



# Manage nodes

ONTAP 9

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# Manage nodes

## Add nodes to an ONTAP cluster

After a cluster is created, you can expand it by adding nodes to it. You add only one node at a time.

### Before you begin

- Install and configure your new storage system by reviewing the hardware requirements, preparing your site, and installing and cabling the hardware components (controllers, storage shelves and switches). See the following ONTAP hardware systems documentation for details:
  - [AFF systems](#)
  - [ASA systems](#)
  - [AFX systems](#)
  - [ASA R2 systems](#)
  - [FAS systems](#)
- Review your cluster switch model's cabling and configuration considerations for the cluster ports on your new storage system. See the [Switch documentation for ONTAP hardware systems](#)
  - a. Select the **Cluster Switches** or **Shared Switches** in the **Supported switches** tile.
  - b. Select the **Install** documentation for your switch model.
  - c. Search for the **Review cabling and configuration considerations** topic and review it for your storage system.
- If you are adding nodes to a multiple-node cluster, all the existing nodes in the cluster must be healthy (indicated by `cluster show`). Learn more about `cluster show` in the [ONTAP command reference](#).
- If you are adding nodes to a two-node switchless cluster, you must convert your two-node switchless cluster to a switch-attached cluster using a NetApp supported cluster switch.

| Switch model                                   | Migration procedure  |
|--|--|
| Broadcom BES-53248                             | <a href="#">Migrate to a switched NetApp cluster environment</a>                           |
| Cisco Nexus 9336C-FX2                          | <a href="#">Migrate to a two-node switched cluster</a>                                     |
| Cisco Nexus 9336C-FX2 (Shared Cluster+Storage) | <a href="#">Migrate from a switchless cluster with direct-attached storage</a>             |
| NVIDIA SN2100                                  | <a href="#">Migrate to a two-node switched cluster with NVIDIA SN2100 cluster switches</a> |

- If you are adding a second node to a single-node cluster, the second node must have been installed, and the cluster network must have been configured.
- If the cluster has SP automatic configuration enabled, the subnet specified for the SP must have available resources to allow the joining node to use the specified subnet to automatically configure the SP.
- You must have gathered the following information for the new node's node management LIF:

- Port
- IP address
- Netmask
- Default gateway

### About this task

Nodes must be in even numbers so that they can form HA pairs. After you start to add a node to the cluster, you must complete the process. The node must be part of the cluster before you can start to add another node.

### Steps

1. Power on the node that you want to add to the cluster.

The node boots, and the Node Setup wizard starts on the console.

```
Welcome to node setup.
```

```
You can enter the following commands at any time:
```

```
"help" or "?" - if you want to have a question clarified,
```

```
"back" - if you want to change previously answered questions, and
```

```
"exit" or "quit" - if you want to quit the setup wizard.
```

```
Any changes you made before quitting will be saved.
```

```
To accept a default or omit a question, do not enter a value.
```

```
Enter the node management interface port [e0M]:
```

2. Exit the Node Setup wizard: `exit`

The Node Setup wizard exits, and a login prompt appears, warning that you have not completed the setup tasks.

Learn more about `exit` in the [ONTAP command reference](#).

3. Log in to the admin account by using the `admin` user name.
4. Start the Cluster Setup wizard:

```
::> cluster setup
```

Welcome to the cluster setup wizard.

You can enter the following commands at any time:

"help" or "?" - if you want to have a question clarified,  
"back" - if you want to change previously answered questions, and  
"exit" or "quit" - if you want to quit the cluster setup wizard.  
Any changes you made before quitting will be saved.

You can return to cluster setup at any time by typing "cluster setup".  
To accept a default or omit a question, do not enter a value....

Use your web browser to complete cluster setup by accessing  
`https://<node_mgmt_or_e0M_IP_address>`

Otherwise, press Enter to complete cluster setup using the  
command line interface:



For more information on setting up a cluster using the setup GUI, see the [node management documentation](#). Learn more about `cluster setup` in the [ONTAP command reference](#).

5. Press Enter to use the CLI to complete this task. When prompted to create a new cluster or join an existing one, enter `join`.

```
Do you want to create a new cluster or join an existing cluster?  
{create, join}:  
join
```

If the ONTAP version running on the new node is different to the version running on the existing cluster, the system reports a `System checks Error: Cluster join operation cannot be performed at this time error`. This is the expected behavior. To continue, run the `cluster add-node -allow-mixed-version-join true -cluster-ips <IP address> -node-names <new_node_name>` command at the advanced privilege level from an existing node in the cluster.

6. Follow the prompts to set up the node and join it to the cluster:
  - To accept the default value for a prompt, press Enter.
  - To enter your own value for a prompt, enter the value, and then press Enter.
7. Repeat the preceding steps for each additional node that you want to add.

### After you finish

After adding nodes to the cluster, you should enable storage failover for each HA pair.

