



## **Add a new controller module to each cluster**

ONTAP MetroCluster

NetApp  
February 06, 2026

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# Add a new controller module to each cluster

## Adding a new controller module to each cluster

You must add a new controller module to each site, creating an HA pair in each site. This is a multistep process involving both hardware and software changes that must be performed in the proper order at each site.

### About this task

- The new controller module must be received from NetApp as part of the upgrade kit.

You should verify that PCIe cards in the new controller module are compatible and supported by the new controller module.

### [NetApp Hardware Universe](#)

- Your system must have an empty slot available for the new controller module when upgrading to a single-chassis HA pair (an HA pair in which both controller modules reside in the same chassis).



This configuration is not supported on all systems. Platforms with single chassis configurations that are supported in ONTAP 9 are AFF A300, FAS8200, FAS8300, AFF A400, AFF80xx, FAS8020, FAS8060, FAS8080, and FAS9000.

- You must have rack space and cables for the new controller module when upgrading to a dual-chassis HA pair (an HA pair in which the controller modules reside in separate chassis).

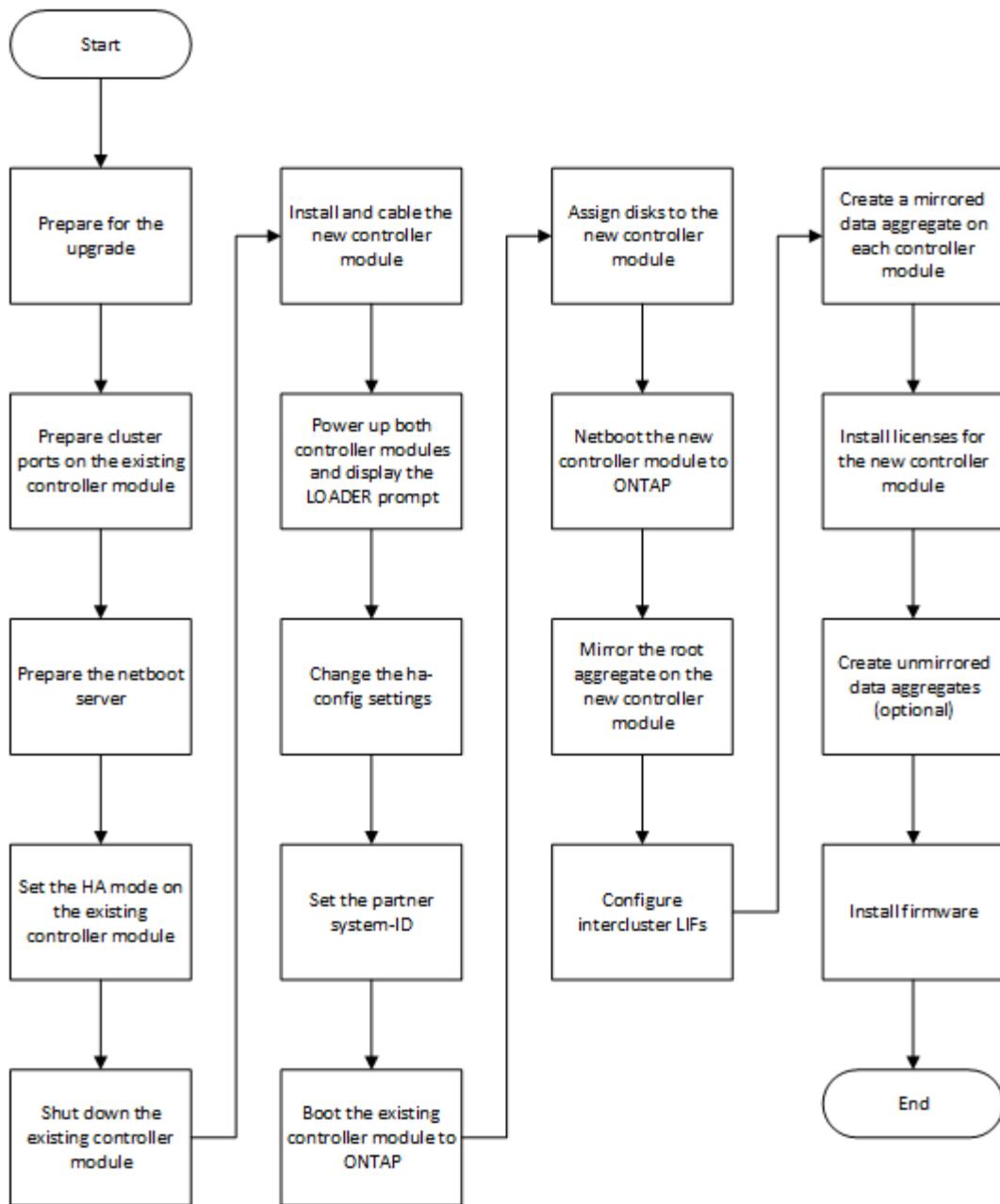


This configuration is not supported on all systems.

- You must connect each controller module to the management network through its e0a port or, if your system has one, you can connect to the e0M port as the management port.
- These tasks must be repeated at each site.
- The preexisting controller modules are referred to as the *existing* controller modules.

The examples in this procedure have the console prompt `existing_ctrlr>`.

- The controller modules that are being added are referred to as the *new* controller modules; the examples in this procedure have the console prompt `new_ctrlr>`.
- This task uses the following workflow:



## Preparing for the upgrade

Before upgrading to an HA pair, you must verify that your system meets all requirements and that you have all of the necessary information.

