Replacing the controller module

You must review the prerequisites for the replacement procedure and select the correct one for your version of the ONTAP operating system.

Before you begin

- All disk shelves must be working properly.
- The healthy node must be able to take over the node that is being replaced (referred to in this procedure as the impaired node).

About this task

- You must replace the failed component with a replacement FRU component you received from your provider.
- You must be replacing 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 disks or disk shelves as part of this procedure.
- In this procedure, the boot device is moved from the impaired node to the replacement node so that the replacement node will boot up in the same version of ONTAP as the old controller.
- It is important that you apply the commands in these steps on the correct systems:
  - The impaired node is the node that is being replaced.
  - The replacement node is the new node that is replacing the impaired node.
  - The healthy node is the surviving node.
- You must always capture the node’s console output to a text file. This provides you a record of the procedure so that you can troubleshoot any issues that you might encounter during the replacement process.

Steps

1. Shutting down the impaired controller on page 1
2. Replacing the controller module hardware on page 2
3. Verifying and setting the HA state of the controller module on page 15
4. Running diagnostics on page 15
5. Completing system restoration on page 16
6. Completing the replacement process on page 18

Shutting down the impaired controller

You can shut down or take over the impaired controller using different procedures, depending on the storage system hardware configuration.
Shutting down the impaired node

To shut down the impaired node, you must determine the status of the node and, if necessary, take over the node so that the healthy node continues to serve data from the impaired node 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 node shows false for eligibility and health, you must correct the issue before shutting down the impaired node.
  
  **ONTAP 9 System Administration Reference**

- If you are using NetApp Storage Encryption, you must have reset the MSID using the instructions in the "Returning SEDs to unprotected mode" section of **ONTAP 9 NetApp Encryption Power Guide**.
  
  **ONTAP 9 NetApp Encryption Power Guide**

- If you have a SAN system, you must have checked event messages (event log show) for impaired node SCSI blade. 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.

Steps

1. If the impaired node is part of an HA pair, disable automatic giveback from the console of the healthy node:

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

2. Take the impaired node to the LOADER prompt:

<table>
<thead>
<tr>
<th>If the impaired node is displaying...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>The LOADER prompt</td>
<td>Go to the next step.</td>
</tr>
<tr>
<td>Waiting for giveback...</td>
<td>Press Ctrl-C, and then respond <strong>y</strong>.</td>
</tr>
<tr>
<td>System prompt or password prompt</td>
<td>Take over or halt the impaired node:</td>
</tr>
<tr>
<td></td>
<td><code>storage failover takeover -ofnode impaired_node_name</code></td>
</tr>
<tr>
<td></td>
<td>When the impaired node shows Waiting for giveback..., press Ctrl-C, and then respond <strong>y</strong>.</td>
</tr>
</tbody>
</table>

Replacing the controller module hardware

To replace the controller module hardware, you must remove the impaired node, move FRU components to the replacement controller module, install the replacement controller module in the chassis, and then boot the system to Maintenance mode.

Steps

1. Removing the controller module on page 3
2. Moving the NVRAM card on page 4
3. Moving PCIe cards on page 6
4. Moving the boot media on page 7
5. Moving the fans on page 9
6. Moving system DIMMs on page 9
7. Installing the NVRAM module on page 11
8. Moving the NVRAM battery on page 11
9. Installing a PCIe riser on page 12
10. Moving the power supply on page 12
Removing the controller module

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

Steps

1. If you are not already grounded, properly ground yourself.
2. Loosen the hook and loop strap binding the cables to the cable management device, and then unplug the system cables and SFPs (if needed) from the controller module, keeping track of where the cables were connected.
   Leave the cables in the cable management device so that when you reinstall the cable management device, the cables are organized.
3. Unplug the controller module power supply from the source, and then unplug the cable from the power supply.
4. Remove the cable management device from the controller module and set it aside.
5. Press down on both of the locking latches, and then rotate both latches downward at the same time.
   The controller module moves slightly out of the chassis.