### Related information

- [Mixed version clusters supported for ONTAP software upgrades](#)

- [cluster add-node](#)

## Remove nodes from an ONTAP cluster

You can remove unwanted nodes from a cluster, one node at a time. After you remove a node, you must also remove its failover partner. If you are removing a node, then its data becomes inaccessible or erased.

### Before you begin

You must satisfy the following conditions before you remove nodes from the cluster:

- More than half of the nodes in the cluster must be healthy.
- All data, volumes, and non-root aggregates must be relocated or removed from the node.
  - All of the data on the node that you want to remove must have been evacuated. This might include [purging data from an encrypted volume](#).
  - All non-root volumes have been [moved](#) from aggregates owned by the node.
  - All non-root aggregates have been [deleted](#) from the node.
- All LIFs and VLANs have been relocated or removed from the node.
  - Data LIFs have been [deleted](#) or [relocated](#) from the node.
  - Cluster management LIFs have been [relocated](#) from the node and the home ports changed.
  - All intercluster LIFs have been [removed](#). When you remove intercluster LIFs a warning is displayed that can be ignored.
  - All VLANs on the node have been [deleted](#).
- The node is not participating in any failover relationships.
  - Storage failover has been [disabled](#) for the node.
  - All LIF failover rules have been [modified](#) to remove ports on the node.
- If the node owns Federal Information Processing Standards (FIPS) disks or self-encrypting disks (SEDs), [disk encryption has been removed](#) by returning the disks to unprotected mode.
  - You might also want to [sanitize FIPS drives or SEDs](#).
- If you have LUNs on the node to be removed, you should [modify the Selective LUN Map \(SLM\) reporting-nodes list](#) before you remove the node.

If you do not remove the node and its HA partner from the SLM reporting-nodes list, access to the LUNs previously on the node can be lost even though the volumes containing the LUNs were moved to another node.

It is recommended that you issue an AutoSupport message to notify NetApp technical support that node removal is underway.



Do not perform operations such as `cluster remove-node`, `cluster unjoin`, and `node rename` when an automated ONTAP upgrade is in progress.

### About this task

- If you are running a mixed-version cluster, you can remove the last low-version node by using one of the advanced privilege commands beginning with ONTAP 9.3:

- ONTAP 9.3: `cluster unjoin -skip-last-low-version-node-check`
- ONTAP 9.4 and later: `cluster remove-node -skip-last-low-version-node-check`
- If you remove two nodes from a four-node cluster, cluster HA is automatically enabled on the two remaining nodes.



All system and user data, from all disks that are connected to the node, must be made inaccessible to users before removing a node from the cluster.

If a node was incorrectly removed from a cluster, contact NetApp Support for assistance with options for recovery.

## Steps

1. Change the privilege level to advanced:

```
set -privilege advanced
```

2. Identify the node in the cluster that has epsilon:

```
cluster show
```

In the following example, "node0" currently holds epsilon:

```
cluster::*>
Node                Health  Eligibility  Epsilon
-----
node0                true    true         true
node1                true    true         false
node2                true    true         false
node3                true    true         false
```

3. If the node that you are removing holds epsilon:
  - a. Move epsilon from the node you are removing:

```
cluster modify -node <name_of_node_to_be_removed> -epsilon false
```

- b. Move epsilon to a node that you are not removing:

```
cluster modify -node <node_name> -epsilon true
```

4. Identify the current master node:

```
cluster ring show
```

The master node is the node that holds processes such as `mgmt`, `vldb`, `vifmgr`, `bcomd`, and `crs`.

5. If the node you are removing is the current master node, enable another node in the cluster to be elected as the master node:
  - a. Make the current master node ineligible to participate in the cluster:

```
cluster modify -node <node_name> -eligibility false
```

The node is marked unhealthy until eligibility is restored. When the master node becomes ineligible, one of the remaining nodes is elected by the cluster quorum as the new master.



If you are performing this step on the first node in an HA pair, you should mark only that node as ineligible. Do not modify the status of the HA partner.

If the partner node is selected as the new master, you need to verify if it holds epsilon before making it ineligible. If the partner node holds epsilon, you need to move epsilon to a different node that is remaining in the cluster before making it ineligible. You do this when you repeat these steps to remove the partner node.

- b. Make the previous master node eligible to participate in the cluster again:

```
cluster modify -node <node_name> -eligibility true
```

6. Log into the remote node management LIF or the cluster-management LIF on a node that you are not removing from the cluster.
7. Remove the nodes from the cluster:

| For this ONTAP version... | Use this command...       |
|---------------------------|---------------------------|
| ONTAP 9.3                 | <pre>cluster unjoin</pre> |

| For this ONTAP version... | Use this command...   |
|---------------------------|---|
| ONTAP 9.4 and later       | <p>With node name:</p> <pre>cluster remove-node -node &lt;node_name&gt;</pre> <p>With node IP:</p> <pre>cluster remove-node -cluster_ip &lt;node_ip&gt;</pre> |

If you have a mixed version cluster and you are removing the last lower version node, use the `-skip-last-low-version-node-check` parameter with these commands.