### Steps

1. Identify unassigned disks or spare disks that you can assign to the new controller module using the following commands:

```

° storage disk show -container-type spare
° storage disk show -container-type unassigned

```

2. Complete the following substeps:

- a. Determine where the aggregates for the existing node are located:

```
storage aggregate show
```

- b. If disk ownership automatic assignment is on, turn it off:

```
storage disk option modify -node node_name -autoassign off
```

- c. Remove ownership on disks that do not have aggregates on them:

```
storage disk removeowner disk_name
```

- d. Repeat the previous step for as many disks as you need for the new node.

3. Verify that you have cables ready for the following connections:

- Cluster connections

If you are creating a two-node switchless cluster, you require two cables to connect the controller modules. Otherwise, you require a minimum of four cables, two for each controller module connection to the cluster-network switch. Other systems (like the 80xx series) have defaults of either four or six cluster connections.

- HA interconnect connections, if the system is in a dual-chassis HA pair

4. Verify that you have a serial port console available for the controller modules.

5. Verify that your environment meets the site and system requirements.

#### [NetApp Hardware Universe](#)

6. Gather all of the IP addresses and other network parameters for the new controller module.

## Clearing the configuration on a controller module

Before using a new controller module in the MetroCluster configuration, you must clear the existing configuration.

### Steps

1. If necessary, halt the node to display the LOADER prompt:

```
halt
```

2. At the LOADER prompt, set the environmental variables to default values:

```
set-defaults
```

3. Save the environment:

```
saveenv
```

4. At the LOADER prompt, launch the boot menu:

```
boot_ontap menu
```

5. At the boot menu prompt, clear the configuration:

```
wipeconfig
```

Respond yes to the confirmation prompt.

The node reboots and the boot menu is displayed again.

6. At the boot menu, select option **5** to boot the system into Maintenance mode.

Respond yes to the confirmation prompt.

## Preparing cluster ports on an existing controller module

Before installing a new controller module, you must configure cluster ports on the existing controller module so that the cluster ports can provide cluster communication with the new controller module.

### About this task

If you are creating a two-node switchless cluster (with no cluster network switches), you must enable the switchless cluster networking mode.

For detailed information about port, LIF, and network configuration in ONTAP, see [Network Management](#).

### Steps

1. Determine which ports should be used as the node's cluster ports.

For a list of the default port roles for your platform, see the [Hardware Universe](#)

The *Installation and Setup Instructions* for your platform on the NetApp Support Site contains information about the ports for cluster network connections.

2. For each cluster port, identify the port roles:

```
network port show
```

In the following example, ports “e0a”, “e0b”, “e0c”, and “e0d” must be changed to cluster ports:

```

cluster_A::> network port show

Node: controller_A_1
Speed(Mbps) Health
Port      IPspace      Broadcast Domain Link   MTU      Admin/Oper  Status
-----  -----  -----  -----  -----  -----  -----
-----  -----
e0M      Default      mgmt_bd_1500      up      1500  auto/1000  healthy
e0a      Default      Default          up      1500  auto/10000 healthy
e0b      Default      Default          up      1500  auto/10000 healthy
e0c      Default      Default          up      1500  auto/10000 healthy
e0d      Default      Default          up      1500  auto/10000 healthy
e0i      Default      Default          down    1500  auto/10      -
e0j      Default      Default          down    1500  auto/10      -
e0k      Default      Default          down    1500  auto/10      -
e0l      Default      Default          down    1500  auto/10      -
e2a      Default      Default          up      1500  auto/10000 healthy
e2b      Default      Default          up      1500  auto/10000 healthy
e4a      Default      Default          up      1500  auto/10000 healthy
e4b      Default      Default          up      1500  auto/10000 healthy
13 entries were displayed.

```

3. For any data LIF that is using a cluster port as the home-port or current-port, modify the LIF to use a data port as its home-port:

```
network interface modify
```

The following example changes the home port of a data LIF to a data port:

```

cluster1::> network interface modify -lif datalif1 -vserver vs1 -home
           -port e1b

```

4. For each LIF that you modified, revert the LIF to its new home port:

```
network interface revert
```

The following example reverts the LIF “datalif1” to its new home port “e1b”:

```

cluster1::> network interface revert -lif datalif1 -vserver vs1

```

5. Remove any VLAN ports using cluster ports as member ports and ifgrps using cluster ports as member ports.

- a. Delete VLAN ports:

```
network port vlan delete -node node-name -vlan-name portid-vlandid
```

For example:

```
network port vlan delete -node node1 -vlan-name e1c-80
```

b. Remove physical ports from the interface groups:

```
network port ifgrp remove-port -node node-name -ifgrp interface-group-name -port portid
```

For example:

```
network port ifgrp remove-port -node node1 -ifgrp a1a -port e0d
```

c. Remove VLAN and interface group ports from broadcast domain::

```
network port broadcast-domain remove-ports -ipspace ipspace -broadcast -domain broadcast-domain-name -ports nodename:portname,nodename:portname,..
```

d. Modify interface group ports to use other physical ports as member as needed.:

```
ifgrp add-port -node node-name -ifgrp interface-group-name -port port-id
```

6. Verify that the port roles have changed:

```
network port show
```

The following example shows that ports “e0a”, “e0b”, “e0c”, and “e0d” are now cluster ports:

Node: controller_A_1							
Speed (Mbps)		Health					
Port	IPspace	Broadcast Domain	Link	MTU	Admin/Oper	Status	
-----	-----	-----	---	----	-----	-----	-----
e0M	Default	mgmt_bd_1500	up	1500	auto/1000	healthy	
e0a	Cluster	Cluster	up	9000	auto/10000	healthy	
e0b	Cluster	Cluster	up	9000	auto/10000	healthy	
e0c	Cluster	Cluster	up	9000	auto/10000	healthy	
e0d	Cluster	Cluster	up	9000	auto/10000	healthy	
e0i	Default	Default	down	1500	auto/10	-	
e0j	Default	Default	down	1500	auto/10	-	
e0k	Default	Default	down	1500	auto/10	-	
e0l	Default	Default	down	1500	auto/10	-	
e2a	Default	Default	up	1500	auto/10000	healthy	
e2b	Default	Default	up	1500	auto/10000	healthy	
e4a	Default	Default	up	1500	auto/10000	healthy	
e4b	Default	Default	up	1500	auto/10000	healthy	

13 entries were displayed.

