Maintain

Install and maintain

NetApp
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Overview of the maintenance procedures - FAS70 and FAS90

Maintain the hardware of your FAS70 or FAS90 storage system to ensure long-term reliability and optimal performance. Perform regular maintenance tasks such as replacing faulty components, as this helps prevent downtime and data loss.

The maintenance procedures assume that the FAS70 or FAS90 storage system has already been deployed as a storage node in the ONTAP environment.

System components

For the FAS70 and FAS90 storage system, you can perform maintenance procedures on the following components.

Boot media - automated recovery	The boot media stores a primary and secondary set of ONTAP image files that the storage system uses to boot. During automated recovery, the system retrieves the boot image from the partner node and automatically runs the appropriate boot menu option to install the image on your replacement boot media. The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.
Boot media- manual recovery	The boot media stores a primary and secondary set of ONTAP image files that the storage system uses to boot the image from a USB drive and restore the configuration from the partner node
Controller	A controller consists of a board, firmware, and software. It controls the drives and runs the ONTAP operating system software.
DIMM	A dual in-line memory module (DIMM) is a type of computer memory. They are installed to add system memory to a controller motherboard.
Fan	A fan cools the controller.
Flash Cache	Flash Cache speeds access to data through real-time intelligent caching of recently read user data and NetApp metadata. It’s effective for random read-intensive workloads, including databases, email, and file services.
NVRAM	The NVRAM (Non-Volatile Random Access Memory) is a module that allows the controller to protect and save in-flight data if the system loses power. The system ID resides in the NVRAM module. When replaced, the controller assumes the new system ID from the replacement NVRAM module.

NV battery	The NV battery is responsible for providing power to the NVRAM module while data in-flight is being destaged to flash memory after a power loss.
I/O module	The I/O module (Input/Output module) is a hardware component that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.
Power supply	A power supply provides a redundant power source in a controller.
Real-time clock battery	A real-time clock battery preserves system date and time information if the power is off.
System management module	The System management module provides the interface between the controller and a console or laptop for controller or system maintenance purposes. The System management module contains the boot media and stores the system serial number (SSN).

Boot media - automated recovery

Boot media automated recovery workflow - FAS70 and FAS90

The automated recovery of the boot image involves the system automatically identifying and selecting the appropriate boot menu option. It uses the boot image on partner node to reinstall ONTAP on the replacement boot media in your FAS70 or FAS90 storage system.

The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.

To get started, review the replacement requirements, shut down the controller, replace the boot media, allow the system to restore the image, and verify system functionality.

1. **Review the boot media requirements**

Review the requirements for boot media replacement.

2. **Shut down the controller**

Shut down the controller in your storage system when when you need to replace the boot media.

3. **Replace the boot media**

Remove the failed boot media from the System Management module and install the replacement boot media.

4. **Restore the image on the boot media**

Restore the ONTAP image from the partner controller.

5 **Return the failed part to NetApp**

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Requirements for automated boot media recovery - FAS70 and FAS90

Before replacing the boot media in your FAS70 or FAS90 storage system, ensure you meet the necessary requirements for a successful replacement. This includes verifying that you have the correct replacement boot media, confirming the cluster ports on the impaired controller are working properly, and determining whether Onboard Key Manager (OKM) or External Key Manager (EKM) is enabled.

The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.

Review the following requirements.

- You must replace the failed boot media with a replacement boot media you received from NetApp.
- The cluster ports are used to communicate between the two controllers during the automated boot recovery process. Make sure that the cluster ports on the impaired controller are working properly.
- For OKM, you need the cluster-wide passphrase and also the backup data.
- For EKM, you need copies of the following files from the partner node:
  - /cfcard/kmip/servers.cfg
  - /cfcard/kmip/certs/client.crt
  - /cfcard/kmip/certs/client.key
  - /cfcard/kmip/certs/CA.pem
- It is critical to apply the commands to the correct controller when you are replacing the impaired boot media:
  - The *impaired controller* is the controller on which you are performing maintenance.
  - The *healthy controller* is the HA partner of the impaired controller.

What's next

After you've reviewed the boot media requirements, you shut down the controller.

Shut down the controller for automated boot media recovery - FAS70 and FAS90

Shut down the impaired controller in your FAS70 or FAS90 storage system to prevent data loss and maintain system stability during the automatic boot media recovery process.

The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

What's next

After you shut down the impaired controller, you replace the boot media.

Replace the boot media for automated boot recovery - FAS70 and FAS90

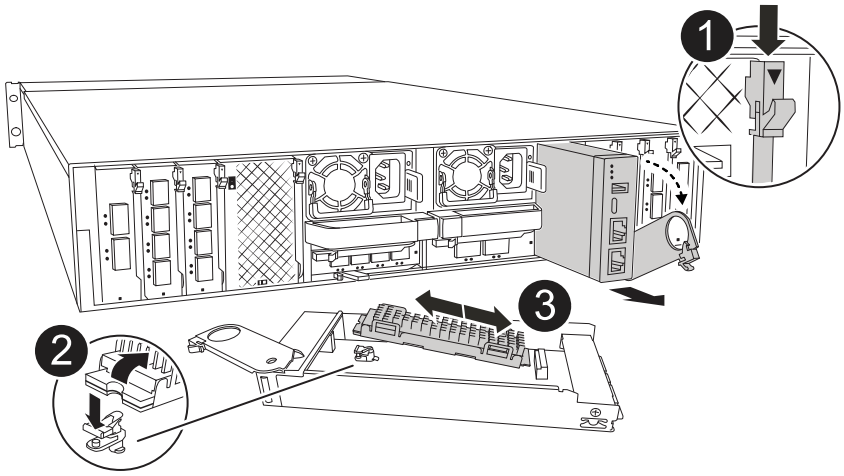
The boot media in your FAS70 or FAS90 storage system stores essential firmware and

configuration data. The replacement process involves removing the System Management module, removing the impaired boot media, installing the replacement boot media in the System Management module, and then reinstalling the System Management module.

The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.

The boot media is located inside the System Management module and is accessed by removing the module from the system.

Replace the boot media.



1	System Management module cam latch
2	Boot media locking button
3	Boot media

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs.

   If your storage system has DC power supplies, disconnect the power cable block from the power supply units (PSUs).

3. Remove the System Management module:
   a. Remove any cables connected to the System Management module. Make sure that you label where the cables were connected, so that you can connect them to the correct ports when you reinstall the module.
   b. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
   c. Depress the System Management cam button.
   d. Rotate the cam latch down as far as it will go.

e. Remove the System Management module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.

f. Place the System Management module on an anti-static mat, so that the boot media is accessible.

4. Remove the boot media from the management module:
   a. Press the blue locking button.
   b. Rotate the boot media up, slide it out of the socket, and set it aside.
5. Install the replacement boot media into the System Management module:
   a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
   b. Rotate the boot media down toward the locking button.
   c. Push the locking button, rotate the boot media all the way down and then release the locking button.
6. Reinstall the System Management module:
   a. Align the module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
7. Rotate the cable management tray up to the closed position.
   a. Recable the System Management module.
8. Plug the power cables into the power supplies and reinstall the power cable retainer.

   The controller begins to boot as soon as power is reconnected to the system.

What's next

After physically replacing the impaired boot media, restore the ONTAP image from the partner node.

Automated boot media recovery from the partner node - FAS70 and FAS90

After installing the new boot media device in your FAS70 or FAS90 storage system, you can start the automated boot media recovery process to restore the configuration from the partner node. During the recovery process, the system checks whether encryption is enabled and determines the type of key encryption in use. If key encryption is enabled, the system guides you through the appropriate steps to restore it.

The automated boot media recovery process is supported only in ONTAP 9.17.1 and later. If your storage system is running an earlier version of ONTAP, use the manual boot recovery procedure.

Before you begin

- For OKM, you need the cluster-wide passphrase and also the backup data.
- For EKM, you need copies of the following files from the partner node:
  - /cfcard/kmip/servers.cfg file.
  - /cfcard/kmip/certs/client.crt file.
  - /cfcard/kmip/certs/client.key file.
  - /cfcard/kmip/certs/CA.pem file.

Steps

1. From the LOADER prompt, enter the command:

   `boot_recovery -partner`

   The screen displays the following message:

   `Starting boot media recovery (BMR) process. Press Ctrl-C to abort…`

2. Monitor the boot media install recovery process.

   The process completes and displays the `Installation complete` message.

3. The system checks for encryption and encryption type and displays one of two messages. Depending on what message is displayed, take one of the following actions:

   > Occasionally, the process may not be able to identify if key manager is configured on the system. It will display an error message, ask if key manager is configured for the system, and then ask what type of key manager is configured. The process will resume after you resolve the issue.

   Show example of configuration error finding prompts

   ```
   Error when fetching key manager config from partner ${partner_ip}:
   ${status}

   Has key manager been configured on this system

   Is the key manager onboard
   ```

If you see this message…	Do this…
`key manager is not configured. Exiting.`	Encryption is not installed on the system. Complete the following steps: a. Log into the node when the login prompt is displayed and give back the storage: `storage failover giveback -ofnode` *`impaired_node_name`* b. Go to step 5 to enable automatic giveback if it was disabled.
`key manager is configured.`	Go to step 4 to restore the appropriate key manager. The node accesses the boot menu and runs: • Option 10 for systems with Onboard Key Manager (OKM). • Option 11 for systems with External Key Manager (EKM).

4. Select the appropriate key manager restoration process.

Onboard Key Manager (OKM)

If OKM is detected, the system displays the following message and begins running BootMenu Option 10.

```
key manager is configured.
Entering Bootmenu Option 10...

This option must be used only in disaster recovery procedures. Are
you sure? (y or n):
```

a. Enter `Y` at the prompt to confirm you want to start the OKM recovery process.

b. Enter the following when prompted:

   i. The passphrase

   ii. The passphrase again when prompted to confirm

   iii. Backup data for onboard key manager

   Show example of passphrase and backup data prompts

   ```
   Enter the passphrase for onboard key management:
   -----BEGIN PASSPHRASE-----
   <passphrase_value>
   -----END PASSPHRASE-----
   Enter the passphrase again to confirm:
   -----BEGIN PASSPHRASE-----
   <passphrase_value>
   -----END PASSPHRASE-----
   Enter the backup data:
   -----BEGIN BACKUP-----
   <passphrase_value>
   -----END BACKUP-----
   ```

c. Continue to monitor the recovery process as it restores the appropriate files from the partner node.

   When the recovery process is complete, the node will reboot. The following messages indicate a successful recovery:

```
Trying to recover keymanager secrets....
Setting recovery material for the onboard key manager
Recovery secrets set successfully
Trying to delete any existing km_onboard.keydb file.

Successfully recovered keymanager secrets.
```

d. When the node reboots, verify the boot media recovery was successful by confirming that the system is back online and operational.

e. Return the impaired controller to normal operation by giving back its storage:

```
storage failover giveback -ofnode impaired_node_name
```

f. After the partner node is fully up and serving data, synchronize the OKM keys across the cluster.

```
security key-manager onboard sync
```

External Key Manager (EKM)

If EKM is detected, the system displays the following message and begins running BootMenu Option 11.

```
key manager is configured.
Entering Bootmenu Option 11...
```

a. The next step depends on which version of ONTAP your system is running:

If your system is running…	Do this…
ONTAP 9.16.0	a. Press `Ctlr-C` to exit BootMenu Option 11. b. Press `Ctlr-C` to exit the EKM configuration process and return to the boot menu. c. Select BootMenu Option 8. d. Reboot the node. If `AUTOBOOT` is set, the node reboots and uses the configuration files from the partner node. If `AUTOBOOT` is not set, enter the appropriate boot command. The node reboots and uses the configuration files from the partner node. e. Reboot the node so that EKM protects the boot media partition. f. Proceed to step c.

If your system is running…	Do this…
ONTAP 9.16.1 and later	Proceed to the next step.

b. Enter the following EKM configuration setting when prompted:

Action	Example

Enter the client certificate contents from the `/cfcard/kmip/certs/client.crt` file.	**Show example of client certificate contents**
	`-----BEGIN CERTIFICATE-----`
	`<certificate_value>`
	`-----END CERTIFICATE-----`

Enter the client key file contents from the `/cfcard/kmip/certs/client.key` file.	**Show example of client key file contents**
	`-----BEGIN RSA PRIVATE KEY-----`
	`<key_value>`
	`-----END RSA PRIVATE KEY-----`

Enter the KMIP server CA(s) file contents from the `/cfcard/kmip/certs/CA.pem` file.	**Show example of KMIP server file contents**
	`-----BEGIN CERTIFICATE-----`
	`<KMIP_certificate_CA_value>`
	`-----END CERTIFICATE-----`

Action	Example

Enter the server configuration file contents from the `/cfcard/kmip/servers.cfg` file.	**Show example of server configuration file contents**
	`xxx.xxx.xxx.xxx:5696.host=xxx.xxx.xxx.xxx`
	`xxx.xxx.xxx.xxx:5696.port=5696`
	`xxx.xxx.xxx.xxx:5696.trusted_file=/cfcard/kmip/certs/CA.pem`
	`xxx.xxx.xxx.xxx:5696.protocol=KMIP1_4`
	`1xxx.xxx.xxx.xxx:5696.timeout=25`
	`xxx.xxx.xxx.xxx:5696.nbio=1`
	`xxx.xxx.xxx.xxx:5696.cert_file=/cfcard/kmip/certs/client.crt`
	`xxx.xxx.xxx.xxx:5696.key_file=/cfcard/kmip/certs/client.key`
	`xxx.xxx.xxx.xxx:5696.ciphers="TLSv1.2:kRSA:!CAMELLIA:!IDEA:!RC2:!RC4:!SEED:!eNULL:!aNULL"`
	`xxx.xxx.xxx.xxx:5696.verify=true`
	`xxx.xxx.xxx.xxx:5696.netapp_keystore_uuid=<id_value>`

Action	Example
If prompted, enter the ONTAP Cluster UUID from the partner. You can check the cluster UUID from the partner node using the `cluster identify show` command.	**Show example of ONTAP Cluster UUID** ``` Notice: bootarg.mgwd.cluster_uuid is not set or is empty. Do you know the ONTAP Cluster UUID? {y/n} y Enter the ONTAP Cluster UUID: <cluster_uuid_value> System is ready to utilize external key manager(s). ```
If prompted, enter the temporary network interface and settings for the node. You need to enter: 1. The IP address for the port 2. The netmask for the port 3. The IP address of the default gateway	**Show example of a temporary network setting** ``` In order to recover key information, a temporary network interface needs to be configured. Select the network port you want to use (for example, 'e0a') e0M Enter the IP address for port : xxx.xxx.xxx.xxx Enter the netmask for port : xxx.xxx.xxx.xxx Enter IP address of default gateway: xxx.xxx.xxx.xxx Trying to recover keys from key servers.... [discover_versions] [status=SUCCESS reason= message=] ```

c. Depending on whether the key is successfully restored, take one of the following actions:

- If you see `kmip2_client: Successfully imported the keys from external key server: xxx.xxx.xxx.xxx:5696` in the output, the EKM configuration has been successfully restored.