The system informs you of the following:

- You must also remove the node's failover partner from the cluster.
- After the node is removed and before it can rejoin a cluster, you must use boot menu option **(4) Clean configuration and initialize all disks** or option **(9) Configure Advanced Drive Partitioning** to erase the node's configuration and initialize all disks.

A failure message is generated if you have conditions that you must address before removing the node. For example, the message might indicate that the node has shared resources that you must remove or that the node is in a cluster HA configuration or storage failover configuration that you must disable.

If the node is the quorum master, the cluster will briefly lose and then return to quorum. This quorum loss is temporary and does not affect any data operations.

8. If a failure message indicates error conditions, address those conditions and rerun the `cluster remove-node` or `cluster unjoin` command.

The node automatically reboots after it is successfully removed from the cluster.

9. If you are repurposing the node, erase the node configuration and initialize all disks:
  - a. During the boot process, press Ctrl-C to display the boot menu when prompted to do so.
  - b. Select the boot menu option **(4) Clean configuration and initialize all disks**.
10. Return to admin privilege level:

```
set -privilege admin
```

11. Repeat Steps 1 to 9 to remove the failover partner from the cluster.

#### Related information

- [cluster remove-node](#)

# Access ONTAP node logs, core dumps, and MIB files using a web browser

The Service Processor Infrastructure (`spi`) web service is enabled by default to enable a web browser to access the log, core dump, and MIB files of a node in the cluster. The files remain accessible even when the node is down, provided that the node is taken over by its partner.

## Before you begin

- The cluster management LIF must be up.

You can use the management LIF of the cluster or a node to access the `spi` web service. However, using the cluster management LIF is recommended.

The `network interface show` command displays the status of all LIFs in the cluster.

Learn more about `network interface show` in the [ONTAP command reference](#).

- You must use a local user account to access the `spi` web service, domain user accounts are not supported.
- If your user account does not have the `admin` role (which has access to the `spi` web service by default), your access-control role must be granted access to the `spi` web service.

The `vserver services web access show` command shows what roles are granted access to which web services.

- If you are not using the `admin` user account (which includes the `http` access method by default), your user account must be set up with the `http` access method.

The `security login show` command shows user accounts' access and login methods and their access-control roles.

Learn more about `security login show` in the [ONTAP command reference](#).

- If you want to use HTTPS for secure web access, SSL must be enabled and a digital certificate must be installed.

The `system services web show` command displays the configuration of the web protocol engine at the cluster level.

## About this task

The `spi` web service is enabled by default, and the service can be disabled manually (`vserver services web modify -vserver * -name spi -enabled false`).

The `admin` role is granted access to the `spi` web service by default, and the access can be disabled manually (`services web access delete -vserver cluster_name -name spi -role admin`).

## Steps

1. Point the web browser to the `spi` web service URL in one of the following formats:

- `http://cluster-mgmt-LIF/spi/`
- `https://cluster-mgmt-LIF/spi/`

`cluster-mgmt-LIF` is the IP address of the cluster management LIF.

2. When prompted by the browser, enter your user account and password.

After your account is authenticated, the browser displays links to the `/mroot/etc/log/`, `/mroot/etc/crash/`, and `/mroot/etc/mib/` directories of each node in the cluster.

## Access the system console of an ONTAP node

If a node is hanging at the boot menu or the boot environment prompt, you can access it only through the system console (also called the *serial console*). You can access the system console of a node from an SSH connection to the node's SP or to the cluster.

### About this task

Both the SP and ONTAP offer commands that enable you to access the system console. However, from the SP, you can access only the system console of its own node. From the cluster, you can access the system console of any other node in the cluster (other than the local node).

### Steps

1. Access the system console of a node:

| If you are in the... | Enter this command...                |
|----------------------|--------------------------------------|
| SP CLI of the node   | <code>system console</code>          |
| ONTAP CLI            | <code>system node run-console</code> |

2. Log in to the system console when you are prompted to do so.
3. To exit the system console, press Ctrl-D.

### Examples of accessing the system console

The following example shows the result of entering the `system console` command at the "SP node2" prompt. The system console indicates that node2 is hanging at the boot environment prompt. The `boot_ontap` command is entered at the console to boot the node to ONTAP. Ctrl-D is then pressed to exit the console and return to the SP.

```
SP node2> system console
Type Ctrl-D to exit.
```

```
LOADER>
LOADER> boot_ontap
...
*****
*                                     *
* Press Ctrl-C for Boot Menu. *
*                                     *
*****
...
```