7. Add the ports to the cluster broadcast domain:

```
broadcast-domain add-ports -ipspace Cluster -broadcast-domain Cluster -ports
port-id, port-id, port-id...
```

For example:

```
broadcast-domain add-ports -ipspace Cluster -broadcast-domain Cluster
-ports cluster1-01:e0a
```

8. If your system is part of a switched cluster, create cluster LIFs on the cluster ports: `network interface create`

The following example creates a cluster LIF on one of the node's cluster ports. The `-auto` parameter configures the LIF to use a link-local IP address.

```
cluster1::> network interface create -vserver Cluster -lif clus1 -role
cluster -home-node node0 -home-port ela -auto true
```

9. If you are creating a two-node switchless cluster, enable the switchless cluster networking mode:

- Change to the advanced privilege level from either node:

```
set -privilege advanced
```

You can respond `y` when prompted whether you want to continue into advanced mode. The advanced mode prompt appears (`*>`).

- Enable the switchless cluster networking mode:

```
network options switchless-cluster modify -enabled true
```

- Return to the admin privilege level:

```
set -privilege admin
```



Cluster interface creation for the existing node in a two-node switchless cluster system is completed after cluster setup is completed through a netboot on the new controller module.

## Preparing the netboot server to download the image

When you are ready to prepare the netboot server, you must download the correct ONTAP netboot image from the NetApp Support Site to the netboot server and note the IP address.

### About this task

- You must be able to access an HTTP server from the system before and after adding the new controller module.

- You must have access to the NetApp Support Site to download the necessary system files for your platform and your version of ONTAP.

### [NetApp Support Site](#)

- Both controller modules in the HA pair must run the same version of ONTAP.

### Steps

1. Download the appropriate ONTAP software from the software download section of the NetApp Support Site and store the <ontap\_version>\_image.tgz file on a web-accessible directory.

The <ontap\_version>\_image.tgz file is used for performing a netboot of your system.

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

For...	Then...
FAS2200, FAS2500, FAS3200, FAS6200, FAS/AFF8000 series systems	<p>Extract the contents of the &lt;ontap_version&gt;_image.tgz file to the target directory:</p> <pre>tar -zxvf &lt;ontap_version&gt;_image.tgz</pre> <p> If you are extracting the contents on Windows, use 7-Zip or WinRAR to extract the netboot image.</p> <p>Your directory listing should contain a netboot folder with a kernel file:</p> <pre>netboot/kernel</pre>
All other systems	<p>Your directory listing should contain the following file:</p> <pre>&lt;ontap_version&gt;_image.tgz</pre> <p> There is no need to extract the file contents.</p>

3. Determine the IP address of the existing controller module.

This address is referred to later in this procedure as *ip-address-of-existing controller*.

4. Ping *ip-address-of-existing controller* to verify that the IP address is reachable.

## Setting the HA mode on the existing controller module

You must use the storage failover modify command to set the mode on the existing controller module. The mode value is enabled later, after you reboot the controller

module.

### Steps

1. Set the mode to HA:

```
storage failover modify -mode ha -node existing_node_name
```

## Shutting down the existing controller module

You must perform a clean shutdown of the existing controller module to verify that all of the data has been written to disk. You must also disconnect the power supplies.

### About this task



You must perform a clean system shutdown before replacing the system components to avoid losing unwritten data in the NVRAM or NVMMEM.

### Steps

1. Halt the node from the existing controller module prompt:

```
halt local -inhibit-takeover true
```

If you are prompted to continue the halt procedure, enter *y* when prompted, and then wait until the system stops at the LOADER prompt.

In an 80xx system, the NVRAM LED is located on the controller module to the right of the network ports, marked with a battery symbol.

This LED blinks if there is unwritten data in the NVRAM. If this LED is flashing amber after you enter the halt command, you need to reboot your system and try halting it again.

2. If you are not already grounded, properly ground yourself.
3. Turn off the power supplies and disconnect the power, using the correct method for your system and power-supply type:

If your system uses...	Then...
AC power supplies	Unplug the power cords from the power source, and then remove the power cords.
DC power supplies	Remove the power at the DC source, and then remove the DC wires, if necessary.

## Install and cable the new controller module

### Installing and cabling the new controller module

You must physically install the new controller module in the chassis, and then cable it.

## Steps

1. If you have an I/O expansion module (IOXM) in your system and are creating a single-chassis HA pair, you must unplug and remove the IOXM.

You can then use the empty bay for the new controller module. However, the new configuration will not have the extra I/O provided by the IOXM.

2. Physically install the new controller module and, if necessary, install additional fans:

If you are adding a controller module...	Then perform these steps...
To an empty bay to create a single-chassis HA pair and the system belongs to one of the following platforms:  • FAS8200 • 80xx	<ol style="list-style-type: none"><li>Remove the blank plate in the rear of the chassis that covers the empty bay that will contain the new controller module.</li><li>Gently push the controller module halfway into the chassis.</li></ol> <p>To prevent the controller module from automatically booting, do not fully seat it in the chassis until later in this procedure.</p>
In a separate chassis from its HA partner to create a dual-chassis HA pair when the existing configuration is in a controller-IOX module configuration.	Install the new system in the rack or system cabinet.