  The process attempts to restore the appropriate files from the partner node and reboots the node. Go to step d.

- If the key is not successfully restored, the system will halt and indicate that it could not restore the key. The error and warning messages are displayed. You must rerun the recovery process:

  ```
  boot_recovery -partner
  ```

  Show example of key recovery error and warning messages

  ```
  ERROR: kmip_init: halting this system with encrypted
  mroot...
  WARNING: kmip_init: authentication keys might not be
  available.
  ********************************************************
  *                A T T E N T I O N                     *
  *                                                      *
  *       System cannot connect to key managers.         *
  *                                                      *
  ********************************************************
  ERROR: kmip_init: halting this system with encrypted
  mroot...
  .
  Terminated

  Uptime: 11m32s
  System halting...

  LOADER-B>
  ```

d. When the node reboots, verify that the boot media recovery was successful by confirming that the system is back online and operational.

e. Return the controller to normal operation by giving back its storage:

```
storage failover giveback -ofnode impaired_node_name
```

5. If automatic giveback was disabled, reenable it:

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

6. If AutoSupport is enabled, restore automatic case creation:

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

What's next

After you've restored the ONTAP image and the node is up and serving data, you return the failed part to NetApp.

Return the failed boot media part to NetApp - FAS70 and FAS90

If a component in your FAS70 or FAS90 storage system fails, return the failed part to NetApp. See the Part Return and Replacements page for further information.

Boot media - manual recovery

Boot media manual recovery workflow - FAS70 and FAS90

The manual recovery of the boot image involves using a USB drive to reinstall ONTAP onto the FAS70 or FAS90 system's replacement boot media. You must download the appropriate ONTAP recovery image from the NetApp Support Site and copy it to a USB drive. This prepared USB drive is then used to perform the recovery and restore the system to operational status.

If your system is running in ONTAP 9.17.1 and later, use the automatic boot recovery procedure.

To get started, review the recovery requirements, shut down the controller, replace the boot media, use the USB drive to restore the image, and reapply encryption settings if necessary.

Review boot media replacement requirements

Review the requirements for replacing the boot media.

Check onboard encryption keys

Determine whether the system has security key manager enabled or encrypted disks.

Shut down the impaired controller

Shut down the controller when when you need to replace the boot media.

Replace the boot media

Remove the failed boot media from the System Management module and install the replacement boot media, and then transfer an ONTAP image using a USB flash drive.

Boot the recovery image

Boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

6 Restore encryption

Restore the onboard key manager configuration or the external key manager from the ONTAP boot menu.

7 Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Requirements for manual boot media recovery - FAS70 and FAS90

Before replacing the boot media in your FAS70 or FAS90 system, ensure you meet the necessary requirements for a successful replacement. This includes making sure you have a USB flash drive with the appropriate amount of storage and verifying that you have the correct replacement boot device.

USB flash drive

- Ensure you have a USB flash drive formatted to FAT32.
- The USB must have sufficient storage capacity to hold the `image_xxx.tgz` file.

File preparation

Copy the `image_xxx.tgz` file to the USB flash drive. This file will be used when you transfer the ONTAP image using the USB flash drive.

Component replacement

Replace the failed component with the replacement component provided by NetApp.

Controller identification

It is critical to apply the commands to the correct controller when you are replacing the impaired boot media:

- The *impaired controller* is the controller on which you are performing maintenance.
- The *healthy controller* is the HA partner of the impaired controller.

What's next?

After you've reviewed the requirements to replace the boot media, you need to check encryption key support and status on the boot media.

Check encryption support for manual boot media recovery - FAS70 and FAS90

To ensure data security on your FAS70 or FAS90 storage system, you need to verify the encryption key support and status on your boot media. Check if your ONTAP version supports NetApp Volume Encryption (NVE), and before you shut down the controller check if the key manager is active.

Step 1: Check if your version of ONTAP supports NetApp Volume Encryption

Check whether your ONTAP version supports NetApp Volume Encryption (NVE). This information is crucial for

downloading the correct ONTAP image.

Steps

1. Determine if your ONTAP version supports encryption by running the following command:

   `version -v`

   If the output includes `1Ono-DARE`, NVE is not supported on your cluster version.

2. Depending on whether NVE is supported on your system, take one of the following actions:
   - If NVE is supported, download the ONTAP image with NetApp Volume Encryption.
   - If NVE is not supported, download the ONTAP image **without** NetApp Volume Encryption.

Step 2: Determine if it is safe to shut down the controller

To safely shut down a controller, first identify whether the External Key Manager (EKM) or the Onboard Key Manager (OKM) is active. Then, verify the key manager in use, display the appropriate key information, and take action based on the status of the authentication keys.

Steps

1. Determine which key manager is enabled on your system:

ONTAP version	Run this command
ONTAP 9.14.1 or later	`security key-manager keystore show` • If EKM is enabled, `EKM` is listed in the command output. • If OKM is enabled, `OKM` is listed in the command output. • If no key manager is enabled, `No key manager keystores configured` is listed in the command output.
ONTAP 9.13.1 or earlier	`security key-manager show-key-store` • If EKM is enabled, `external` is listed in the command output. • If OKM is enabled, `onboard` is listed in the command output. • If no key manager is enabled, `No key managers configured` is listed in the command output.

2. Depending on whether a key manger is configured on your system, select one of the following options.

No key manager configured

You can safely shut down the impaired controller. Go to shutdown the impaired controller.

External or Onboard key manager configured

a. Enter the following query command to display the status of the authentication keys in your key manager.

```
security key-manager key query
```

b. Check the output for the value in the `Restored` column for your key manager.

This column indicates whether the authentication keys for your key manager (either EKM or OKM) have been successfully restored.

3. Depending on whether your system is using the External Key Manager or Onboard Key Manager, select one of the following options.

External Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in `Restored` column	**Follow these steps…**
`true`	You can safely shut down the impaired controller. Go to shutdown the impaired controller.
Anything other than `true`	a. Restore the external key management authentication keys to all nodes in the cluster using the following command: `security key-manager external restore` If the command fails, contact NetApp Support. b. Verify that the `Restored` column displays `true` for all authentication keys by entering the `security key-manager key query` command. If all the authentication keys are `true`, you can safely shut down the impaired controller. Go to shutdown the impaired controller.

Onboard Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in `Restored` column	**Follow these steps…**
`true`	Manually back up the OKM information. a. Go to the advanced mode by entering `set -priv advanced` and then enter `Y` when prompted. b. Enter the following command to display the key management information: `security key-manager onboard show-backup` c. Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM. d. You can safely shut down the impaired controller. Go to shutdown the impaired controller.

Output value in `Restored` column	Follow these steps…

Anything other than `true`	a. Enter the onboard security key-manager sync command:
	
	`security key-manager onboard sync`
	
	b. Enter the 32 character, alphanumeric onboard key management passphrase when prompted.
	
	If the passphrase cannot be provided, contact NetApp Support.
	
	c. Verify the `Restored` column displays `true` for all authentication keys:
	
	`security key-manager key query`
	
	d. Verify that the `Key Manager` type displays `onboard`, and then manually back up the OKM information.
	e. Enter the command to display the key management backup information:
	
	`security key-manager onboard show-backup`
	
	f. Copy the contents of the backup information to a separate file or your log file.
	
	You'll need it in disaster scenarios where you might need to manually recover OKM.
	
	g. You can safely shut down the impaired controller. Go to shutdown the impaired controller.

What's next?

After checking the encryption key support and status on the boot media, you need to shut down the controller.

Shut down the controller for manual boot media recovery - FAS70 and FAS90

Shut down the impaired controller in your FAS70 or FAS90 storage system to prevent data loss and maintain system stability during the manual boot media recovery process.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

What's next?

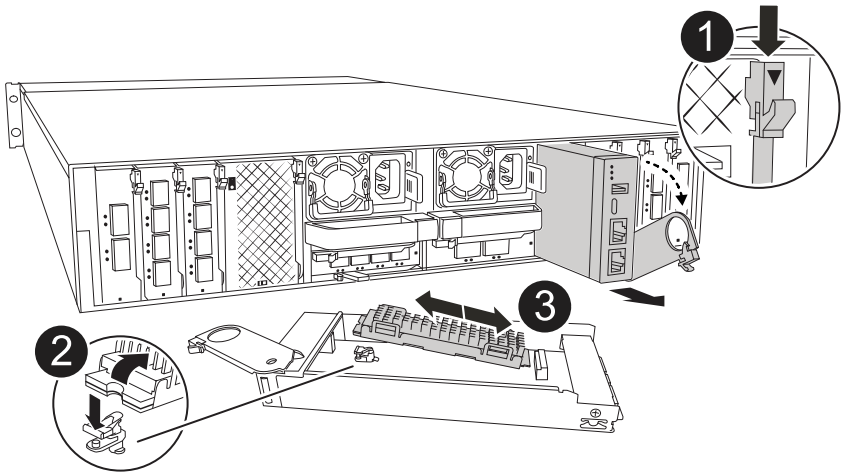
After shutting down the controller, you need to replace the boot media.

Replace the boot media and prepare for manual boot recovery - FAS70 and FAS90

The boot media in your FAS70 or FAS90 system stores essential firmware and configuration data. The replacement process involves removing the System Management module, removing the impaired boot media, installing the replacement boot media, and then manually transferring the ONTAP image to the replacement boot media using a USB flash drive.

Step 1: Replace the boot media

The boot media is located inside the System Management module and is accessed by removing the module from the system.



1	System Management module cam latch
2	Boot media locking button
3	Boot media

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs.

   If your storage system has DC power supplies, disconnect the power cable block from the power supply units (PSUs).

3. Remove the System Management module:
   a. Remove any cables connected to the System Management module. Make sure that you label where the cables were connected, so that you can connect them to the correct ports when you reinstall the module.
   b. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
   c. Depress the System Management cam button.
   d. Rotate the cam latch down as far as it will go.
   e. Remove the System Management module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.
   f. Place the System Management module on an anti-static mat, so that the boot media is accessible.
4. Remove the boot media from the management module:
   a. Press the blue locking button.
   b. Rotate the boot media up, slide it out of the socket, and set it aside.
5. Install the replacement boot media into the System Management module:
   a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.
   b. Rotate the boot media down toward the locking button.
   c. Push the locking button, rotate the boot media all the way down and then release the locking button.
6. Reinstall the System Management module.
   a. Align the module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
7. Rotate the cable management tray up to the closed position.
   a. Recable the System Management module.

Step 2: Transfer the ONTAP image to the boot media

The replacement boot media that you installed is without an ONTAP image. You can transfer the ONTAP image to the replacement boot media by downloading the appropriate ONTAP service image from the NetApp Support Site to a USB flash drive and then to the replacement boot media.

Before you begin

- You must have an empty USB flash drive, formatted to FAT32, with at least 4GB capacity.
- Download a copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the Downloads section on the NetApp Support Site. Use the `version -v` command to display if your version of ONTAP supports NVE. If the command output displays

`<10no- DARE>`, your version of ONTAP does not support NVE.

  - If NVE is supported by your version of ONTAP, download the image with NetApp Volume Encryption, as indicated in the download button.
  - If NVE is not supported, download the image without NetApp Volume Encryption, as indicated in the download button.

- If your system is an HA pair, you must have a network connection between the node management ports of the controllers (typically the e0M interfaces).

Steps

1. Download and copy the appropriate service image from the NetApp Support Site to the USB flash drive.
   a. Download the service image from the Downloads link on the page, to your work space on your laptop.
   b. Unzip the service image.

      If you are extracting the contents using Windows, do not use WinZip to extract the netboot image. Use another extraction tool, such as 7-Zip or WinRAR.

      The USB flash drive should have the appropriate ONTAP image of what the impaired controller is running.

   c. Remove the USB flash drive from your laptop.
2. Insert the USB flash drive into the USB slot on the System Management module.

   Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

3. Plug the power cables back into the PSU.

   The system will begin to reboot, typically to the LOADER prompt.

4. Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt.

   If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

What's next?

After replacing the boot media, you need to boot the recovery image.

Manual boot media recovery from a USB drive - FAS70 and FAS90

After installing the new boot media device in your FAS70 or FAS90 system, you can boot the recovery image manually from a USB drive to restore the configuration from the partner node.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

   The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.

3. Restore the var file system:

Option 1: ONTAP 9.16.0 or earlier

a. On the impaired controller, press `Y` when you see `Do you want to restore the backup configuration now?`

b. If prompted on the impaired controller, press `Y` to overwrite */etc/ssh/ssh_host_ecdsa_key*.

c. On the healthy partner controller, set the impaired controller to advanced privilege level: `set -privilege advanced`.

d. On the healthy partner controller, run the restore backup command: `system node restore-backup -node local -target-address impaired_node_IP_address`.