(Ctrl-D is pressed to exit the system console.)

```
Connection to 123.12.123.12 closed.
SP node2>
```

The following example shows the result of entering the `system node run-console -node node2` command from ONTAP to access the system console of node2, which is hanging at the boot environment prompt. The `boot_ontap` command is entered at the console to boot node2 to ONTAP. Ctrl-D is then pressed to exit the console and return to ONTAP.

```
cluster1::> system node run-console -node node2
Pressing Ctrl-D will end this session and any further sessions you might
open on top of this session.
Type Ctrl-D to exit.

LOADER>
LOADER> boot_ontap
...
*****
*                                     *
* Press Ctrl-C for Boot Menu. *
*                                     *
*****
...
```

(Ctrl-D is pressed to exit the system console.)

```
Connection to 123.12.123.12 closed.
cluster1::>
```

# Manage ONTAP node root volumes and root aggregates

A node's root volume is a FlexVol volume that is installed at the factory or by setup software. It is reserved for system files, log files, and core files. The directory name is `/mroot`, which is accessible only through the systemshell by technical support. The minimum size for a node's root volume depends on the platform model.

## Rules governing node root volumes and root aggregates overview

A node's root volume contains special directories and files for that node. The root aggregate contains the root volume. A few rules govern a node's root volume and root aggregate.

- The following rules govern the node's root volume:
  - Unless technical support instructs you to do so, do not modify the configuration or content of the root volume.
  - Do not store user data in the root volume.

Storing user data in the root volume increases the storage giveback time between nodes in an HA pair.

- You can move the root volume to another aggregate. See [Relocate root volumes to new aggregates](#).
- The root aggregate is dedicated to the node's root volume only.

ONTAP prevents you from creating other volumes in the root aggregate.

[NetApp Hardware Universe](#)

## Free up space on a node's root volume

A warning message appears when a node's root volume has become full or almost full. The node cannot operate properly when its root volume is full. You can free up space on a node's root volume by deleting core dump files, packet trace files, and root volume snapshots.

### Steps

1. Display the node's core dump files and their names:

```
system node coredump show
```

2. Delete unwanted core dump files from the node:

```
system node coredump delete
```

3. Access the nodeshell:

```
system node run -node nodename
```

*nodename* is the name of the node whose root volume space you want to free up.

4. Switch to the nodeshell advanced privilege level from the nodeshell:

```
priv set advanced
```

5. Display and delete the node's packet trace files through the nodeshell:

a. Display all files in the node's root volume:

```
ls /etc
```

b. If any packet trace files (\*.trc) are in the node's root volume, delete them individually:

```
rm /etc/log/packet_traces/file_name.trc
```

6. Identify and delete the node's root volume snapshots through the nodeshell:

a. Identify the root volume name:

```
vol status
```

The root volume is indicated by the word "root" in the "Options" column of the `vol status` command output.

In the following example, the root volume is `vol0`:

```
node1*> vol status
```

| Volume | State  | Status                  | Options         |
|--------|--------|-------------------------|-----------------|
| vol0   | online | raid_dp, flex<br>64-bit | root, nvfail=on |

b. Display root volume snapshots:

```
snap list root_vol_name
```

c. Delete unwanted root volume snapshots:

```
snap delete root_vol_namesnapshot_name
```

7. Exit the nodeshell and return to the clustershell:

```
exit
```

## Relocate root volumes to new aggregates

The root replacement procedure migrates the current root aggregate to another set of disks without disruption.

### About this task

Storage failover must be enabled to relocate root volumes. You can use the `storage failover modify -node nodename -enable true` command to enable failover.

You can change the location of the root volume to a new aggregate in the following scenarios:

- When the root aggregates are not on the disk you prefer
- When you want to rearrange the disks connected to the node

- When you are performing a shelf replacement of the EOS disk shelves

### Steps

1. Set the privilege level to advanced:

```
set privilege advanced
```

2. Relocate the root aggregate:

```
system node migrate-root -node nodename -disklist disklist -raid-type raid-type
```

- **-node**

Specifies the node that owns the root aggregate that you want to migrate.

- **-disklist**

Specifies the list of disks on which the new root aggregate will be created. All disks must be spares and owned by the same node. The minimum number of disks required is dependent on the RAID type.

- **-raid-type**

Specifies the RAID type of the root aggregate. The default value is `raid-dp`.

3. Monitor the progress of the job:

```
job show -id jobid -instance
```

### Results

If all of the pre-checks are successful, the command starts a root volume replacement job and exits. Expect the node to restart.

### Related information

- [storage failover modify](#)

## Start or stop an ONTAP node for maintenance or troubleshooting

You might need to start or stop a node for maintenance or troubleshooting reasons. You can do so from the ONTAP CLI, the boot environment prompt, or the SP CLI.

