```
metrocluster operation show
```

```
cluster_A::> metrocluster operation show
Operation: switchback
State: successful
Start Time: MM/DD/YYYY TIME
End Time: MM/DD/YYYY TIME
Errors: -
```

16. Verify that all cluster SVMs are in a health state:
17. Repeat all previous steps on the other cluster.

18. Verify that the MetroCluster configuration is healthy:
   a. Check the configuration:
      
      ```
      metrocluster vserver show
      ```
      
      ```
      cluster_A::> metrocluster check run
      Last Checked On: MM/DD/YYYY TIME
      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.
      ```
   
   b. If you want to view more detailed results, use the metrocluster check run command:
      
      ```
      metrocluster check aggregate show
      ```
      
      ```
      metrocluster check config-replication show
      ```
      
      ```
      metrocluster check lif show
      ```
      
      ```
      metrocluster check node show
      ```
   
   c. Set the privilege level to advanced:
set -privilege advanced

d. Simulate the switchover operation:

    metrocluster switchover -simulate

e. Review the results of the switchover simulation:

    metrocluster operation show

    cluster_A::*> metrocluster operation show
    Operation: switchover
    State: successful
    Start time: MM/DD/YYYY TIME
    End time: MM/DD/YYYY TIME
    Errors: -

f. Return to the admin privilege level:

    set -privilege admin

g. Repeat these substeps on the other cluster.

After you finish
Perform any post-upgrade tasks.

Related information
MetroCluster Disaster recovery

Manual disruptive ONTAP upgrade using the CLI

If you can take your cluster offline to upgrade to a new ONTAP release, then you can use the disruptive upgrade method. This method has several steps: disabling storage failover for each HA pair, rebooting each node in the cluster, and then reenabling storage failover.

• You must download and install the software image.
• If you are operating in a SAN environment, all SAN clients must be shut down or suspended until the upgrade is complete.

    If SAN clients are not shut down or suspended prior to a disruptive upgrade, then the client file systems and applications suffer errors that might require manual recovery after the upgrade is completed.

In a disruptive upgrade, downtime is required because storage failover is disabled for each HA pair, and each
node is updated. When storage failover is disabled, each node behaves as a single-node cluster; that is, system services associated with the node are interrupted for as long as it takes the system to reboot.

Steps

1. Set the privilege level from admin to advanced, entering y when prompted to continue:

```bash
set -privilege advanced
```

The advanced prompt (>*>) appears.

2. Set the new ONTAP software image to be the default image:

```bash
system image modify {-node * -iscurrent false} -isdefault true
```

This command uses an extended query to change the target ONTAP software image (which is installed as the alternate image) to be the default image for each node.

3. Verify that the new ONTAP software image is set as the default image:

```bash
system image show
```

In the following example, image 2 is the new ONTAP version and is set as the default image on both nodes:

```
cluster1::*> system image show
Is      Is                Install
Node     Image   Default Current Version    Date
-------- ------- ------- ------- --------- -------------------
node0    image1  false   true    X.X.X     MM/DD/YYYY TIME
         image2  true    false   Y.Y.Y     MM/DD/YYYY TIME
node1    image1  false   true    X.X.X     MM/DD/YYYY TIME
         image2  true    false   Y.Y.Y     MM/DD/YYYY TIME
4 entries were displayed.
```

4. Perform either one of the following steps:

<table>
<thead>
<tr>
<th>If the cluster consists of...</th>
<th>Do this...</th>
</tr>
</thead>
<tbody>
<tr>
<td>One node</td>
<td>Continue to the next step.</td>
</tr>
<tr>
<td>If the cluster consists of...</td>
<td>Do this...</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| Two nodes                   | a. Disable cluster high availability:  
  cluster ha modify -configured false  
  Enter y to continue when prompted.  
b. Disable storage failover for the HA pair:  
  storage failover modify -node * -enabled false |
| More than two nodes         | Disable storage failover for each HA pair in the cluster:  
  storage failover modify -node * -enabled false |

5. Reboot a node in the cluster:

```
system node reboot -node nodename -ignore-quorum-warnings
```

ℹ️ Do not reboot more than one node at a time.

The node boots the new ONTAP image. The ONTAP login prompt appears, indicating that the reboot process is complete.

6. After the node or set of nodes has rebooted with the new ONTAP image, set the privilege level to advanced:

```
set -privilege advanced
```

Enter y when prompted to continue

7. Confirm that the new software is running:

```
system node image show
```

In the following example, image1 is the new ONTAP version and is set as the current version on node0:
### 8. Verify that the upgrade is completed successfully:

a. Set the privilege level to advanced:

```bash
set -privilege advanced
```

b. Verify that the upgrade status is complete for each node:

```bash
system node upgrade-revert show -node nodename
```

The status should be listed as complete.

If the status is not complete, contact NetApp Support immediately.

c. Return to the admin privilege level:

```bash
set -privilege admin
```

### 9. Repeat Steps 2 through 8 for each additional node.

### 10. If the cluster consists of two or more nodes, enable storage failover for each HA pair in the cluster:

```bash
storage failover modify -node * -enabled true
```

### 11. If the cluster consists of only two nodes, enable cluster high availability:

```bash
cluster ha modify -configured true
```