NOTE: If you see any message other than a successful restore, contact NetApp Support.

e. On the healthy partner controller, return the impaired controller to admin level: `set -privilege admin`.

f. On the impaired controller, press `Y` when you see `Was the restore backup procedure successful?`.

g. On the impaired controller, press `Y` when you see `…would you like to use this restored copy now?`.

h. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.

i. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to Restore encryption.

Option 2: ONTAP 9.16.1 or later

a. On the impaired controller, press `Y` when prompted to restore the backup configuration.

After restore procedure is successful, this message will be seen on the console - `syncflash_partner: Restore from partner complete`.

b. On the impaired controller, press `Y` when prompted to confirm if the restore backup was successful.

c. On the impaired controller, press `Y` when prompted to use the restored configuration.

d. On the impaired controller, press `Y` when prompted to reboot the node.

e. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.

f. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to Restore encryption.

4. Connect the console cable to the partner controller.

5. Give back the controller using the `storage failover giveback -fromnode local` command.

6. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.

7. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.

   NOTE: If the process fails, contact NetApp Support.

What's next?

After booting the recovery image, you need to restore encryption on the boot media.

Restore encryption keys after manual boot recovery - FAS70 and FAS90

Restore encryption on the replacement boot media in your FAS70 or FAS90 system to ensure continued data protection. The replacement process involves verifying key availability, reapplying encryption settings, and confirming secure access to your data.

You must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled using the settings that you captured at the beginning of the boot media replace procedure.

Depending on which a key manger is configured on your system, select one of the following options to restore it from the boot menu.

- Option 1: Restore the Onboard Key Manager configuration
- Option 2: Restore the External Key Manager configuration

Option 1: Restore the Onboard Key Manager configuration

Restore the Onboard Key Manager (OKM) configuration from the ONTAP boot menu.

Before you begin

- Make sure you have following information while restoring the OKM configuration:
  - Cluster-wide passphrase entered while enabling onboard key management.
  - Backup information for the Onboard Key Manager.
- Perform the How to verify onboard key management backup and cluster-wide passphrase procedure before proceeding.

Steps

1. Connect the console cable to the target controller.
2. From the ONTAP boot menu select the appropriate option from the boot menu.

ONTAP version	Select this option
ONTAP 9.8 or later	Select option 10. **Show example boot menu** ``` Please choose one of the following: (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 Manager recovery secrets. (11) Configure node for external key management. Selection (1-11)? 10 ```

ONTAP version	Select this option

ONTAP 9.7 and earlier	Select the hidden option `recover_onboard_keymanager`
	
	Show example boot menu
	
	`Please choose one of the following:`
	
	`(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.`
	`Selection (1-19)?`
	`recover_onboard_keymanager`

3. Confirm that you want to continue the recovery process.

   Show example prompt

   ```
   This option must be used only in disaster recovery procedures. Are you
   sure? (y or n):
   ```

4. Enter the cluster-wide passphrase twice.

   While entering the passphrase the console will not show any input.

   Show example prompt

   ```
   Enter the passphrase for onboard key management:

   Enter the passphrase again to confirm:
   ```

5. Enter the backup information.

   a. Paste the entire content from the BEGIN BACKUP line through the END BACKUP line.

Show example prompt

```
Enter the backup data:

--------------------------BEGIN BACKUP--------------------------
0123456789012345678901234567890123456789012345678901234567890123
1234567890123456789012345678901234567890123456789012345678901234
2345678901234567890123456789012345678901234567890123456789012345
3456789012345678901234567890123456789012345678901234567890123456
4567890123456789012345678901234567890123456789012345678901234567
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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0123456789012345678901234567890123456789012345678901234567890123
1234567890123456789012345678901234567890123456789012345678901234
2345678901234567890123456789012345678901234567890123456789012345
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

---------------------------END BACKUP---------------------------
```

b. Press the enter key twice at the end of the input.

The recovery process completes.

Show example prompt

```
Trying to recover keymanager secrets....
Setting recovery material for the onboard key manager
Recovery secrets set successfully
Trying to delete any existing km_onboard.wkeydb file.

Successfully recovered keymanager secrets.

*******************************************************************
******************
* Select option "(1) Normal Boot." to complete recovery process.
*
* Run the "security key-manager onboard sync" command to
synchronize the key database after the node reboots.
*******************************************************************
******************
```

Do not proceed if the displayed output is anything other than `Successfully recovered keymanager secrets`. Perform troubleshooting to correct the error.

6. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****************************************************************
***************
* Select option "(1) Normal Boot." to complete the recovery process.
*
*****************************************************************
***************


(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 Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 1
```

7. Confirm that the controller's console displays the following message.

   `Waiting for giveback…(Press Ctrl-C to abort wait)`

8. From the partner node, giveback the partner controller by entering the following command.

   `storage failover giveback -fromnode local -only-cfo-aggregates true.`

9. After booting with only the CFO aggregate, run the following command.

   `security key-manager onboard sync`

10. Enter the cluster-wide passphrase for the Onboard Key Manager.

Show example prompt

```
Enter the cluster-wide passphrase for the Onboard Key Manager:

All offline encrypted volumes will be brought online and the
corresponding volume encryption keys (VEKs) will be restored
automatically within 10 minutes. If any offline encrypted volumes
are not brought online automatically, they can be brought online
manually using the "volume online -vserver <vserver> -volume
<volume_name>" command.
```

If the sync is successful the cluster prompt is returned with no additional messages. If the sync fails an error message appears before returning to the cluster prompt. Do not continue until the the error is corrected and the sync runs successfully.

11. Ensure that all keys are synced by entering the following command.

    ```
    security key-manager key query -restored false.

    There are no entries matching your query.
    ```

    No results should appear when filtering for false in the restored parameter.

12. Giveback the node from the partner by entering the following command.

    ```
    storage failover giveback -fromnode local
    ```

13. Restore automatic giveback, if you disabled it, by entering the following command.

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

14. If AutoSupport is enabled, restore automatic case creation by entering the following command.

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

Option 2: Restore the External Key Manager configuration

Restore the External Key Manager configuration from the ONTAP boot menu.

Before you begin

You need the following information for restoring the External Key Manager (EKM) configuration.

- A copy of the /cfcard/kmip/servers.cfg file from another cluster node or the following information:
  - The KMIP server address.
  - The KMIP port.
- A copy of the `/cfcard/kmip/certs/client.crt` file from another cluster node or the client certificate.

- A copy of the `/cfcard/kmip/certs/client.key` file from another cluster node or the client key.
- A copy of the `/cfcard/kmip/certs/CA.pem` file from another cluster node or the KMIP server CA(s).

Steps

1. Connect the console cable to the target controller.
2. Select option 11 from the ONTAP boot menu.

   Show example 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 Manager recovery secrets.
   (11) Configure node for external key management.
   Selection (1-11)? 11
   ```

3. When prompted, confirm you have gathered the required information.

   Show example prompt

   ```
   Do you have a copy of the /cfcard/kmip/certs/client.crt file? {y/n}
   Do you have a copy of the /cfcard/kmip/certs/client.key file? {y/n}
   Do you have a copy of the /cfcard/kmip/certs/CA.pem file? {y/n}
   Do you have a copy of the /cfcard/kmip/servers.cfg file? {y/n}
   ```

4. When prompted, enter the client and server information.

   Show prompt

   ```
   Enter the client certificate (client.crt) file contents:
   Enter the client key (client.key) file contents:
   Enter the KMIP server CA(s) (CA.pem) file contents:
   Enter the server configuration (servers.cfg) file contents:
   ```

Show example

```
Enter the client certificate (client.crt) file contents:
-----BEGIN CERTIFICATE-----
<certificate_value>
-----END CERTIFICATE-----

Enter the client key (client.key) file contents:
-----BEGIN RSA PRIVATE KEY-----
<key_value>
-----END RSA PRIVATE KEY-----

Enter the KMIP server CA(s) (CA.pem) file contents:
-----BEGIN CERTIFICATE-----
<certificate_value>
-----END CERTIFICATE-----

Enter the IP address for the KMIP server: 10.10.10.10
Enter the port for the KMIP server [5696]:

System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
kmip_init: configuring ports
Running command '/sbin/ifconfig e0M'
..
..
kmip_init: cmd: ReleaseExtraBSDPort e0M
```

After you enter the client and server information, the recovery process completes.

Show example

```
System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
Performing initialization of OpenSSL
Successfully recovered keymanager secrets.
```

5. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****************************************************************
*******
* Select option "(1) Normal Boot." to complete the recovery process.
*
*****************************************************************
*******