Using the SP CLI command `system power off` or `system power cycle` to turn off or power-cycle a node might cause an improper shutdown of the node (also called a *dirty shutdown*) and is not a substitute for a graceful shutdown using the ONTAP `system node halt` command.

### Reboot a node at the system prompt

You can reboot a node in normal mode from the system prompt. A node is configured to boot from the boot device, such as a PC CompactFlash card.

### Steps

1. If the cluster contains four or more nodes, verify that the node to be rebooted does not hold epsilon:

a. Set the privilege level to advanced:

```
set -privilege advanced
```

b. Determine which node holds epsilon:

```
cluster show
```

The following example shows that “node1” holds epsilon:

```
cluster1::*> cluster show
Node                Health  Eligibility  Epsilon
-----
node1                true    true         true
node2                true    true         false
node3                true    true         false
node4                true    true         false
4 entries were displayed.
```

c. If the node to be rebooted holds epsilon, then remove epsilon from the node:

```
cluster modify -node node_name -epsilon false
```

d. Assign epsilon to a different node that will remain up:

```
cluster modify -node node_name -epsilon true
```

e. Return to the admin privilege level:

```
set -privilege admin
```

2. Use the `system node reboot` command to reboot the node.

If you do not specify the `-skip-lif-migration` parameter, the command attempts to migrate data and cluster management LIFs synchronously to another node prior to the reboot. If the LIF migration fails or times out, the rebooting process is aborted, and ONTAP displays an error to indicate the LIF migration failure.

```
cluster1::> system node reboot -node node1 -reason "software upgrade"
```

The node begins the reboot process. The ONTAP login prompt appears, indicating that the reboot process is complete.

## Boot ONTAP at the boot environment prompt

You can boot the current release or the backup release of ONTAP when you are at the boot environment prompt of a node.

## Steps

1. Access the boot environment prompt from the storage system prompt by using the `system node halt` command.

The storage system console displays the boot environment prompt.

2. At the boot environment prompt, enter one of the following commands:

| To boot...                                   | Enter...                  |
|--|---------------------------|
| The current release of ONTAP                 | <code>boot_ontap</code>   |
| The ONTAP primary image from the boot device | <code>boot_primary</code> |
| The ONTAP backup image from the boot device  | <code>boot_backup</code>  |

If you are unsure about which image to use, you should use `boot_ontap` in the first instance.

## Shut down a node

You can shut down a node if it becomes unresponsive or if support personnel direct you to do so as part of troubleshooting efforts.

### Steps

1. If the cluster contains four or more nodes, verify that the node to be shut down does not hold epsilon:
  - a. Set the privilege level to advanced:

```
set -privilege advanced
```

- b. Determine which node holds epsilon:

```
cluster show
```

The following example shows that “node1” holds epsilon:

```
cluster1::*> cluster show
Node           Health  Eligibility  Epsilon
-----
node1          true    true         true
node2          true    true         false
node3          true    true         false
node4          true    true         false
4 entries were displayed.
```

- c. If the node to be shut down holds epsilon, then remove epsilon from the node:

```
cluster modify -node node_name -epsilon false
```

d. Assign epsilon to a different node that will remain up:

```
cluster modify -node node_name -epsilon true
```

e. Return to the admin privilege level:

```
set -privilege admin
```

2. Use the `system node halt` command to shut down the node.

If you do not specify the `-skip-lif-migration` parameter, the command attempts to migrate data and cluster management LIFs synchronously to another node prior to the shutdown. If the LIF migration fails or times out, the shutdown process is aborted, and ONTAP displays an error to indicate the LIF migration failure.

You can manually trigger a core dump with the shutdown by using both the `-dump` parameter.

The following example shuts down the node named “node1” for hardware maintenance:

```
cluster1::> system node halt -node node1 -reason 'hardware maintenance'
```

## Manage an ONTAP node using the boot menu

You can use the boot menu to correct configuration problems on a node, reset the admin password, initialize disks, reset the node configuration, and restore the node configuration information back to the boot device.



If an HA pair is using [encrypting SAS or NVMe drives \(SED, NSE, FIPS\)](#), you must follow the instructions in the topic [Returning a FIPS drive or SED to unprotected mode](#) for all drives within the HA pair prior to initializing the system (boot options 4 or 9). Failure to do this may result in future data loss if the drives are repurposed.

### Steps

1. Reboot the node to access the boot menu by using the `system node reboot` command at the system prompt.

The node begins the reboot process.

2. During the reboot process, press Ctrl-C to display the boot menu when prompted to do so.

The node displays the following options for the boot menu:

- (1) Normal Boot.
  - (2) Boot without /etc/rc.
  - (3) Change password.
  - (4) Clean configuration and initialize all disks.
  - (5) Maintenance mode boot.
  - (6) Update flash from backup config.
  - (7) Install new software first.
  - (8) Reboot node.
  - (9) Configure Advanced Drive Partitioning.
  - (10) Set onboard key management recovery secrets.
  - (11) Configure node for external key management.
- Selection (1-11)?