3. Cable the cluster network connections, as necessary:

- Identify the ports on the controller module for the cluster connections.

[AFF A320 systems: Installation and setup](#)

[AFF A220/FAS2700 Systems Installation and Setup Instructions](#)

[AFF A800 Systems Installation and Setup Instructions](#)

[AFF A300 Systems Installation and Setup Instructions](#)

[FAS8200 Systems Installation and Setup Instructions](#)

- If you are configuring a switched cluster, identify the ports that you will use on the cluster network switches.

See the [Clustered Data ONTAP Switch Setup Guide for Cisco Switches](#), [^NetApp 10G Cluster-Mode Switch Installation Guide](#) or [NetApp 1G Cluster-Mode Switch Installation Guide](#), depending on what switches you are using.

- Connect cables to the cluster ports:

If the cluster is...	Then...
A two-node switchless cluster	Directly connect the cluster ports on the existing controller module to the corresponding cluster ports on the new controller module.
A switched cluster	Connect the cluster ports on each controller to the ports on the cluster network switches identified in Substep b.

## Cabling the new controller module's FC-VI and HBA ports to the FC switches

The new controller module's FC-VI ports and HBAs (host bus adapters) must be cabled to the site FC switches.

### Steps

1. Cable the FC-VI ports and HBA ports, using the table for your configuration and switch model.
  - [Port assignments for FC switches](#)
  - [Port assignments for systems using two initiator ports](#)

## Cabling the new controller module's cluster peering connections

You must cable the new controller module to the cluster peering network so that it has connectivity with the cluster on the partner site.

### About this task

At least two ports on each controller module should be used for cluster peering.

The recommended minimum bandwidth for the ports and network connectivity is 1 GbE.

### Steps

1. Identify and cable at least two ports for cluster peering and verify they have network connectivity with the partner cluster.

## Powering up both controller modules and displaying the LOADER prompt

You power up the existing controller module and the new controller module to display the LOADER prompt.

### Steps

Power up the controller modules and interrupt the boot process, using the steps for your configuration:

If the controller modules are...	Then...

In the same chassis	<ol style="list-style-type: none"> <li>Verify that the new controller module is <b>not</b> fully inserted into the bay. The existing controller module should be fully inserted into the bay because it was never removed from the chassis, but the new controller module should not be.</li> <li>Connect the power and turn on the power supplies so that the existing controller module receives power.</li> <li>Interrupt the boot process on the existing controller module by pressing Ctrl-C.</li> <li>Push the new controller module firmly into the bay. When fully seated, the new controller module receives power and automatically boots.</li> <li>Interrupt the boot process by pressing Ctrl-C.</li> <li>Tighten the thumbscrew on the cam handle, if present.</li> <li>Install the cable management device, if present.</li> <li>Bind the cables to the cable management device with the hook and loop strap.</li> </ol>
In separate chassis	<ol style="list-style-type: none"> <li>Turn on the power supplies on the existing controller module.</li> <li>Interrupt the boot process by pressing Ctrl-C.</li> <li>Repeat these steps for the new controller module</li> </ol>

Each controller module should display the LOADER prompt (LOADER>, LOADER-A>, or LOADER-B>).



If there is no LOADER prompt, record the error message. If the system displays the boot menu, reboot and attempt to interrupt the boot process again.

## Changing the ha-config setting on the existing and new controller modules

When you expand a MetroCluster configuration, you must update the ha-config setting of the existing controller module and the new controller module. You must also determine the system ID of the new controller module.

### About this task

This task is performed in Maintenance mode on both the existing and new controller modules.

### Steps

- Change the ha-config setting of the existing controller module:
  - Display the ha-config setting of the existing controller module and chassis:

```
ha-config show
```

The ha-config setting is “mcc-2n” for all components because the controller module was in a two-node MetroCluster configuration.

- b. Change the ha-config setting of the existing controller module to “mcc”:

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

- c. Change the ha-config setting of the existing chassis to “mcc”:

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

- d. Retrieve the system ID for the existing controller module:

```
sysconfig
```

Note the system ID. You need it when you set the partner ID on the new controller module.

- e. Exit Maintenance mode to return to the LOADER prompt:

```
halt
```

2. Change the ha-config setting and retrieve the system ID of the new controller module:

- a. If the new controller module is not already in Maintenance mode, boot it to Maintenance mode:

```
boot_ontap maint
```

- b. Change the ha-config setting of the new controller module to “mcc”:

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

- c. Change the ha-config setting of the new chassis to mcc:

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

- d. Retrieve the system ID for the new controller module:

```
sysconfig
```

Note the system ID. You need it when you set the partner ID and assign disks to the new controller module.

- e. Exit Maintenance mode to return to the LOADER prompt:

```
halt
```

## Setting the partner system ID for both controller modules

You must set the partner system ID on both controller modules so that they can form an HA pair.

### About this task

This task is performed with both controller modules at the LOADER prompt.

### Steps

1. On the existing controller module, set the partner system ID to that of the new controller module:

```
setenv partner-sysid sysID_of_new_controller
```

2. On the new controller module, set the partner system ID to that of the existing controller module:

```
setenv partner-sysid sysID_of_existing_controller
```

## Booting the existing controller module

You must boot the existing controller module to ONTAP.

### Steps

1. At the LOADER prompt, boot the existing controller module to ONTAP:

```
boot_ontap
```

## Assigning disks to the new controller module

Before you complete the configuration of the new controller module through netboot, you must assign disks to it.

### About this task

You must have made sure that there are enough spares, unassigned disks, or assigned disks that are not part of an existing aggregate.

### [Preparing for the upgrade](#)

These steps are performed on the existing controller module.