(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 Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 1
```

6. Restore automatic giveback if you disabled it.

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

7. If AutoSupport is enabled, restore automatic case creation by entering the following command.

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

What's next?

After restoring encryption on the boot media, you need to return the failed part to NetApp.

Return the failed part to NetApp - FAS70 and FAS90

If a component in your FAS70 or FAS90 system fails, return the failed part to NetApp. See the Part Return and Replacements page for further information.

Controller

Controller replacement workflow - FAS70 and FAS90

Get started with replacing the controller in your FAS70 or FAS90 storage system by shutting down the impaired controller, removing and replacing the controller, restoring the system configuration, and returning control of storage resources to the replacement

controller.

1. **Review controller replacement requirements**

To replace the controller module, you must meet certain requirements.

2. **Shut down the impaired controller**

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

3. **Replace the controller**

Replacing the controller includes removing the impaired controller, moving the FRU components to the replacement controller module, and then installing the replacement controller module in the enclosure.

4. **Restore and verify the system configuration**

Verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

5. **Give back the controller**

Transfer the ownership of storage resources back to the replacement controller.

6. **Complete controller replacement**

Verify the LIfs, check cluster health, and return the failed part to NetApp.

Requirements to replace the controller - FAS70 and FAS90

Before replacing the controller in your FAS70 or FAS90 system, ensure you meet the necessary requirements for a successful replacement. This includes verifying all other components in the system are functioning properly, verifying that you have the correct replacement controller, and saving the controller's console output to a text log file.

Review the requirements for replacing the controller.

- All drive shelves must be working properly.
- The healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the "impaired controller").
- Do not use this procedure for controller upgrades; instead, refer to the Choose your controller hardware upgrade procedure for guidance.
- If your system is in a MetroCluster configuration, you must review the section Choosing the correct recovery procedure to determine whether you should use this controller replacement procedure.
- You must replace the failed component with the field-replaceable unit (FRU) you received from NetApp.

- You must replace a controller module with a controller module of the same model type. You cannot upgrade your system by just replacing the controller module.
- You cannot change any drives or drive shelves as part of this procedure.
- Because the boot device is located on the System Management module that is installed in the back of the system, you do not need to move the boot device when replacing a controller module.
- It is important that you apply the commands in these steps on the correct systems:
  - The *impaired* controller is the controller that is being replaced.
  - The *replacement* controller is the new controller that is replacing the impaired controller.
  - The *healthy* controller is the surviving controller.
- You must always capture the controller's console output to a text log file.

  This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

What's next?

After you've reviewed the requirements to replace your FAS70 or FAS90 controller, you need to shut down the impaired controller.

Shut down the impaired controller - FAS70 and FAS90

Shut down the controller in your FAS70 or FAS90 storage system to prevent data loss and ensure system stability when replacing the controller.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

What's next?

After you've shut down the controller, you need to replace the controller.

Replace the controller - FAS70 and FAS90

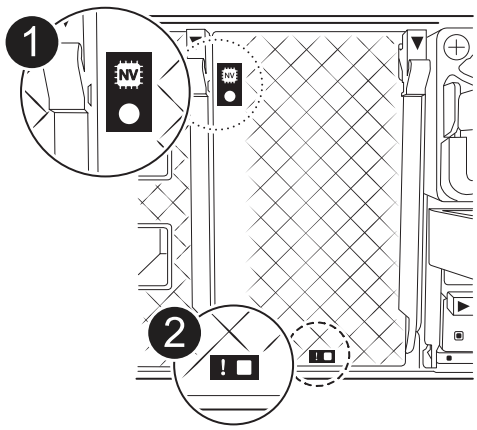
Replace the controller in your FAS70 or FAS90 system when a hardware failure requires it. The replacement process involves removing the impaired controller, moving the components to the replacement controller, installing the replacement controller, and rebooting it.

Step 1: Remove the controller module

You must remove the controller module from the enclosure when you replace the controller module or replace a component inside the controller module.

Steps

1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:

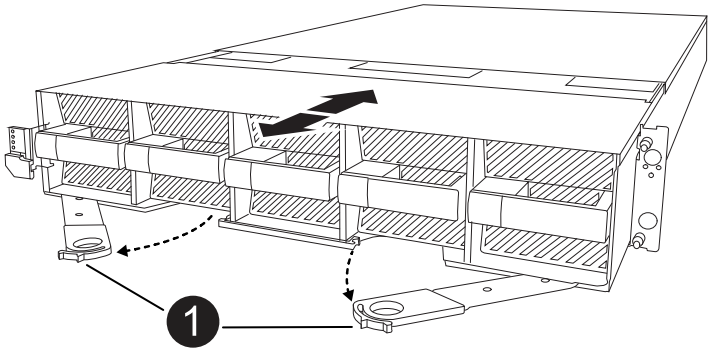


1	NVRAM status LED
2	NVRAM attention LED

- If the NV LED is off, go to the next step.
- If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.

2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

   The controller module moves slightly out of the enclosure.



1	Locking cam latches

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

   Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

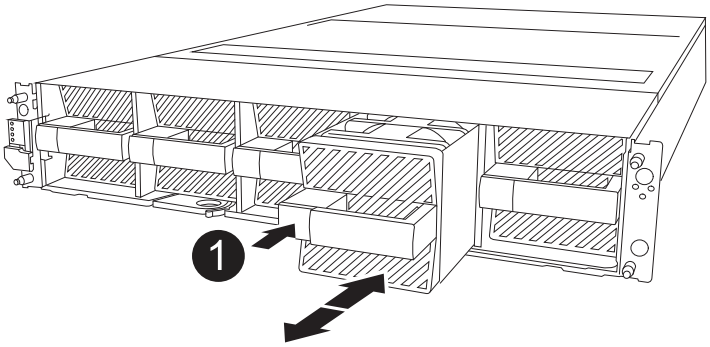
Step 2: Move the fans

You must remove the five fan modules from the impaired controller module to the replacement controller module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Press the gray locking button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.

   The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1	Black locking button

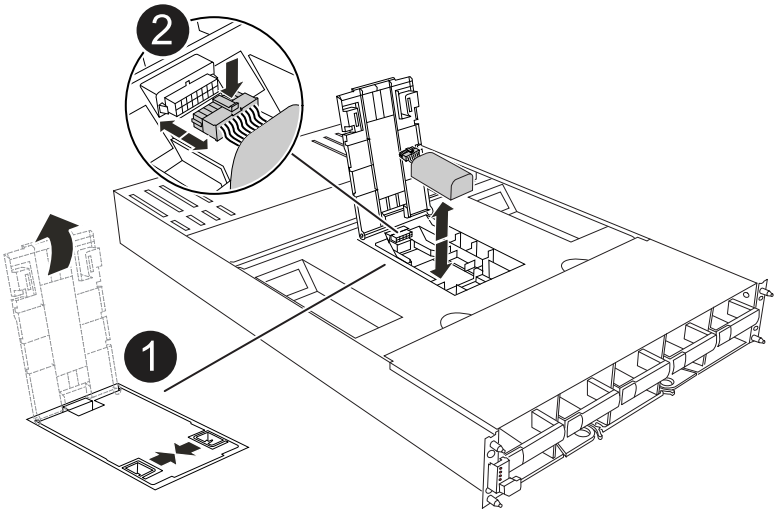
4. Install the fan in the replacement controller module:
   a. Align the edges of the fan housing with the opening in the front of the replacement controller module.
   b. Gently slide the fan module all the way into the replacement controller module until it locks in place.
5. Repeat the preceding steps for the remaining fan modules.

Step 3: Move the NV battery

Move the NV battery to the replacement controller.

Steps

1. Open the NV battery air duct cover and locate the NV battery.



1	NV battery air duct cover
2	NV battery plug
3	NV battery pack

2. Lift the battery up to access the battery plug.

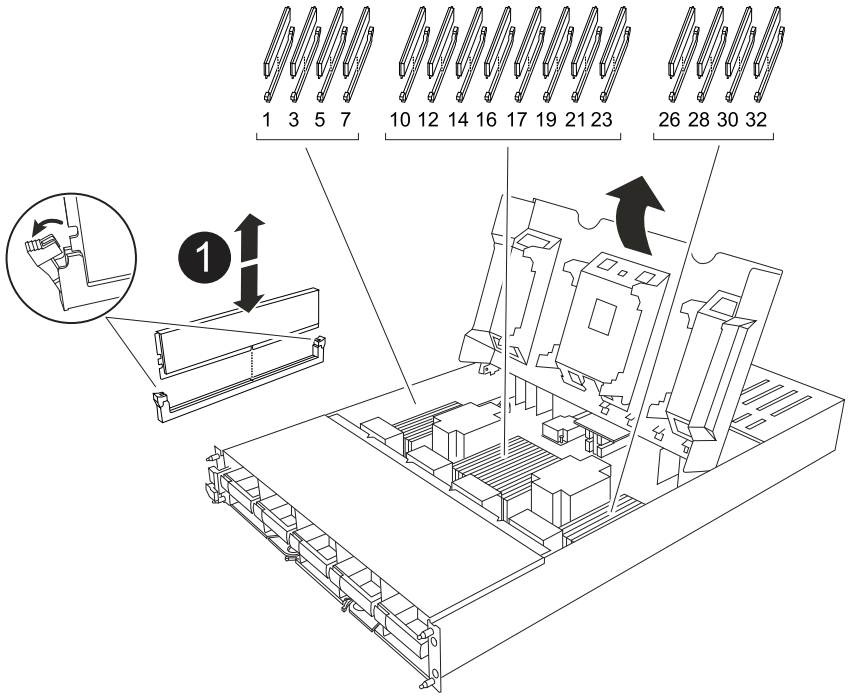
3. Squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Lift the battery out of the air duct and controller module.
5. Move the battery pack to the replacement controller module and then install it in the NV battery air duct:
   a. Open the NV battery air duct in the replacement controller module.
   b. Plug the battery plug into the socket and make sure that the plug locks into place.
   c. Insert the battery pack into the slot and press firmly down on the battery pack to make sure that it is locked into place.
   d. Close the air duct cover.

Step 4: Move system DIMMs

Move the DIMMs to the replacement controller module.

Steps

1. Open the motherboard air duct and locate the DIMMs.



1	System DIMM

2. Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller module in the proper orientation.
3. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

> Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.

4. Locate the slot where you are installing the DIMM in the replacement controller module.
5. Insert the DIMM squarely into the slot.

   The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

   Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

6. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
7. Repeat these steps for the remaining DIMMs. Close the motherboard air duct.

Step 5: Install the controller module

Reinstall the controller module and boot it.

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

   It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans

   Do not use excessive force when sliding the controller module into the enclosure to avoid damaging the connectors.

   The controller boots to the LOADER prompt as soon as it is fully seated.

4. From the LOADER prompt, enter `show date` to display the date and time on the replacement controller. Date and time are in GMT.

   Time displayed is local time not always GMT and is displayed in 24hr mode.

5. Set the current time in GMT with the `set time hh:mm:ss` command. You can get the current GMT from the partner node the `date -u`command.
6. Recable the storage system, as needed.

   If you removed the transceivers (QSFPs or SFPs), remember to reinstall them if you are using fiber optic cables.

What's next?

After you've replaced the impaired FAS70 or FAS90 controller, you need to restore the system configuration.

Restore and verify the system configuration - FAS70 and FAS90

Verify that the controller's HA configuration is active and functioning correctly in your FAS70 or FAS90 storage system, and confirm that the system's adapters list all the paths to the disks.

Step 1: Verify HA config settings

You must verify the `HA` state of the controller module and, if necessary, update the state to match your system configuration.

Steps

1. Boot to maintenance mode: `boot_ontap maint`
   a. Enter `y` when you see *Continue with boot?*.

      If you see the *System ID mismatch* warning message, enter `y`.

2. Enter `sysconfig -v` and capture the display contents.

   If you see *PERSONALITY MISMATCH* contact customer support.

3. From the `sysconfig -v` output, compare the adapter card information with the cards and locations in the replacement controller.
4. Verify that all components display the same `HA` state: `ha-config show`

   The HA state should be the same for all components.

5. If the displayed system state of the controller module does not match your system configuration, set the `HA` state for the controller module: `ha-config modify controller ha`

   The value for the HA state can be one of the following:

   - `ha`
   - `mcc` (not supported)
   - `mccip` (not supported in ASA systems)
   - `non-ha` (not supported)

6. Confirm that the setting has changed: `ha-config show`

Step 2: Verify disk list

Steps

1. Verify that the adapter lists the paths to all disks with the `storage show disk -p`.

   If you see any issues, check cabling and reseat cables.

2. Exit Maintenance mode: `halt`.

What's next?

After you've restored and verified the system configuration for your FAS70 or FAS90 system, you need to give back the controller.

Give back the controller - FAS70 and FAS90

Return control of storage resources to the replacement controller so your FAS70 or

FAS90 system can resume normal operation. The give back procedure varies based on the encryption type used by your system: no encryption or Onboard Key Manager (OKM) encryption.

No encryption

Return the impaired controller to normal operation by giving back its storage.

Steps

1. From the LOADER prompt, enter `boot_ontap`.
2. Press <enter> when console messages stop.
   - If you see the *login* prompt, go to the next step at the end of this section.
   - If you see *Waiting for giveback*, press the <enter> key, log into the partner node, and then go to the next step at the end of this section.
3. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`
5. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

Onboard encryption (OKM)

Reset onboard encryption and return the controller to normal operation.

Steps

1. From the LOADER prompt, enter `boot_ontap maint`.
2. Boot to the ONTAP menu from the LOADER prompt `boot_ontap menu` and select option 10.
3. Enter the OKM passphrase.

   You are prompted twice for the passphrase.

4. Enter the backup key data when prompted.
5. At the boot menu, enter option `1` for normal boot.
6. Press <enter> when *Waiting for giveback* is displayed.
7. Move the console cable to the partner node and login as `admin`.
8. Give back only the CFO aggregates (the root aggregate): `storage failover giveback -fromnode local -only-cfo-aggregates true`
   - If you encounter errors, contact NetApp Support.
9. Wait 5 minutes after the giveback report completes, and check failover status and giveback status: `storage failover show` and `storage failover show-giveback`.
10. Synchronize and verify status of the keys:
    a. Move the console cable back to the replacement controller.
    b. Synchronize missing keys: `security key-manager onboard sync`

       You are prompted for the cluster-wide passphrase of OKM for the cluster.

    c. Verify status of the keys: `security key-manager key query -restored false`

The output should show no results when when properly synchronized.

If the output shows results (the key IDs of keys that are not present in the system's internal key table), contact NetApp Support.

11. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
12. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`
13. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

What's next?

After you've transferred the ownership of storage resources back to the replacement controller, you need to complete the controller replacement procedure.

Complete controller replacement - FAS70 and FAS90

To complete the controller replacement for your AFF A1K system, first restore the NetApp Storage Encryption configuration (if necessary). Next, confirm that the logical interfaces (LIFs) are reporting to their home ports and perform a cluster health check. Finally, return the failed part to NetApp.

Step 1: Verify LIFs and check cluster health

Before returning the replacement node to service, verify that the logical interfaces are on their home ports, check the cluster health, and reset automatic giveback.

Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

   If any logical interfaces are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`

2. Check the health of your cluster. See the How to perform a cluster health check with a script in ONTAP KB article for more information.
3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`

Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace a DIMM - FAS70 and FAS90

Replace a DIMM in your FAS70 or FAS90 system if excessive correctable or

uncorrectable memory errors are detected. Such errors can prevent the storage system from booting ONTAP. The replacement process involves shutting down the impaired controller, removing it, replacing the DIMM, reinstalling the controller, and then returning the failed part to NetApp.

Before you begin

- Make sure all other components in the system are functioning properly; if not, you must contact technical support.
- Make sure you replace the failed component with a replacement component you received from NetApp.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

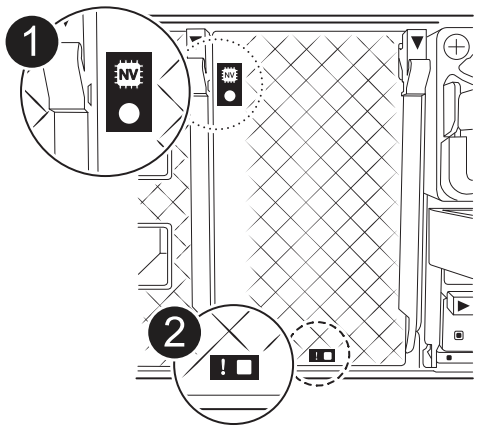
If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

Step 2: Remove the controller module

You must remove the controller module from the enclosure when you replace the controller module or replace a component inside the controller module.

Steps

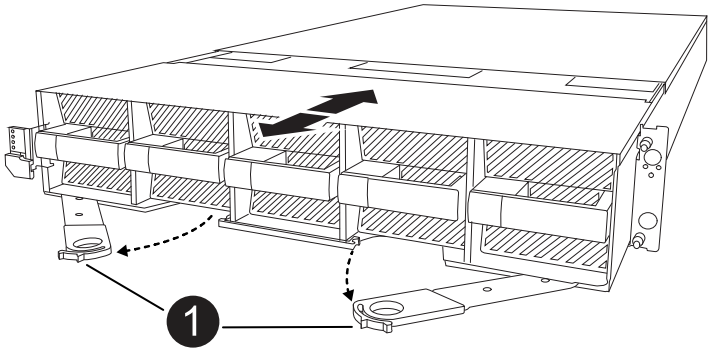
1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:



1	NVRAM status LED
2	NVRAM attention LED

   - If the NV LED is off, go to the next step.
   - If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.
2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

   The controller module moves slightly out of the enclosure.



1	Locking cam latches

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

   Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

Step 3: Replace a DIMM

You must replace a DIMM when the system reports a permanent failure condition for that DIMM.

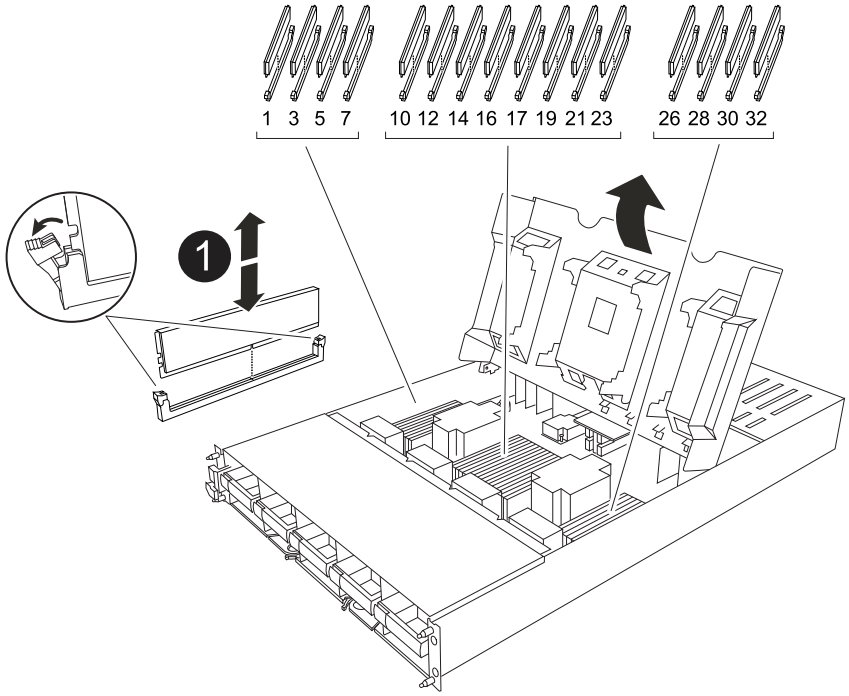
1. If you are not already grounded, properly ground yourself.
2. Open the controller air duct on the top of the controller.
   a. Insert your fingers in the recesses at the far ends of the air duct.
   b. Lift the air duct and rotate it upward as far as it will go.
3. Locate the DIMMs on your controller module and identify the DIMM for replacement.

   DIMMs locations are dependent on the system model:

Model	DIMM slot location
FAS70	Slots 3, 10, 19, 26
FAS90	Slots 3, 7, 10, 14, 19, 23, 26, 30

4. Eject the DIMM from its slot by slowly pushing apart the two DIMM ejector tabs on either side of the DIMM, and then slide the DIMM out of the slot.

   Carefully hold the DIMM by the edges to avoid pressure on the components on the DIMM circuit board.



1	DIMM and DIMM ejector tabs

5. Remove the replacement DIMM from the antistatic shipping bag, hold the DIMM by the corners, and align it to the slot.

   The notch among the pins on the DIMM should line up with the tab in the socket.

6. Make sure that the DIMM ejector tabs on the connector are in the open position, and then insert the DIMM squarely into the slot.

   The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and reinsert it.

   Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.

7. Push carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at the ends of the DIMM.
8. Close the controller air duct.

Step 4: Install the controller

Reinstall the controller module and boot it.

Steps

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

   It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.

3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans

   Do not use excessive force when sliding the controller module into the enclosure to avoid damaging the connectors.

   The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.
5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace a fan - FAS70 and FAS90

Replace a fan module in your FAS70 or FAS90 system when a fan fails or is not operating efficiently, as this can affect system cooling and overall performance. The replacement process involves shutting down the controller, removing the controller, replacing the fan, reinstalling the controller, and returning the failed part to NetApp.

Steps

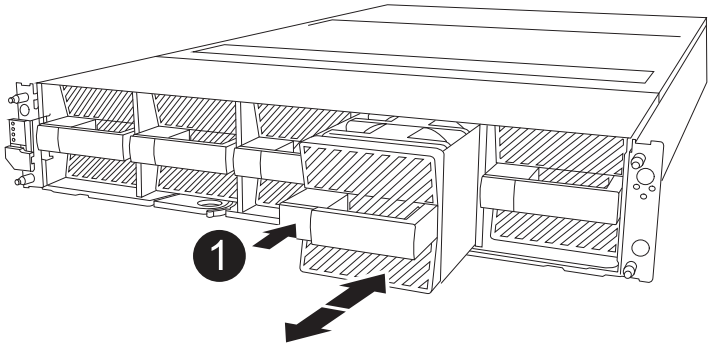
1. If you are not already grounded, properly ground yourself.
2. Remove the bezel (if necessary) with two hands, by grasping the openings on each side of the bezel, and then pulling it toward you until the bezel releases from the ball studs on the chassis frame.
3. Identify the fan module that you must replace by checking the console error messages and looking at the Attention LED on each fan module.

   Facing the controller module, fan modules are numbered 1 through 5, from left to right.

   There is a single LED for each fan. It is green when the fan is functioning correctly and amber when not.

4. Press the black button on the fan module and pull the fan module straight out of the chassis, making sure that you support it with your free hand.

   The fan modules are short. Always support the bottom of the fan module with your free hand so that it does not suddenly drop free from the chassis and injure you.



1	Black release button

5. Set the fan module aside.
6. Align the edges of the replacement fan module with the opening in the chassis, and then slide it into the chassis until it snaps into place.

   When inserted into a live system, the amber Attention LED turns off once the fan is recognized by that system.

7. Align the bezel with the ball studs, and then gently push the bezel onto the ball studs.
8. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace the Flash Cache module carrier or a caching module - FAS70 and FAS90

The NVMe SSD Flash Cache module carrier in your FAS70 or FAS90 system contains one or two Flash Cache modules (caching modules) with a single SSD Flash Cache drive integrated into each caching module.

The FAS70 supports 2TB caching modules and FAS90 supports 4TB caching modules. You cannot mix caching modules of different capacity in the Flash Cache module carrier.

You can perform either of the following procedures depending on what component you need to replace: the entire Flash Cache module carrier or a caching module.

- Replace the Flash Cache module carrier
- Replace the caching module

Replace the Flash Cache module carrier

The Flash Cache module carrier is located in slot 6 and houses up to two Flash Cache modules. You cannot hot-swap the Flash Cache module carrier

Before you begin

- Ensure your storage system has the appropriate operating system for the replacement Flash Cache module carrier.

- Confirm all other components are functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired node

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

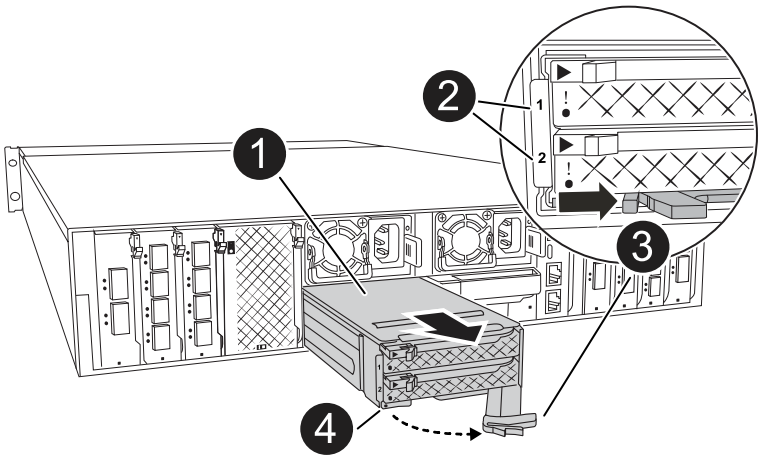
If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

Step 2: Replace the Flash Cache module carrier

Perform the following steps to replace the Flash Cache module carrier.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the failed Flash Cache module carrier, in slot 6, by the lit amber Attention LED on the front of the Flash Cache module carrier.



1	Flash Cache module carrier
2	Caching module slot numbers
3	Flash Cache module carrier cam handle
4	Flash Cache module carrier fault LED

3. Remove the failed Flash Cache module carrier:
   a. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.

b. Pinch the blue tab at the bottom of the Flash Cache module carrier.

c. Rotate the tab away from the module.

4. Pull the Flash Cache module carrier out of the controller module and set it on an antistatic mat.
5. Move the caching modules to the replacement Flash Cache module carrier:
   a. Pinch the Terra Cotta tab at the top of the caching module and rotate the cam handle away from the caching module.
   b. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the Flash Cache module carrier.
   c. Install the caching module into the same slot in the replacement Flash Cache module carrier and rotate the cam handle to the closed position on the caching module to lock it in place.
6. Repeat these steps if there is a second caching module.
7. Install the replacement Flash Cache module carrier into the system:
   a. Align the module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
   c. Rotate the cable management tray up to the closed position.

Step 3: Reboot the controller

After you replace the Flash Cache module carrier, you must reboot the controller module.

Steps

1. From the LOADER prompt, reboot the node: *bye*

   This reinitializes the I/O cards and other components and reboots the node.

2. Return the node to normal operation: *storage failover giveback -ofnode impaired_node_name*
3. If automatic giveback was disabled, reenable it: *storage failover modify -node local -auto-giveback true*

Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace the caching module

The Flash Cache modules (caching modules) are located in slot 6-1 or in slot 6-2 or in both slot 6-1 and slot 6-2.

You can hot-swap the individual caching modules with caching modules of the same capacity from the same vendor or from a different supported vendor.

Before you begin

- Ensure the replacement caching module has the same capacity as the failed one, from the same vendor or from a different supported vendor.
- Confirm all other components are functioning properly; if not, you must contact technical support.
- The drives in the caching modules are not field replaceable units (FRU). You must replace the entire

caching module.

Steps

1. If you are not already grounded, properly ground yourself.
2. Locate the failed caching module, in slot 6, by the lit amber Attention LED on the front of the caching module.
3. Prepare the caching module slot for replacement as follows:

   a. Record the caching module capacity, part number, and serial number on the target node: *system node run local sysconfig -av 6*

   b. In admin privilege level, prepare the target caching module slot for removal, responding `y` when prompted whether to continue: *system controller slot module remove -node node_name -slot slot_number* The following command prepares slot 6-1 on node1 for removal, and displays a message that it is safe to remove:

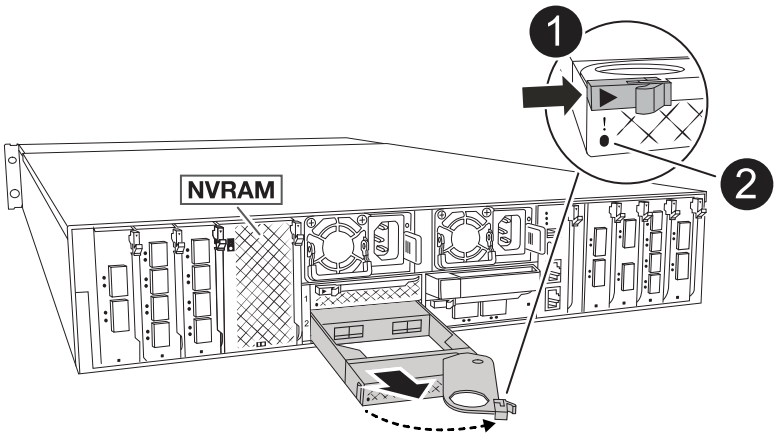
   ```
   ::> system controller slot module remove -node node1 -slot 6-1