Boot menu option (2) Boot without /etc/rc is obsolete and takes no effect on the system.

3. Select one of the following options by entering the corresponding number:

| To...   | Select...  |
|---|--|
| Continue to boot the node in normal mode  | 1) Normal Boot   |
| Change the password of the node, which is also the “admin” account password                           | 3) Change Password   |
| Initialize the node’s disks and create a root volume for the node                                     | <p>4) Clean configuration and initialize all disks</p> <div style="border-left: 1px solid #ccc; padding-left: 10px; margin-top: 10px;">  This menu option erases all data on the disks of the node and resets your node configuration to the factory default settings. </div> <p>Only select this menu item after the node has been removed from a cluster and is not joined to another cluster.</p> <p>For a node with internal or external disk shelves, the root volume on the internal disks is initialized. If there are no internal disk shelves, then the root volume on the external disks is initialized.</p> <p>If the node you want to initialize has disks that are partitioned for root-data partitioning, the disks must be unpartitioned before the node can be initialized, see <b>9) Configure Advanced Drive Partitioning</b> and <a href="#">Disks and aggregates management</a>.</p> |
| Perform aggregate and disk maintenance operations and obtain detailed aggregate and disk information. | <p>5) Maintenance mode boot</p> <p>You exit Maintenance mode by using the <code>halt</code> command.</p>   |

| To...   | Select...  |
|---|--|
| Restore the configuration information from the node's root volume to the boot device, such as a PC CompactFlash card                              | <p>6) Update flash from backup config</p> <p>ONTAP stores some node configuration information on the boot device. When the node reboots, the information on the boot device is automatically backed up onto the node's root volume. If the boot device becomes corrupted or needs to be replaced, you must use this menu option to restore the configuration information from the node's root volume back to the boot device.</p>  |
| Install new software on the node  | <p>7) Install new software first</p> <p>If the ONTAP software on the boot device does not include support for the storage array that you want to use for the root volume, you can use this menu option to obtain a version of the software that supports your storage array and install it on the node.</p> <p>This menu option is only for installing a newer version of ONTAP software on a node that has no root volume installed. Do <i>not</i> use this menu option to upgrade ONTAP.</p>   |
| Reboot the node   | 8) Reboot node   |
| Unpartition all disks and remove their ownership information or clean the configuration and initialize the system with whole or partitioned disks | <p>9) Configure Advanced Drive Partitioning</p> <p>The Advanced Drive Partitioning option provides additional management features for disks that are configured for root-data or root-data-data partitioning. The following options are available from Boot Option 9:</p> <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <p>(9a) Unpartition all disks and remove their ownership information.</p> <p>(9b) Clean configuration and initialize system with partitioned disks.</p> <p>(9c) Clean configuration and initialize system with whole disks.</p> <p>(9d) Reboot the node.</p> <p>(9e) Return to main boot menu.</p> </div> |

## View the attributes of the nodes in an ONTAP cluster

You can view the attributes of one or more nodes in the cluster, for example, the name, owner, location, model number, serial number, how long the node has been running, health state, and eligibility to participate in a cluster.

### Steps

1. To display the attributes of a specified node or about all nodes in a cluster, use the `system node show` command.

### Example of displaying information about a node

The following example displays detailed information about node1:

```
cluster1::> system node show -node node1
      Node: node1
      Owner: Eng IT
      Location: Lab 5
      Model: model_number
      Serial Number: 12345678
      Asset Tag: -
      Uptime: 23 days 04:42
      NVRAM System ID: 118051205
      System ID: 0118051205
      Vendor: NetApp
      Health: true
      Eligibility: true
      Differentiated Services: false
      All-Flash Optimized: true
      Capacity Optimized: false
      QLC Optimized: false
      All-Flash Select Optimized: false
      SAS2/SAS3 Mixed Stack Support: none
```

## Modify the attributes of an ONTAP node

You can modify the attributes of a node as required. The attributes that you can modify include the node's owner information, location information, asset tag, and eligibility to participate in the cluster.

### About this task

A node's eligibility to participate in the cluster can be modified at the advanced privilege level by using the `-eligibility` parameter of the `system node modify` or `cluster modify` command. If you set a node's eligibility to `false`, the node becomes inactive in the cluster.



You cannot modify node eligibility locally. It must be modified from a different node. Node eligibility also cannot be modified with a cluster HA configuration.



You should avoid setting a node's eligibility to `false`, except for situations such as restoring the node configuration or prolonged node maintenance. SAN and NAS data access to the node might be impacted when the node is ineligible.