### Steps

1. Assign the root disk to the new controller module:

```
storage disk assign -disk disk_name -sysid new_controller_sysID -force true
```

If your platform model uses the Advanced Drive Partitioning (ADP) feature, you must include the -root true parameter:

```
storage disk assign -disk disk_name -root true -sysid new_controller_sysID -force true
```

2. Assign the remaining required disks to the new controller module by entering the following command for each disk:

```
storage disk assign -disk disk_name -sysid new_controller_sysID -force true
```

3. Verify that the disk assignments are correct:

```
storage disk show -partitionownership*
```



Ensure that you have assigned all disks that you intend to assign to the new node.

## Netbooting and setting up ONTAP on the new controller module

You must perform a specific sequence of steps to netboot and install the ONTAP operating system on the new controller module when adding controller modules to an existing MetroCluster configuration.

### About this task

- This task starts at the LOADER prompt of the new controller module.
- This task includes initializing disks.

The amount of time you need to initialize the disks depends on the size of the disks.

- The system automatically assigns two disks to the new controller module.

### [Disk and aggregate management](#)

### Steps

1. At the LOADER prompt, configure the IP address of the new controller module based on DHCP availability:

If DHCP is...	Then enter the following command...
Available	<code>ifconfig e0M -auto</code>
Not available	<code>ifconfig e0M -addr=filer_addr -mask=netmask -gw=gateway -dns=dns_addr -domain=dns_domain</code>  <i>filer_addr</i> is the IP address of the storage system.  <i>netmask</i> is the network mask of the storage system.  <i>gateway</i> is the gateway for the storage system.  <i>dns_addr</i> is the IP address of a name server on your network.  <i>dns_domain</i> is the Domain Name System (DNS) domain name. If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL; you need only the server's host name.  Other parameters might be necessary for your interface. For details, use the <code>help ifconfig</code> command at the LOADER prompt.

2. At the LOADER prompt, netboot the new node:

For...	Issue this command...
FAS2200, FAS2500, FAS3200, FAS6200, FAS/AFF8000 series systems	netboot http:// <i>web_server_ip</i> /path_to_web-accessible_directory/netboot/kernel
All other systems	netboot \http:// <i>web_server_ip</i> /path_to_web-accessible_directory/<ontap_version>_image.tgz

The *path\_to\_the\_web-accessible\_directory* is the location of the downloaded <ontap\_version>\_image.tgz file.

3. Select the **Install new software first** option from the displayed menu.

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

- You should enter “y” when prompted with the message that this procedure is not supported for nondisruptive upgrade on an HA pair.
- You should enter “y” when warned that this process replaces the existing ONTAP software with new software.
- You should enter the path as follows when prompted for the URL of the image.tgz file:

*http://path\_to\_the\_web-accessible\_directory/image.tgz*

4. Enter “y” when prompted regarding nondisruptive upgrade or replacement of the software.

5. Enter the path to the image.tgz file when prompted for the URL of the package.

What is the URL for the package? `http://path\_to\_web-accessible\_directory/image.tgz`

6. Enter “n” to skip the backup recovery when prompted to restore the backup configuration.

```
*****  
*           Restore Backup Configuration      *  
*   This procedure only applies to storage controllers that      *  
*   are configured as an HA pair.                  *  
*  
*   Choose Yes to restore the "varfs" backup configuration      *  
*   from the SSH server. Refer to the Boot Device Replacement  *  
*   guide for more details.                      *  
*   Choose No to skip the backup recovery and return to the  *  
*   boot menu.                                *  
*****
```

Do you want to restore the backup configuration  
now? {y|n} `n`

7. Enter "y" when prompted to reboot now.

The node must be rebooted to start using the newly installed software.  
Do you want to  
reboot now? {y|n} `y`

8. If necessary, select the option to **Clean configuration and initialize all disks** after the node has booted.

Because you are configuring a new controller module and the new controller module's disks are empty, you can respond "y" when the system warns you that this will erase all disks.



The amount of time needed to initialize disks depends on the size of your disks and configuration.

9. After the disks are initialized and the Cluster Setup wizard starts, set up the node:

Enter the node management LIF information on the console.

10. Log in to the node, and enter the `cluster setup` and then enter "join" when prompted to join the cluster.

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

11. Respond to the remaining prompts as appropriate for your site.

The [Setup ONTAP](#) for your version of ONTAP contains additional details.

12. If the system is in a two-node switchless cluster configuration, create the cluster interfaces on the existing node using the network interface create command to create cluster LIFs on the cluster ports.

The following is an example command for creating a cluster LIF on one of the node's cluster ports. The

-auto parameter configures the LIF to use a link-local IP address.

```
cluster_A::> network interface create -vserver Cluster -lif clus1 -role
cluster -home-node node_A_1 -home-port ela -auto true
```

13. After setup is complete, verify that the node is healthy and eligible to participate in the cluster:

```
cluster show
```

The following example shows a cluster after the second node (cluster1-02) has been joined to it:

```
cluster_A::> cluster show
Node           Health  Eligibility
-----
node_A_1       true    true
node_A_2       true    true
```

You can access the Cluster Setup wizard to change any of the values you entered for the admin storage virtual machine (SVM) or node SVM by using the cluster setup command.

14. Confirm that you have four ports configured as cluster interconnects:

```
network port show
```

The following example shows output for two controller modules in cluster\_A:

```

cluster_A::> network port show
                                         Speed
                                         (Mbps)
Node    Port      IPspace      Broadcast Domain Link    MTU    Admin/Oper
-----  -----  -----  -----  -----  -----  -----  -----
-----  -----
node_A_1
    **e0a      Cluster      Cluster      up      9000
auto/1000
    e0b      Cluster      Cluster      up      9000
auto/1000**
    e0c      Default      Default      up      1500  auto/1000
    e0d      Default      Default      up      1500  auto/1000
    e0e      Default      Default      up      1500  auto/1000
    e0f      Default      Default      up      1500  auto/1000
    e0g      Default      Default      up      1500  auto/1000
node_A_2
    **e0a      Cluster      Cluster      up      9000
auto/1000
    e0b      Cluster      Cluster      up      9000
auto/1000**
    e0c      Default      Default      up      1500  auto/1000
    e0d      Default      Default      up      1500  auto/1000
    e0e      Default      Default      up      1500  auto/1000
    e0f      Default      Default      up      1500  auto/1000
    e0g      Default      Default      up      1500  auto/1000
14 entries were displayed.