   Warning: SSD module in slot 6-1 of the node node1 will be powered off
   for removal.
   Do you want to continue? (y|n): _y_
   The module has been successfully removed from service and powered
   off. It can now be safely removed.
   ```

   c. Display the slot status with the `system controller slot module show` command.

   The caching module slot status displays `powered-off` in the screen output for the caching module that needs replacing.

   ⓘ See the Command man pages for your version of ONTAP for more details.

4. Remove the caching module:



1	Caching module cam handle

2	Caching module fault LED

a. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.

b. Press the terra cotta release button on the front of the caching module.

c. Rotate the cam handle as far as it will go.

d. Remove the caching module module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the Flash Cache module carrier.

   Be sure to support the caching module as you remove it from the Flash Cache module carrier.

5. Install the replacement caching module:

   a. Align the edges of the caching module with the opening in the controller module.

   b. Gently push the caching module into the bay until the cam handle engages.

   c. Rotate the cam handle until it locks into place.

   d. Rotate the cable management tray up to the closed position.

6. Bring the replacement caching module online by using the `system controller slot module insert` command as follows:

   The following command prepares slot 6-1 on node1 for power-on, and displays a message that it is powered on:

```
::> system controller slot module insert -node node1 -slot 6-1

Warning: NVMe module in slot 6-1 of the node localhost will be powered
on and initialized.
Do you want to continue? (y|n): `y`