### Steps

1. Use the `system node modify` command to modify a node's attributes.

### Example of modifying node attributes

The following command modifies the attributes of the “node1” node. The node’s owner is set to “Joe Smith” and its asset tag is set to “js1234”:

```
cluster1::> system node modify -node node1 -owner "Joe Smith" -assettag js1234
```

### Related information

- [system node modify](#)
- [cluster modify](#)

## Rename an ONTAP node

You can change a node’s name as required.

### Steps

1. To rename a node, use the `system node rename` command.

The `-newname` parameter specifies the new name for the node. Learn more about `system node rename` in the [ONTAP command reference](#).

If you want to rename multiple nodes in the cluster, you must run the command for each node individually.



Node name cannot be “all” because “all” is a system reserved name.

### Example of renaming a node

The following command renames node “node1” to “node1a”:

```
cluster1::> system node rename -node node1 -newname node1a
```

## Manage a single-node ONTAP cluster

A single-node cluster is a special implementation of a cluster running on a standalone node. Single-node clusters are not recommended because they do not provide redundancy. If the node goes down, data access is lost.



For fault tolerance and nondisruptive operations, it is highly recommended that you configure your cluster with [high-availability \(HA pairs\)](#).

If you choose to configure or upgrade a single-node cluster, you should be aware of the following:

- Root volume encryption is not supported on single-node clusters.
- If you remove nodes to have a single-node cluster, you should modify the cluster ports to serve data traffic by modifying the cluster ports to be data ports, and then creating data LIFs on the data ports.

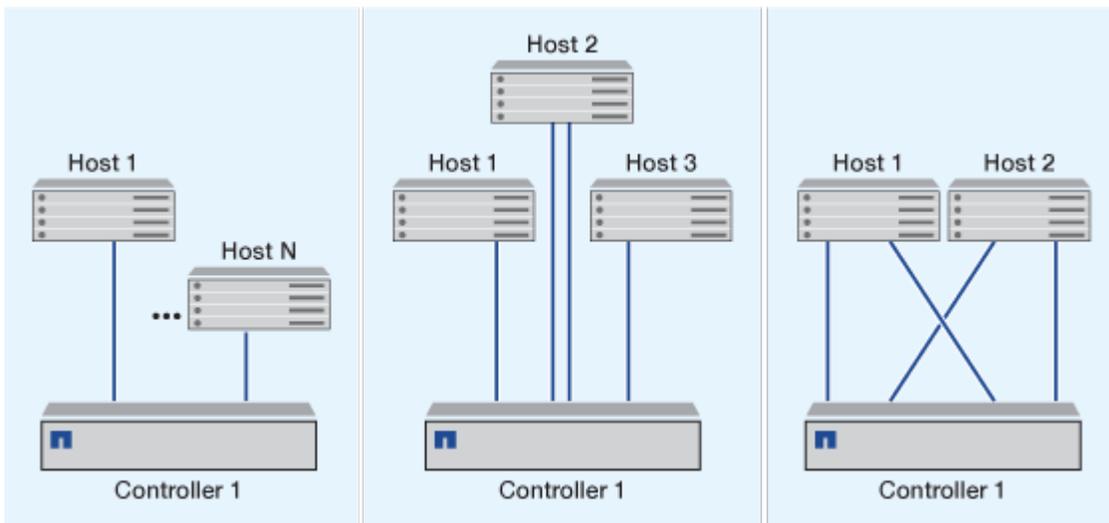
- For single-node clusters, you can specify the configuration backup destination during software setup. After setup, those settings can be modified using ONTAP commands.
- If there are multiple hosts connecting to the node, each host can be configured with a different operating system such as Windows or Linux. If there are multiple paths from the host to the controller, then ALUA must be enabled on the host.

## Ways to configure iSCSI SAN hosts with single nodes

You can configure iSCSI SAN hosts to connect directly to a single node or to connect through one or more IP switches. The node can have multiple iSCSI connections to the switch.

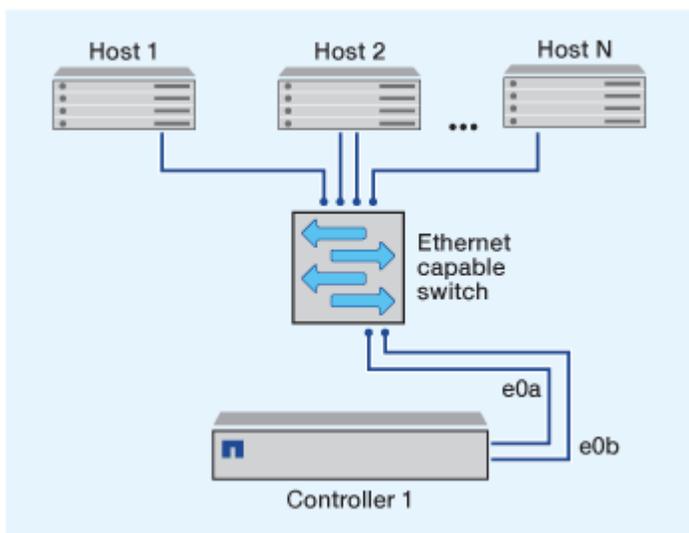
### Direct-attached single-node configurations

In direct-attached single-node configurations, one or more hosts are directly connected to the node.