```

## Mirroring the root aggregate on the new controller

You must mirror the root aggregate to provide data protection when you are adding a controller to a MetroCluster configuration.

This task must be performed on the new controller module.

1. Mirror the root aggregate:

```
storage aggregate mirror aggr_name
```

The following command mirrors the root aggregate for controller\_A\_1:

```
controller_A_1::> storage aggregate mirror aggr0_controller_A_1
```

This mirrors the aggregate, so it consists of a local plex and a remote plex located at the remote MetroCluster site.

## Configure intercluster LIFs

Learn how to configure intercluster LIFs on dedicated and shared ports.

## Configure intercluster LIFs on dedicated ports

You can configure intercluster LIFs on dedicated ports to increase the available bandwidth for replication traffic.

### Steps

1. List the ports in the cluster:

```
network port show
```

For complete command syntax, see the man page.

The following example shows the network ports in cluster01:

```

cluster01::> network port show
                                         Speed
                                         (Mbps)
Node    Port      IPspace      Broadcast Domain Link      MTU
Admin/Oper
-----
-----
cluster01-01
    e0a      Cluster      Cluster      up      1500
auto/1000
    e0b      Cluster      Cluster      up      1500
auto/1000
    e0c      Default      Default      up      1500
auto/1000
    e0d      Default      Default      up      1500
auto/1000
    e0e      Default      Default      up      1500
auto/1000
    e0f      Default      Default      up      1500
auto/1000
cluster01-02
    e0a      Cluster      Cluster      up      1500
auto/1000
    e0b      Cluster      Cluster      up      1500
auto/1000
    e0c      Default      Default      up      1500
auto/1000
    e0d      Default      Default      up      1500
auto/1000
    e0e      Default      Default      up      1500
auto/1000
    e0f      Default      Default      up      1500
auto/1000

```

2. Determine which ports are available to dedicate to intercluster communication:

```
network interface show -fields home-port,curr-port
```

For complete command syntax, see the man page.

The following example shows that ports "e0e" and "e0f" have not been assigned LIFs:

```
cluster01::> network interface show -fields home-port,curr-port
vserver lif           home-port curr-port
-----
Cluster cluster01-01_clus1  e0a      e0a
Cluster cluster01-01_clus2  e0b      e0b
Cluster cluster01-02_clus1  e0a      e0a
Cluster cluster01-02_clus2  e0b      e0b
cluster01
    cluster_mgmt      e0c      e0c
cluster01
    cluster01-01_mgmt1  e0c      e0c
cluster01
    cluster01-02_mgmt1  e0c      e0c
```

3. Create a failover group for the dedicated ports:

```
network interface failover-groups create -vserver <system_SVM> -failover
-group <failover_group> -targets <physical_or_logical_ports>
```

The following example assigns ports "e0e" and "e0f" to the failover group "intercluster01" on the system SVM "cluster01":

```
cluster01::> network interface failover-groups create -vserver
cluster01 -failover-group
intercluster01 -targets
cluster01-01:e0e,cluster01-01:e0f,cluster01-02:e0e,cluster01-02:e0f
```

4. Verify that the failover group was created:

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

For complete command syntax, see the man page.

```

cluster01::> network interface failover-groups show
                           Failover
Vserver          Group          Targets
-----
-----
Cluster
      Cluster
          cluster01-01:e0a, cluster01-
01:e0b,
          cluster01-02:e0a, cluster01-02:e0b
cluster01
      Default
          cluster01-01:e0c, cluster01-
01:e0d,
          cluster01-02:e0c, cluster01-
02:e0d,
          cluster01-01:e0e, cluster01-01:e0f
          cluster01-02:e0e, cluster01-02:e0f
      intercluster01
          cluster01-01:e0e, cluster01-01:e0f
          cluster01-02:e0e, cluster01-02:e0f

```

5. Create intercluster LIFs on the system SVM and assign them to the failover group.

ONTAP version	Command
9.6 and later	network interface create -vserver <system_SVM> -lif <LIF_name> -service-policy default-intercluster -home-node <node> -home-port <port> -address <port_IP> -netmask <netmask> -failover-group <failover_group>
9.5 and earlier	network interface create -vserver system_SVM -lif <LIF_name> -role intercluster -home-node <node> -home-port <port> -address <port_IP> -netmask <netmask> -failover-group <failover_group>

For complete command syntax, see the man page.