The module has been successfully powered on, initialized and placed into
service.
```

7. Verify the slot status using the `system controller slot module show` command.

   Make sure that command output reports status for the as `powered-on` and ready for operation.

8. Verify that the replacement caching module is online and recognized, and then visually confirm that the amber attention LED is not lit: `sysconfig -av slot_number`

   If you replace the caching module with a caching module from a different vendor, the new vendor name is displayed in the command output.

9. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace NVRAM - FAS70 and FAS90

Replace the NVRAM in your FAS70 or FAS90 system when the non-volatile memory becomes faulty or requires an upgrade. The replacement process involves shutting down the impaired controller, replacing the NVRAM module or the NVRAM DIMM, reassigning the disks, and returning the failed part to NetApp.

The NVRAM module consists of the NVRAM12 hardware and field-replaceable DIMMs. You can replace a failed NVRAM module or the DIMMs inside the NVRAM module.

Before you begin

- Make sure you have the replacement part available. You must replace the failed component with a replacement component you received from NetApp.
- Make sure all other components in the storage system are functioning properly; if not, contact NetApp support.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

Step 2: Replace the NVRAM module or NVRAM DIMM

Replace the NVRAM module or NVRAM DIMMs using the appropriate following option.

Option 1: Replace the NVRAM module

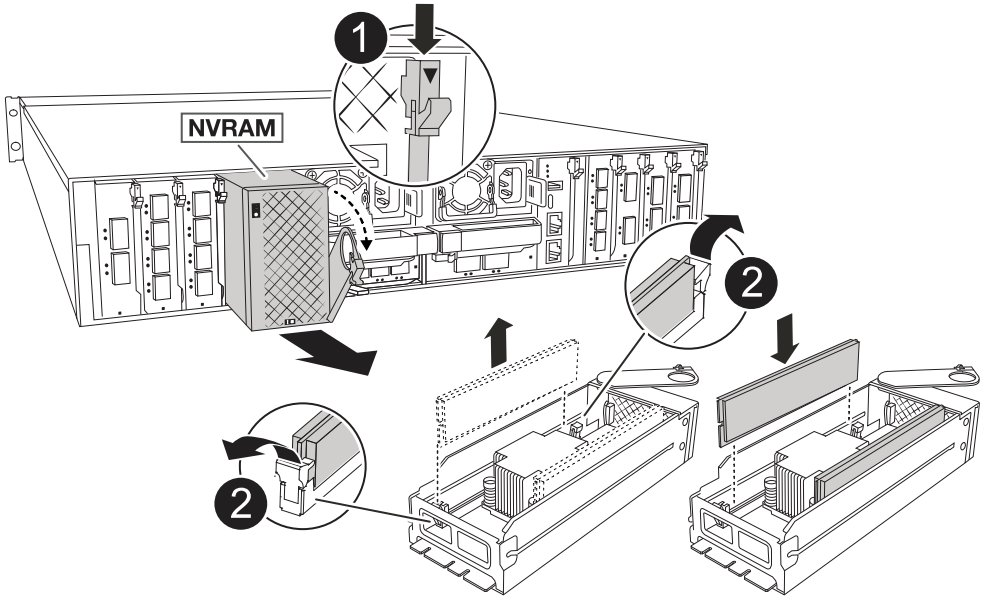
To replace the NVRAM module, locate it in slot 4/5 in the enclosure and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs.
3. Rotate the cable management tray down by gently pulling the pins on the ends of the tray and rotating the tray down.
4. Remove the impaired NVRAM module from the enclosure:
   a. Depress the locking cam button.

      The cam button moves away from the enclosure.

   b. Rotate the cam latch down as far as it will go.
   c. Remove the impaired NVRAM module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.



1	Cam locking button
2	DIMM locking tabs

5. Set the NVRAM module on a stable surface.
6. Remove the DIMMs, one at a time, from the impaired NVRAM module and install them in the replacement NVRAM module.
7. Install the replacement NVRAM module into the enclosure:
   a. Align the module with the edges of the enclosure opening in slot 4/5.

b. Gently slide the module into the slot all the way, and then rotate the cam latch all the way up to lock the module in place.

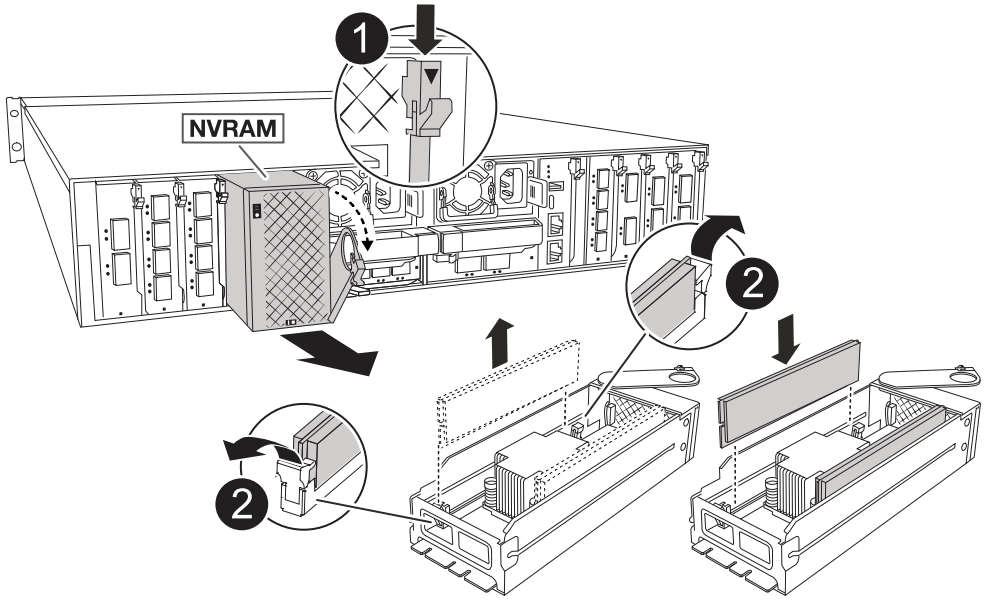
8. Recable the controller.
9. Rotate the cable management tray up to the closed position.

Option 2: Replace the NVRAM DIMM

To replace NVRAM DIMMs in the NVRAM module, you must remove the NVRAM module, and then replace the target DIMM.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug the power supply cables from the PSUs.
3. Rotate the cable management tray down by gently pulling the pins on the ends of the tray and rotating the tray down.
4. Remove the target NVRAM module from the enclosure.



1	Cam locking button
2	DIMM locking tabs

5. Set the NVRAM module on a stable surface.
6. Locate the DIMM to be replaced inside the NVRAM module.

Consult the FRU map label on the side of the NVRAM module to determine the locations of DIMM slots 1 and 2.

7. Remove the DIMM by pressing down on the DIMM locking tabs and lifting the DIMM out of the socket.
8. Install the replacement DIMM by aligning the DIMM with the socket and gently pushing the DIMM into the socket until the locking tabs lock in place.

9. Install the NVRAM module into the enclosure:
    a. Gently slide the module into the slot until the cam latch begins to engage with the I/O cam pin, and then rotate the cam latch all the way up to lock the module in place.
10. Recable the controller.
11. Rotate the cable management tray up to the closed position.

Step 3: Reboot the controller

After you replace the FRU, you must reboot the controller module by plugging the power cables back into the PSU.

Steps

1. Plug the power cables back into the PSU.

   The system will begin to reboot, typically to the LOADER prompt.

2. Enter *bye* at the LOADER prompt.
3. Return the impaired controller to normal operation by giving back its storage: *`storage failover giveback -ofnode _impaired_node_name`*.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
5. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 4: Reassign disks

You must confirm the system ID change when you boot the controller and then verify that the change was implemented.

Disk reassignment is only needed when replacing the NVRAM module and does not apply to NVRAM DIMM replacement.

Steps

1. If the controller is in Maintenance mode (showing the `*>` prompt), exit Maintenance mode and go to the LOADER prompt: *halt*
2. From the LOADER prompt on the controller, boot the controller and enter *y* when prompted to override the system ID due to a system ID mismatch.
3. Wait until the Waiting for giveback… message is displayed on the console of the controller with the replacement module and then, from the healthy controller, verify that the new partner system ID has been automatically assigned: *storage failover show*

   In the command output, you should see a message that the system ID has changed on the impaired controller, showing the correct old and new IDs. In the following example, node2 has undergone replacement and has a new system ID of 151759706.

```
node1:> storage failover show
                                    Takeover
Node                Partner         Possible     State Description
------------      ------------      --------
-------------------------------------
node1               node2           false        System ID changed on
partner (Old:
                                                  151759755, New:
151759706), In takeover
node2               node1           -            Waiting for giveback
(HA mailboxes)
```

4. Give back the controller:
   a. From the healthy controller, give back the replaced controller's storage: *storage failover giveback -ofnode replacement_node_name*

      The controller takes back its storage and completes booting.

      If you are prompted to override the system ID due to a system ID mismatch, you should enter *y*.

      > If the giveback is vetoed, you can consider overriding the vetoes.

      For more information, see the Manual giveback commands topic to override the veto.

   b. After the giveback has been completed, confirm that the HA pair is healthy and that takeover is possible: *storage failover show*

      The output from the `storage failover show` command should not include the System ID changed on partner message.

5. Verify that the disks were assigned correctly: `storage disk show -ownership`

   The disks belonging to the controller should show the new system ID. In the following example, the disks owned by node1 now show the new system ID, 151759706:

```
node1:> storage disk show -ownership

Disk  Aggregate Home  Owner  DR Home  Home ID    Owner ID  DR Home ID
Reserver  Pool
----- ------    ----- ------ -------- -------    -------    -------
---------  ---
1.0.0  aggr0_1  node1 node1  -        151759706  151759706  -
151759706 Pool0
1.0.1  aggr0_1  node1 node1           151759706  151759706  -
151759706 Pool0
.
.
.
```

6. If the system is in a MetroCluster configuration, monitor the status of the controller: *metrocluster node show*

   The MetroCluster configuration takes a few minutes after the replacement to return to a normal state, at which time each controller will show a configured state, with DR Mirroring enabled and a mode of normal. The `metrocluster node show -fields node-systemid` command output displays the impaired system ID until the MetroCluster configuration returns to a normal state.

7. If the controller is in a MetroCluster configuration, depending on the MetroCluster state, verify that the DR home ID field shows the original owner of the disk if the original owner is a controller on the disaster site.

   This is required if both of the following are true:

   - The MetroCluster configuration is in a switchover state.
   - The controller is the current owner of the disks on the disaster site.

     See Disk ownership changes during HA takeover and MetroCluster switchover in a four-node MetroCluster configuration for more information.

8. If your system is in a MetroCluster configuration, verify that each controller is configured: *metrocluster node show - fields configuration-state*

```
node1_siteA::> metrocluster node show -fields configuration-state

dr-group-id            cluster node           configuration-state
-----------            ---------------------- --------------
--------------------
1 node1_siteA          node1mcc-001           configured
1 node1_siteA          node1mcc-002           configured
1 node1_siteB          node1mcc-003           configured
1 node1_siteB          node1mcc-004           configured