### Single-network single-node configurations

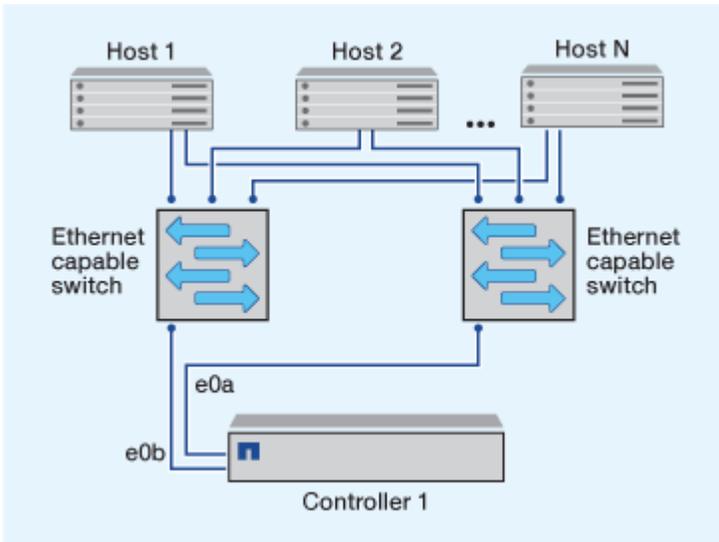
In single-network single-node configurations, one switch connects a single node to one or more hosts. Because there is a single switch, this configuration is not fully redundant.



### Multi-network single-node configurations

In multi-network single-node configurations, two or more switches connect a single node to one or more hosts.

Because there are multiple switches, this configuration is fully redundant.



## Ways to configure FC and FC-NVMe SAN hosts with single nodes

You can configure FC and FC-NVMe SAN hosts with single nodes through one or more fabrics. N-Port ID Virtualization (NPIV) is required and must be enabled on all FC switches in the fabric. You cannot directly attach FC or FC-NVMe SAN hosts to single nodes without using an FC switch.

### Single-fabric single-node configurations

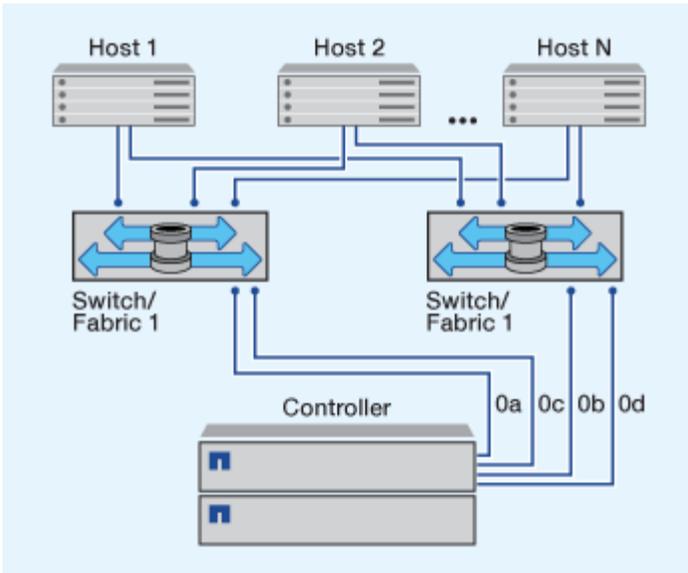
In single-fabric single-node configurations, there is one switch connecting a single node to one or more hosts. Because there is a single switch, this configuration is not fully redundant.

In single-fabric single-node configurations, multipathing software is not required if you only have a single path from the host to the node.

### Multifabric single-node configurations

In multifabric single-node configurations, there are two or more switches connecting a single node to one or more hosts. For simplicity, the following figure shows a multifabric single-node configuration with only two fabrics, but you can have two or more fabrics in any multifabric configuration. In this figure, the storage controller is mounted in the top chassis and the bottom chassis can be empty or can have an IOMX module, as it does in this example.

The FC target ports (0a, 0c, 0b, 0d) in the illustrations are examples. The actual port numbers vary depending on the model of your storage node and whether you are using expansion adapters.



### Related information

[NetApp Technical Report 4684: Implementing and Configuring Modern SANs with NVMe-oF](#)

## ONTAP upgrade for single-node cluster

You can use the ONTAP CLI to perform an automated update of a single-node cluster. Single-node clusters lack redundancy, this means that updates are always disruptive. You can't perform disruptive upgrades using System Manager.

### Before you begin

You must complete upgrade [preparation](#) steps.

### 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.

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