The following example creates intercluster LIFs "cluster01\_icl01" and "cluster01\_icl02" in the failover group "intercluster01":

```

cluster01::> network interface create -vserver cluster01 -lif
cluster01_icl01 -service-
policy default-intercluster -home-node cluster01-01 -home-port e0e
-address 192.168.1.201
-netmask 255.255.255.0 -failover-group intercluster01

cluster01::> network interface create -vserver cluster01 -lif
cluster01_icl02 -service-
policy default-intercluster -home-node cluster01-02 -home-port e0e
-address 192.168.1.202
-netmask 255.255.255.0 -failover-group intercluster01

```

6. Verify that the intercluster LIFs were created:

**In ONTAP 9.6 and later:**

```
network interface show -service-policy default-intercluster
```

**In ONTAP 9.5 and earlier:**

```
network interface show -role intercluster
```

For complete command syntax, see the man page.

```

cluster01::> network interface show -service-policy default-
intercluster
          Logical      Status      Network      Current
Current Is
Vserver      Interface  Admin/Oper Address/Mask      Node
Port      Home
-----  -----
-----  -----
cluster01
          cluster01_icl01
          up/up      192.168.1.201/24  cluster01-01
e0e      true
          cluster01_icl02
          up/up      192.168.1.202/24  cluster01-02
e0f      true

```

7. Verify that the intercluster LIFs are redundant:

**In ONTAP 9.6 and later:**

```
network interface show -service-policy default-intercluster -failover
```

#### In ONTAP 9.5 and earlier:

```
network interface show -role intercluster -failover
```

For complete command syntax, see the man page.

The following example shows that the intercluster LIFs "cluster01\_icl01" and "cluster01\_icl02" on the SVM "e0e" port will fail over to the "e0f" port.

```
cluster01::> network interface show -service-policy default-
intercluster -failover
      Logical          Home          Failover
      Failover
Vserver  Interface      Node:Port      Policy      Group
-----  -----
-----  -----
cluster01
      cluster01_icl01  cluster01-01:e0e  local-only
intercluster01
      Failover Targets:  cluster01-01:e0e,
                           cluster01-01:e0f
      cluster01_icl02  cluster01-02:e0e  local-only
intercluster01
      Failover Targets:  cluster01-02:e0e,
                           cluster01-02:e0f
```

### Configure intercluster LIFs on shared data ports

You can configure intercluster LIFs on ports shared with the data network to reduce the number of ports you need for intercluster networking.

#### Steps

1. List the ports in the cluster:

```
network port show
```

For complete command syntax, see the man page.

The following example shows the network ports in cluster01:

```
cluster01::> network port show
                                         Speed
                                         (Mbps)
Node    Port      IPspace      Broadcast Domain Link      MTU
Admin/Oper
-----
-----
cluster01-01
    e0a      Cluster      Cluster      up      1500
auto/1000
    e0b      Cluster      Cluster      up      1500
auto/1000
    e0c      Default      Default      up      1500
auto/1000
    e0d      Default      Default      up      1500
auto/1000
cluster01-02
    e0a      Cluster      Cluster      up      1500
auto/1000
    e0b      Cluster      Cluster      up      1500
auto/1000
    e0c      Default      Default      up      1500
auto/1000
    e0d      Default      Default      up      1500
auto/1000
```

## 2. Create intercluster LIFs on the system SVM:

### In ONTAP 9.6 and later:

```
network interface create -vserver <system_SVM> -lif <LIF_name> -service
-policy default-intercluster -home-node <node> -home-port <port> -address
<port_IP> -netmask <netmask>
```

### In ONTAP 9.5 and earlier:

```
network interface create -vserver <system_SVM> -lif <LIF_name> -role
intercluster -home-node <node> -home-port <port> -address <port_IP>
-netmask <netmask>
```

For complete command syntax, see the man page.

The following example creates intercluster LIFs `cluster01_icl01` and `cluster01_icl02`:

```

cluster01::> network interface create -vserver cluster01 -lif
cluster01_icl01 -service-
policy default-intercluster -home-node cluster01-01 -home-port e0c
-address 192.168.1.201
-netmask 255.255.255.0

cluster01::> network interface create -vserver cluster01 -lif
cluster01_icl02 -service-
policy default-intercluster -home-node cluster01-02 -home-port e0c
-address 192.168.1.202
-netmask 255.255.255.0

```

3. Verify that the intercluster LIFs were created:

**In ONTAP 9.6 and later:**

```
network interface show -service-policy default-intercluster
```

**In ONTAP 9.5 and earlier:**

```
network interface show -role intercluster
```

For complete command syntax, see the man page.

```

cluster01::> network interface show -service-policy default-
intercluster
          Logical      Status      Network      Current
Current Is
Vserver      Interface  Admin/Oper Address/Mask      Node
Port      Home
-----  -----
-----  -----
cluster01
          cluster01_icl01
          up/up      192.168.1.201/24  cluster01-01
e0c      true
          cluster01_icl02
          up/up      192.168.1.202/24  cluster01-02
e0c      true

```

4. Verify that the intercluster LIFs are redundant:

**In ONTAP 9.6 and later:**

```
network interface show -service-policy default-intercluster -failover
```

#### In ONTAP 9.5 and earlier:

```
network interface show -role intercluster -failover
```

For complete command syntax, see the man page.

The following example shows that the intercluster LIFs "cluster01\_icl01" and "cluster01\_icl02" on the "e0c" port will fail over to the "e0d" port.

```
cluster01::> network interface show -service-policy default-
intercluster -failover
      Logical          Home          Failover
      Failover
  Vserver  Interface      Node:Port      Policy      Group
-----  -----  -----
-----  -----
cluster01
      cluster01_icl01  cluster01-01:e0c  local-only
  192.168.1.201/24
                           Failover Targets: cluster01-01:e0c,
                                         cluster01-01:e0d
      cluster01_icl02  cluster01-02:e0c  local-only
  192.168.1.201/24
                           Failover Targets: cluster01-02:e0c,
                                         cluster01-02:e0d
```

## Create a mirrored data aggregate on each MetroCluster FC node

You must create a mirrored data aggregate on each node in the DR group.

#### About this task

- You should know what drives will be used in the new aggregate.
- If you have multiple drive types in your system (heterogeneous storage), you should understand how you can make sure that the correct drive type is selected.
- Drives are owned by a specific node; when you create an aggregate, all drives in that aggregate must be owned by the same node, which becomes the home node for that aggregate.