4 entries were displayed.
```

9. Verify that the expected volumes are present for each controller: `vol show -node node-name`
10. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.
11. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
12. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace the NV battery - FAS70 and FAS90

Replace the NV battery in your FAS70 or FAS90 system when the battery begins to lose charge or fails, as it is responsible for preserving critical system data during power outages. The replacement process involves shutting down the impaired controller, removing the controller module, replacing the NV battery, reinstalling the controller module, and returning the failed part to NetApp.

All other components in the system must be functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

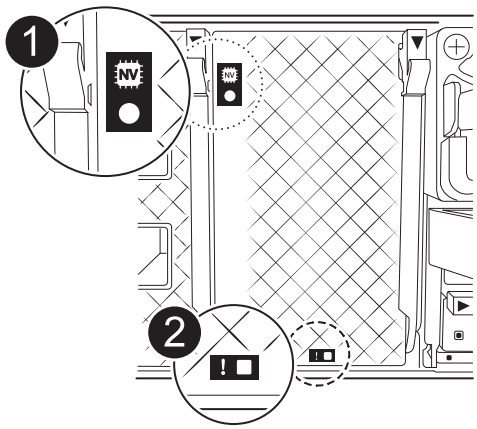
If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

Step 2: Remove the controller module

You must remove the controller module from the enclosure when you replace the controller module or replace a component inside the controller module.

Steps

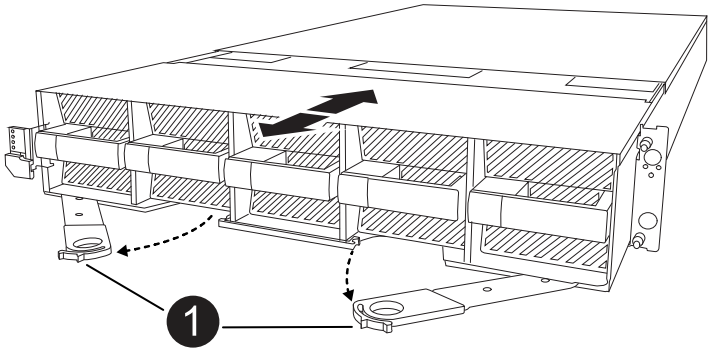
1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:



1	NVRAM status LED
2	NVRAM attention LED

   - If the NV LED is off, go to the next step.
   - If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.
2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

   The controller module moves slightly out of the enclosure.



1	Locking cam latches

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

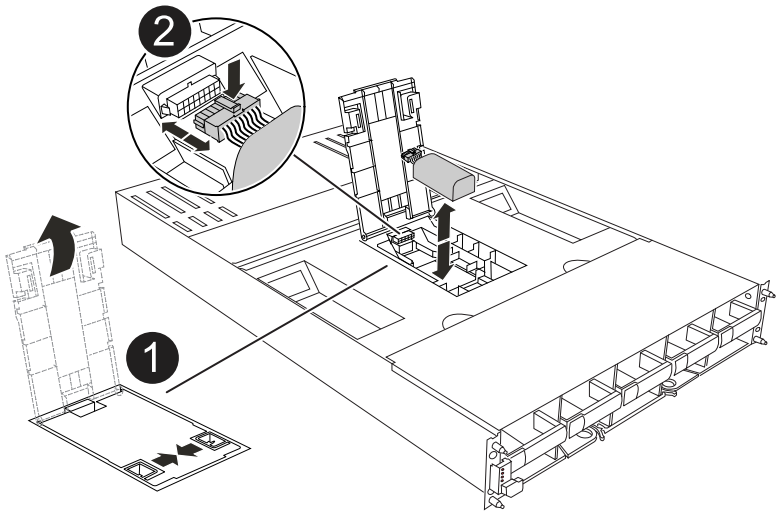
   Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

Step 3: Replace the NV battery

Remove the failed NV battery from the controller module and install the replacement NV battery.

Steps

1. Open the air duct cover and locate the NV battery.



1	NV battery air duct cover
2	NV battery plug

2. Lift the battery up to access the battery plug.
3. Squeeze the clip on the face of the battery plug to release the plug from the socket, and then unplug the battery cable from the socket.
4. Lift the battery out of the air duct and controller module, and then set it aside.

5. Remove the replacement battery from its package.
6. Install the replacement battery pack into the controller:
   a. Plug the battery plug into the riser socket and make sure that the plug locks into place.
   b. Insert the battery pack into the slot and press firmly down on the battery pack to make sure that it is locked into place.
7. Close the NV air duct cover.

   Make sure that the plug locks into the socket.

Step 4: Reinstall the controller module

Reinstall the controller module and boot it.

Steps

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

   It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans

   Do not use excessive force when sliding the controller module into the enclosure to avoid damaging the connectors.

   The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode` *`impaired_node_name`*.
5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

I/O module

Overview of add and replace an I/O module - FAS70 and FAS90

The FAS70 or FAS90 system offers flexibility in expanding or replacing I/O modules to enhance network connectivity and performance. Adding or replacing an I/O module is essential when upgrading network capabilities or addressing a failed module.

You can replace a failed I/O module in your FAS70 or FAS90 storage system with the same type of I/O module, or with a different kind of I/O module. You can also add an I/O module into a system with empty slots.

- Add an I/O module

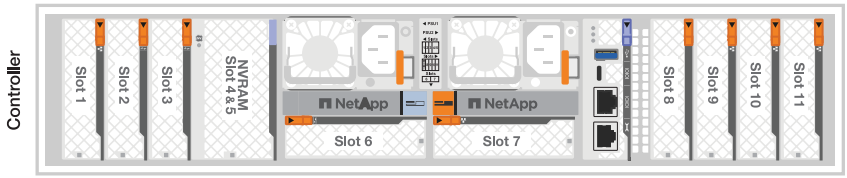
  Adding additional modules can improve redundancy, helping to ensure that the system remains operational even if one module fails.

- Replace an I/O module

  Replacing a failing I/O module can restore the system to its optimal operating state.

I/O slot numbering

The I/O slots on FAS70 and FAS90 controllers are numbered 1 through 11, as shown in the following illustration.



Add an I/O module - FAS70 and FAS90

Add an I/O module to yourFAS70 and FAS90 system to enhance network connectivity and expand your system's ability to handle data traffic.

You can add an I/O module to your FAS70 and FAS90 storage system when there are empty slots available or when all slots are fully populated.

Step 1: Shut down the impaired controller module

Shut down or take over the impaired controller module.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

Before you begin

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message command: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

   The following AutoSupport command suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
`Waiting for giveback…`	Press Ctrl-C, and then respond `y` when prompted.
System prompt or password prompt (enter system password)	Halt or take over the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* When the impaired controller shows Waiting for giveback…, press Ctrl-C, and then respond `y`.

Option 2: MetroCluster configuration

Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster

Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport command: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

   The following AutoSupport command suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next Step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.
System prompt or password prompt (enter system password)	Halt or take over the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* When the impaired controller shows Waiting for giveback…, press Ctrl-C, and then respond `y`.

Step 2: Add the new I/O module

If the storage system has available slots, install the new I/O module into one of the available slots. If all slots are occupied, remove an existing I/O module to make space and then install the new one.

Before you begin

- Check the NetApp Hardware Universe to make sure that the new I/O module is compatible with your storage system and version of ONTAP you're running.
- If multiple slots are available, check the slot priorities in NetApp Hardware Universe and use the best one available for your I/O module.
- Make sure that all other components are functioning properly.

Add I/O module to an available slot

You can add a new I/O module into a storage system with available slots.

Steps

1. If you are not already grounded, properly ground yourself.
2. Rotate the cable management tray down by pulling the buttons on the inside of the cable management tray and rotating it down.
3. Remove the target slot blanking module from the carrier:
   a. Depress the cam latch on the blanking module in the target slot.
   b. Rotate the cam latch away from the module as far as it will go.
   c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.
4. Install the I/O module:
   a. Align the I/O module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
5. Cable the I/O module to the designated device.

   Make sure that any unused I/O slots have blanks installed to prevent possible thermal issues.

6. Rotate the cable management tray up to the closed position.
7. From the LOADER prompt, reboot the node:

   ```
   bye
   ```

   This reinitializes the I/O module and other components and reboots the node.

8. Give back the controller from the partner controller:

   ```
   storage failover giveback -ofnode target_node_name
   ```

9. Repeat these steps for controller B.
10. From the healthy node, restore automatic giveback if you disabled it:

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

11. If AutoSupport is enabled, restore automatic case creation:

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

Add I/O module to a fully-populated system

You can add an I/O module to a fully-populated system by removing an existing I/O module and installing a new one in its place.

About this task

Make sure you understand the following scenarios for adding a new I/O module to a fully-populated system:

Scenario	Action required
NIC to NIC (same number of ports)	The LIFs will automatically migrate when its controller module is shut down.
NIC to NIC (different number of ports)	Permanently reassign the selected LIFs to a different home port. See Migrating a LIF for more information.
NIC to storage I/O module	Use System Manager to permanently migrate the LIFs to different home ports, as described in Migrating a LIF.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling on the target I/O module.
3. Rotate the cable management tray down by pulling the buttons on the inside of the cable management tray and rotating it down.
4. Remove the target I/O module from the chassis:
   a. Depress the cam latch button.
   b. Rotate the cam latch away from the module as far as it will go.
   c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.

      Make sure that you keep track of which slot the I/O module was in.
5. Install the I/O module into the target slot in the enclosure:
   a. Align the module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
6. Cable the I/O module to the designated device.
7. Repeat the remove and install steps to replace additional modules for the controller.
8. Rotate the cable management tray up to the closed position.
9. Reboot the controller from the LOADER prompt:_bye_

   This reinitializes the PCIe cards and other components and reboots the node.

   If you encounter an issue during reboot, see BURT 1494308 - Environment shutdown might be triggered during I/O module replacement
10. Give back the controller from the partner controller:

    ```
    storage failover giveback -ofnode target_node_name
    ```
11. Enable automatic giveback if it was disabled:

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

12. Do one of the following:
    - If you removed a NIC I/O module and installed a new NIC I/O module, use the following network command for each port:

      `storage port modify -node *<node name> -port *<port name> -mode network`

    - If you removed a NIC I/O module and installed a storage I/O module, install and cable your NS224 shelves, as described in Hot-add workflow.
13. Repeat these steps for controller B.

Replace an I/O module - FAS70 and FAS90

Replace an I/O module in your FAS70 or FAS90 system when the module fails or requires an upgrade to support higher performance or additional features. The replacement process involves shutting down the controller, replacing the failed I/O module, rebooting the controller, and returning the failed part to NetApp.

You can use this procedure with all versions of ONTAP supported by your storage system.

Before you begin

- You must have the replacement part available.
- Make sure all other components in the storage system are functioning properly; if not, contact technical support.

Step 1: Shut down the impaired node

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

Do not use this procedure if your system is in a two-node MetroCluster configuration.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- If you have a MetroCluster configuration, you must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state (`metrocluster node show`).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport command: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

   The following AutoSupport command suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next Step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Halt or take over the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name` When the impaired controller shows Waiting for giveback…, press Ctrl-C, and then respond `y`.

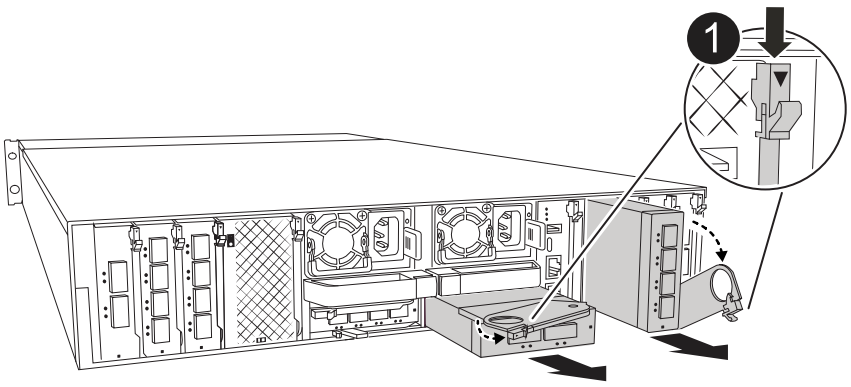
Step 2: Replace a failed I/O module

To replace an I/O module, locate it within the enclosure and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Unplug any cabling on the target I/O module.
3. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.

   This following illustration shows removing a horizontal and vertical I/O module. Typically, you will only remove one I/O module.



1	I/O cam latch

   Make sure that you label the cables so that you know where they came from.

4. Remove the target I/O module from the enclosure:
   a. Depress the cam button on the target module.
   b. Rotate the cam latch away from the module as far as it will go.
   c. Remove the module from the enclosure by hooking your finger into the cam lever opening and pulling the module out of the enclosure.

      Make sure that you keep track of which slot the I/O module was in.

5. Set the I/O module aside.
6. Install the replacement I/O module into the enclosure:
   a. Align the module with the edges of the enclosure slot opening.
   b. Gently slide the module into the slot all the way into the enclosure, and then rotate the cam latch all the way up to lock the module in place.
7. Cable the I/O module.
8. Rotate the cable management tray up to the closed position.

Step 3: Reboot the controller

After you replace an I/O module, you must reboot the controller.

Steps

1. Reboot the controller from the LOADER prompt:

   ```
   bye
   ```

   Rebooting the impaired controller also reinitializes the I/O modules and other components.

2. Return the impaired controller to normal operation by giving back its storage:

   ```
   storage failover giveback -ofnode impaired_node_name
   ```

3. Restore automatic giveback from the console of the healthy controller:

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

4. If AutoSupport is enabled, restore automatic case creation:

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

Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace a power supply - FAS70 and FAS90

Replace an AC or DC power supply unit (PSU) in your FAS70 or FAS90 system when it fails or becomes faulty, ensuring that your system continues to receive the required power for stable operation. The replacement process involves disconnecting the faulty PSU from the power source, unplugging the power cable, replacing the faulty PSU, and then reconnecting it to the power source.

The power supplies are redundant and hot-swappable.

About this task

This procedure is written for replacing one PSU at a time.

Do not mix PSUs with different efficiency ratings. Always replace like for like.

Use the appropriate procedure for your type of PSU: AC or DC.

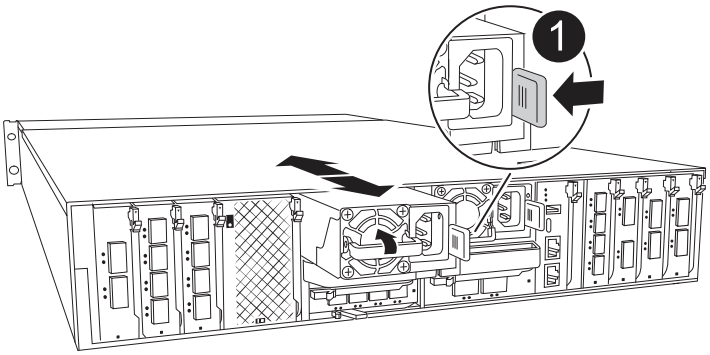
Option 1: Replace an AC PSU

To replace an AC PSU, complete the following steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Identify the PSU you want to replace, based on console error messages or through the red Fault LED on the PSU.
3. Disconnect the PSU:
   a. Open the power cable retainer, and then unplug the power cable from the PSU.
4. Remove the PSU by rotating the handle up, press the locking tab, and then pull PSU out of the controller module.

   The PSU is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.



1	Terracotta PSU locking tab

5. Install the replacement PSU in the controller module:
   a. Using both hands, support and align the edges of the replacement PSU with the opening in the controller module.
   b. Gently push the PSU into the controller module until the locking tab clicks into place.

      The power supplies will only properly engage with the internal connector and lock in place one way.

      To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the system.

6. Reconnect the PSU cabling:
   a. Reconnect the power cable to the PSU.
   b. Secure the power cable to the PSU using the power cable retainer.

   Once power is restored to the PSU, the status LED should be green.

7. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

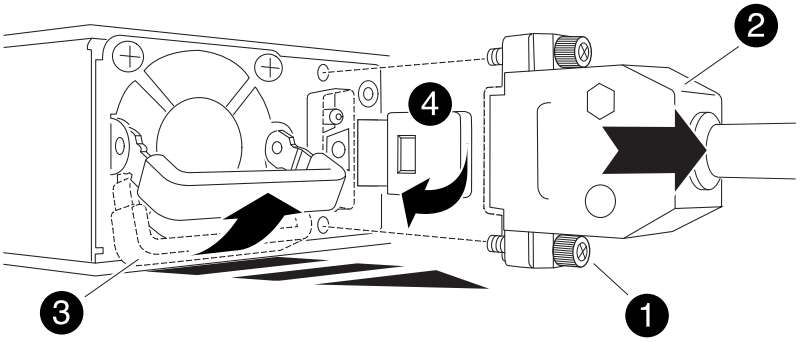
Option 2: Replace a DC PSU

To replace a DC PSU, complete the following steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Identify the PSU you want to replace, based on console error messages or through the red Fault LED on the PSU.
3. Disconnect the PSU:
   a. Unscrew the D-SUB DC cable connector using the thumb screws on the plug.
   b. Unplug the cable from the PSU and set it aside.
4. Remove the PSU by rotating the handle up, press the locking tab, and then pull the PSU out of the controller module.

   The PSU is short. Always use two hands to support it when removing it from the controller module so that it does not suddenly swing free from the controller module and injure you.



1	Thumb screws
2	D-SUB DC power PSU cable connector
3	Power supply handle
4	Blue PSU locking tab

5. Install the replacement PSU in the controller module:
   a. Using both hands, support and align the edges of the replacement PSU with the opening in the controller module.
   b. Gently push the PSU into the controller module until the locking tab clicks into place.

      The power supplies will only properly engage with the internal connector and lock in place one

way.

> To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the system.

6. Reconnect the D-SUB DC power cable:
   a. Plug the power cable connector into the PSU.
   b. Secure the power cable to the PSU with the thumbscrews.

      Once power is restored to the PSU, the status LED should be green.
7. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace the real-time clock battery - FAS70 and FAS90

Replace the real-time clock (RTC) battery, commonly known as a coin cell battery, in your FAS70 or FAS90 system to ensure that services and applications relying on accurate time synchronization remain operational.

Before you begin

- Understand that you can use this procedure with all versions of ONTAP supported by your system.
- Make sure all other components in the system are functioning properly; if not, you must contact technical support.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

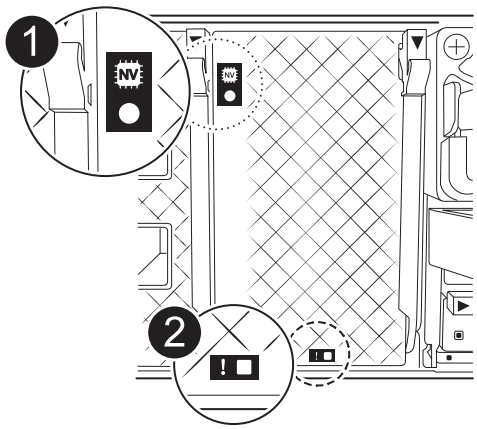
If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode` *`impaired_node_name`* `-halt` *`true`* The *-halt true* parameter brings you to the LOADER prompt.

Step 2: Remove the controller module

You must remove the controller module from the enclosure when you replace the controller module or replace a component inside the controller module.

Steps

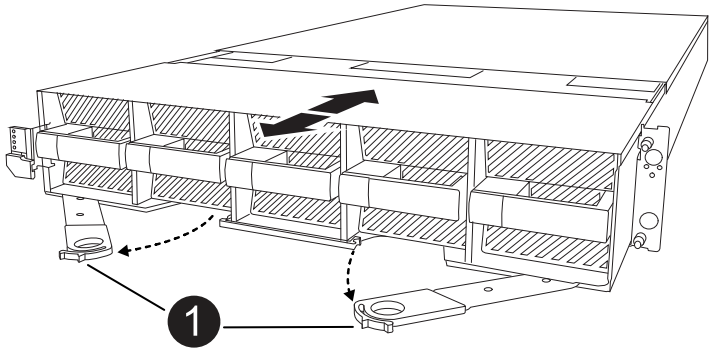
1. Check the NVRAM status LED located in slot 4/5 of the system. There is also an NVRAM LED on the front panel of the controller module. Look for the NV icon:



1	NVRAM status LED
2	NVRAM attention LED

   - If the NV LED is off, go to the next step.
   - If the NV LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.
2. If you are not already grounded, properly ground yourself.
3. On the front of the unit, hook your fingers into the holes in the locking cams, squeeze the tabs on the cam levers, and gently, but firmly rotate both latches toward you at the same time.

   The controller module moves slightly out of the enclosure.



1	Locking cam latches

4. Slide the controller module out of the enclosure and place it on a flat, stable surface.

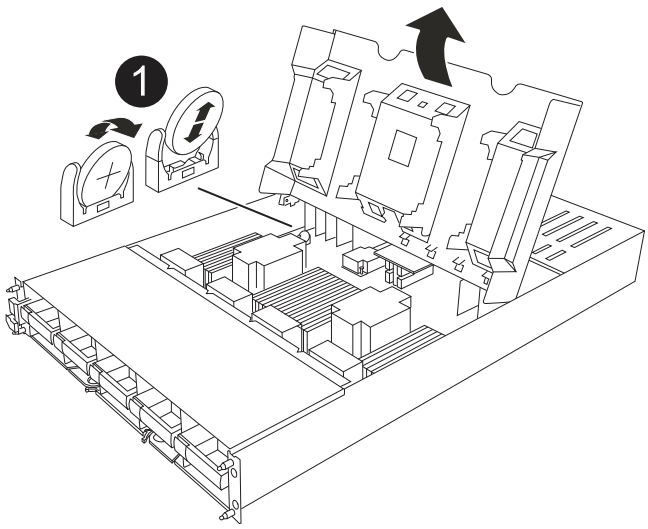
   Make sure that you support the bottom of the controller module as you slide it out of the enclosure.

Step 3: Replace the RTC battery

Remove failed RTC battery and install the replacement RTC battery.

Steps

1. Open the controller air duct on the top of the controller.
   a. Insert your fingers in the recesses at the far ends of the air duct.
   b. Lift the air duct and rotate it upward as far as it will go.
2. Locate the RTC battery under the air duct.



1	RTC battery and housing

3. Gently push the battery away from the holder, rotate it away from the holder, and then lift it out of the holder.

Note the polarity of the battery as you remove it from the holder. The battery is marked with a plus sign and must be positioned in the holder correctly. A plus sign near the holder tells you how the battery should be positioned.

4. Remove the replacement battery from the antistatic shipping bag.
5. Note the polarity of the RTC battery, and then insert it into the holder by tilting the battery at an angle and pushing down.
6. Visually inspect the battery to make sure that it is completely installed into the holder and that the polarity is correct.

Step 4: Reinstall the controller module

Reinstall the controller module and boot it.

Steps

1. Ensure the air duct is completely closed by rotating it down as far as it will go.

   It must lie flush against the controller module sheet metal.

2. Align the end of the controller module with the opening in the enclosure, and slide the controller module into the chassis with the levers rotated away from the front of the system.
3. Once the controller module stops you from sliding it farther, rotate the cam handles inward until they latch back under the fans

   Do not use excessive force when sliding the controller module into the enclosure to avoid damaging the connectors.

   The controller module begins to boot as soon as it is fully seated in the enclosure.

4. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode` *`impaired_node_name`*.
5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
6. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 5: Reset the time and date on the controller

After replacing the RTC battery, inserting controller and powering on first BIOS reset, you will see the following error messages: `RTC date/time error. Reset date/time to default RTC power failure error` These messages are excpected and you can continue with this procedure.

Steps

1. Check the date and time on the healthy controller with the *cluster date show* command.

If your system stops at the boot menu, select the option for `Reboot node` and respond *y* when prompted, then boot to LOADER by pressing *Ctrl-C*

a. At the LOADER prompt on the target controller, check the time and date with the `cluster date show` command.

b. If necessary, modify the date with the `set date mm/dd/yyyy` command.

c. If necessary, set the time, in GMT, using the `set time hh:mm:ss` command.

   1. Confirm the date and time on the target controller.
   2. At the LOADER prompt, enter *bye* to reinitialize the PCIe cards and other components and let the controller reboot.

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

Replace system management module - FAS70 and FAS90

Replace the System Management module in your FAS70 or FAS90 system when it becomes defective or its firmware is corrupted. The replacement process involves shutting down the controller, replacing the failed System Management module, rebooting the controller, updating the license keys, and returning the failed part to NetApp.

The System Management module, located at the back of the controller in slot 8, contains onboard components for system management, as well as ports for external management. The target controller must be shut down to replace an impaired System Management module or replace the boot media.

The System Management module has the following onboard components:

- Boot media, allowing boot media replacement without removing the controller module.
- BMC
- Management switch

The System Management module also contains the following ports for external management:

- RJ45 Serial
- USB Serial (Type-C)
- USB Type-A (Boot recovery)
- e0M RJ45 Ethernet

Before you begin

- Make sure all other system components are working properly.
- Make sure that the partner controller is able to take over the impaired controller.
- Make sure you replace the failed component with a replacement component you received from NetApp.

About this task

This procedure uses the following terminology:

- The impaired controller is the controller on which you are performing maintenance.

- The healthy controller is the HA partner of the impaired controller.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller using one of the following options.

Option 1: Most systems

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from priv advanced mode) displays the node name, quorum status of that node, availability status of that node, and operational status of that node.

  Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

   ```
   system node autosupport invoke -node * -type all -message MAINT=<# of hours>h
   ```

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h
   ```