In systems using ADP, aggregates are created using partitions in which each drive is partitioned in to P1, P2 and P3 partitions.

- Aggregate names should conform to the naming scheme you determined when you planned your MetroCluster configuration.

## Disk and aggregate management

- Aggregate names must be unique across the MetroCluster sites. This means that you cannot have two different aggregates with the same name on site A and site B.



It's recommended you maintain at least 20% free space for mirrored aggregates for optimal storage performance and availability. Although the recommendation is 10% for non-mirrored aggregates, the additional 10% of space can be used by the filesystem to absorb incremental changes. Incremental changes increase space utilization for mirrored aggregates due to ONTAP's copy-on-write Snapshot-based architecture. Failure to adhere to these best practices might have a negative impact on performance.

### Steps

- Display a list of available spares:

```
storage disk show -spare -owner <node_name>
```

- Create the aggregate:

```
storage aggregate create -mirror true
```

If you are logged in to the cluster on the cluster management interface, you can create an aggregate on any node in the cluster. To verify that the aggregate is created on a specific node, use the `-node` parameter or specify drives that are owned by that node.

You can specify the following options:

- Aggregate's home node (that is, the node that owns the aggregate in normal operation)
- List of specific drives that are to be added to the aggregate
- Number of drives to include



In the minimum supported configuration, in which a limited number of drives are available, you must use the `force-small-aggregate` option to allow the creation of a three disk RAID-DP aggregate.

- Checksum style to use for the aggregate
- Type of drives to use
- Size of drives to use
- Drive speed to use
- RAID type for RAID groups on the aggregate
- Maximum number of drives that can be included in a RAID group
- Whether drives with different RPM are allowed

For more information about these options, see the `storage aggregate create` man page.

The following command creates a mirrored aggregate with 10 disks:

```
cluster_A::> storage aggregate create aggr1_node_A_1 -diskcount 10
-node node_A_1 -mirror true
[Job 15] Job is queued: Create aggr1_node_A_1.
[Job 15] The job is starting.
[Job 15] Job succeeded: DONE
```

3. Verify the RAID group and drives of your new aggregate:

```
storage aggregate show-status -aggregate <aggregate-name>
```

## Installing licenses for the new controller module

You must add licenses for the new controller module for any ONTAP services that require standard (node-locked) licenses. For features with standard licenses, each node in the cluster must have its own key for the feature.

For detailed information about licensing, see the knowledgebase article 3013749: Data ONTAP 8.2 Licensing Overview and References on the NetApp Support Site and the *System Administration Reference*.

### Steps

1. If necessary, obtain license keys for the new node on the NetApp Support Site in the My Support section under Software licenses.

For further information on license replacements, see the Knowledge Base article [Post Motherboard Replacement Process to update Licensing on a AFF/FAS system](#).

2. Issue the following command to install each license key:

```
system license add -license-code license_key
```

The *license\_key* is 28 digits in length.

3. Repeat this step for each required standard (node-locked) license.

## Creating unmirrored data aggregates

You can optionally create unmirrored data aggregates for data that does not require the redundant mirroring provided by MetroCluster configurations.

### About this task

- Verify that you know what drives will be used in the new aggregate.
- If you have multiple drive types in your system (heterogeneous storage), you should understand how you can verify that the correct drive type is selected.



In MetroCluster IP configurations, remote unmirrored aggregates are not accessible after a switchover



The unmirrored aggregates must be local to the node owning them.

- Drives are owned by a specific node; when you create an aggregate, all drives in that aggregate must be owned by the same node, which becomes the home node for that aggregate.
- Aggregate names should conform to the naming scheme you determined when you planned your MetroCluster configuration.
- *Disks and aggregates management* contains more information about mirroring aggregates.

## Steps

1. Install and cable the disk shelves that will contain the unmirrored aggregates.

You can use the procedures in the *Installation and Setup* documentation for your platform and disk shelves.

[ONTAP Hardware Systems Documentation](#)

2. Manually assign all disks on the new shelf to the appropriate node:

```
disk assign -disk <disk-id> -owner <owner-node-name>
```

3. Create the aggregate:

```
storage aggregate create
```

If you are logged in to the cluster on the cluster management interface, you can create an aggregate on any node in the cluster. To verify that the aggregate is created on a specific node, you should use the `-node` parameter or specify drives that are owned by that node.

Verify that you are only including drives on the unmirrored shelf to the aggregate.

You can specify the following options:

- Aggregate's home node (that is, the node that owns the aggregate in normal operation)
- List of specific drives that are to be added to the aggregate
- Number of drives to include
- Checksum style to use for the aggregate
- Type of drives to use
- Size of drives to use
- Drive speed to use
- RAID type for RAID groups on the aggregate
- Maximum number of drives that can be included in a RAID group
- Whether drives with different RPM are allowed

For more information about these options, see the `storage aggregate create` man page.

The following command creates a unmirrored aggregate with 10 disks:

```
controller_A_1::> storage aggregate create aggr1_controller_A_1
-diskcount 10 -node controller_A_1
[Job 15] Job is queued: Create aggr1_controller_A_1.
[Job 15] The job is starting.
[Job 15] Job succeeded: DONE
```



You can also use the `-disklist` parameter in the command to specify the disks that you want to use for the aggregate.

4. Verify the RAID group and drives of your new aggregate:

```
storage aggregate show-status -aggregate <aggregate-name>
```

#### Related information

[Disk and aggregate management](#)

## Installing the firmware after adding a controller module

After adding the controller module, you must install the latest firmware on the new controller module so that the controller module functions properly with ONTAP.

#### Steps

1. Download the most current version of firmware for your system and follow the instructions for downloading and installing the new firmware.

[NetApp Downloads: System Firmware and Diagnostics](#)

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