2. Disable automatic giveback:

   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next step.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

Option 2: Controller is in a MetroCluster

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see Synchronize a node with the cluster.
- You must have confirmed that the MetroCluster Configuration State is configured and that the nodes are in an enabled and normal state:

  `metrocluster node show`

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:

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

   The following AutoSupport message suppresses automatic case creation for two hours:

   ```
   cluster1:*> system node autosupport invoke -node * -type all -message
   MAINT=2h
   ```

2. Disable automatic giveback:
   a. Enter the following command from the console of the healthy controller:

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

   b. Enter `y` when you see the prompt *Do you want to disable auto-giveback?*
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying…	Then…
The LOADER prompt	Go to the next section.
Waiting for giveback…	Press Ctrl-C, and then respond `y` when prompted.

If the impaired controller is displaying…	Then…
System prompt or password prompt (enter system password)	Take over or halt the impaired controller from the healthy controller: `storage failover takeover -ofnode impaired_node_name -halt true` The *-halt true* parameter brings you to the LOADER prompt.

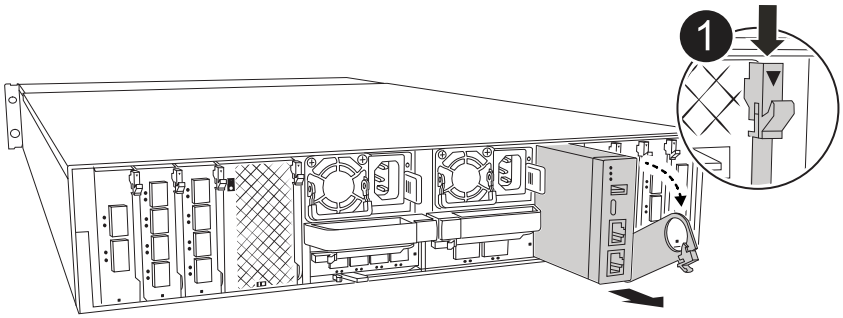
Step 2: Replace the impaired System Management module

Replace the impaired system management module.

Steps

1. Remove the System Management module:

> Make sure NVRAM destage has completed before proceeding. When the LED on the NV module is off, NVRAM is destaged. If the LED is flashing, wait for the flashing to stop. If flashing continues for longer than 5 minutes, contact Technical Support for assistance.



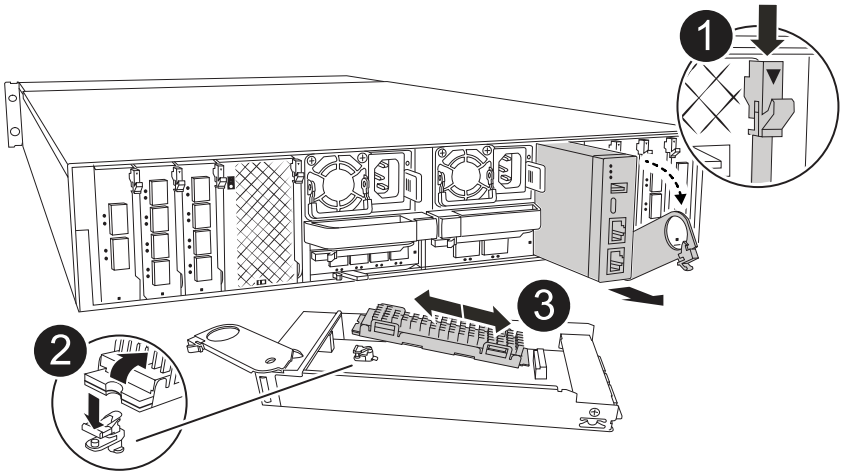
1	System Management module cam latch

   a. If you are not already grounded, properly ground yourself.
   b. Unplug the power supply cables from the PSUs.
2. Remove the System Manage module
   a. Remove any cables connected to the System Management module. Make sure that label where the cables were connected, so that you can connect them to the correct ports when you reinstall the module.
   b. Disconnect the power cords from the PSU for the impaired controller.
   c. Rotate the cable management tray down by pulling the buttons on both sides on the inside of the cable management tray and then rotate the tray down.
   d. Depress the cam button on the System Management module.
   e. Rotate the cam lever down as far as it will go.

f. Loop your finger into the hole on the cam lever and pull the module straight out of the system.

g. Place the System Management module on an anti-static mat, so that the boot media is accessible.

3. Move the boot media to the replacement System Management module:



1	System Management module cam latch
2	Boot media locking button
3	Boot media

a. Press the blue boot media locking button in the impaired System Management module.

b. Rotate the boot media up and slide it out of the socket.

4. Install the boot media in the replacement System Management module:

a. Align the edges of the boot media with the socket housing, and then gently push it squarely into the socket.

b. Rotate the boot media down until it touches the locking button.

c. Depress the blue locking and rotate the boot media all the way down and release the blue locking button.

5. Install the replacement System Management module into the enclosure:

a. Align the edges of the replacement System Management module with the system opening and gently push it into the controller module.

b. Gently slide the module into the slot until the cam latch begins to engage with the I/O cam pin, and then rotate the cam latch all the way up to lock the module in place.

6. Rotate the cable management arm up to the closed position.

7. Recable the System Management module.

Step 3: Reboot the controller module

Reboot the controller module.

Steps

1. Plug the power cables back into the PSU.

   The system will begin to reboot, typically to the LOADER prompt.

2. Enter *bye* at the LOADER prompt.
3. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`.
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto -giveback true`.
5. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`.

Step 4: Install licenses and register serial number

You must install new licenses for the node if the impaired node was using ONTAP features that require a standard (node-locked) license. For features with standard licenses, each node in the cluster should have its own key for the feature.

About this task

Until you install license keys, features requiring standard licenses continue to be available to the node. However, if the node was the only node in the cluster with a license for the feature, no configuration changes to the feature are allowed. Also, using unlicensed features on the node might put you out of compliance with your license agreement, so you should install the replacement license key or keys on the for the node as soon as possible.

Before you begin

The licenses keys must be in the 28-character format.

You have a 90-day grace period in which to install the license keys. After the grace period, all old licenses are invalidated. After a valid license key is installed, you have 24 hours to install all of the keys before the grace period ends.

> If your system was initially running ONTAP 9.10.1 or later, use the procedure documented in Post Motherboard Replacement Process to update Licensing on a AFF/FAS system. If you are unsure of the initial ONTAP release for your system, see NetApp Hardware Universe for more information.

Steps

1. If you need new license keys, obtain replacement license keys on the NetApp Support Site in the My Support section under Software licenses.

   > The new license keys that you require are automatically generated and sent to the email address on file. If you fail to receive the email with the license keys within 30 days, you should contact technical support.

2. Install each license key: `system license add -license-code license-key, license-key...`
3. Remove the old licenses, if desired:
   a. Check for unused licenses: `license clean-up -unused -simulate`
   b. If the list looks correct, remove the unused licenses: `license clean-up -unused`

4. Register the system serial number with NetApp Support.
    - If AutoSupport is enabled, send an AutoSupport message to register the serial number.
    - If AutoSupport is not enabled, call NetApp Support to register the serial number.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the Part Return and Replacements page for further information.

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