6. Slide the controller module out of the chassis.
   Make sure that you support the bottom of the controller module as you slide it out of the chassis.
7. Place the controller module on a stable, flat surface, and then open the air duct:
a. Press in the locking tabs on the sides of the air duct toward the middle of the controller module.

b. Slide the air duct toward the fan modules, and then rotate it upward to its completely open position.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Air duct locking tabs</td>
</tr>
<tr>
<td>2</td>
<td>Risers</td>
</tr>
<tr>
<td>3</td>
<td>Air duct</td>
</tr>
</tbody>
</table>

**Moving the NVRAM card**

As part of the controller replacement process, you must remove the NVRAM card from Riser 1 in the impaired controller module and install the card into Riser 1 of the replacement controller module. You should only reinstall Riser 1 into the replacement controller module after you have moved the DIMMs from the impaired controller module to the replacement controller module.

**Steps**

1. If you are not already grounded, properly ground yourself.

2. Remove the NVRAM riser, Riser 1, from the controller module:
   a. Rotate the riser locking latch on the left side of the riser up and toward the fans.
      
      The NVRAM riser raises up slightly from the controller module.
   
   b. Lift the NVRAM riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser straight up out of the controller module, and then place it on a stable, flat surface so that you can access the NVRAM card.
3. Remove the NVRAM card from the riser module:
   a. Turn the riser module so that you can access the NVRAM card.
   b. Unplug the NVRAM battery cable that is attached to the NVRAM card.
   c. Press the locking bracket on the side of the NVRAM riser, and then rotate it to the open position.
   d. Remove the NVRAM card from the riser module.

4. Remove the NVRAM riser from the replacement controller module.

5. Install the NVRAM card into the NVRAM riser:
   a. Align the card with the card guide on the riser module and the card socket in the riser.
   b. Slide the card squarely into the card socket.
      
      **Note:** Make sure that the card is completely and squarely seated into the riser socket.
   c. Connect the battery cable to the socket on the NVRAM card.
   d. Swing the locking latch into the locked position and make sure that it locks in place.
Moving PCIe cards

As part of the controller replacement process, you must remove both PCIe riser modules, Riser 2 (the middle riser) and Riser 3 (riser on the far right) from the impaired controller module, remove the PCIe cards from the riser modules, and install them in the same riser modules in the replacement controller module. You will install the riser modules into the replacement controller module once the DIMMs have been moved to the replacement controller module.

Steps

1. If you are not already grounded, properly ground yourself.

2. Remove the PCIe riser from the controller module:
   a. Remove any SFP modules that might be in the PCIe cards.
   b. Rotate the module locking latch on the left side of the riser up and toward the fan modules.
      The PCIe riser raises up slightly from the controller module.
   c. Lift the PCIe riser up, shift it toward the fans so that the sheet metal lip on the riser clears the edge of the controller module, lift the riser out of the controller module, and then place it on a stable, flat surface.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Air duct</td>
</tr>
<tr>
<td>2</td>
<td>Riser locking latch</td>
</tr>
<tr>
<td>3</td>
<td>Card locking bracket</td>
</tr>
<tr>
<td>4</td>
<td>Riser 2 (middle riser) and PCI cards in riser slots 2 and 3.</td>
</tr>
</tbody>
</table>
3. Remove the PCIe card from the riser:
   a. Turn the riser so that you can access the PCIe card.
   b. Press the locking bracket on the side of the PCIe riser, and then rotate it to the open position.
   c. Remove the PCIe card from the riser.

4. Remove the corresponding riser from the replacement controller module.

5. Install the PCIe card into the same slot in PCIe riser:
   a. Align the card with the card guide on the riser and the card socket in the riser, and then slide it squarely into the socket in the riser.
      
      **Note:** Make sure that the card is completely and squarely seated into the riser socket.
   b. Swing the locking latch into place until it clicks into the locked position.

6. Repeat the preceding steps for Riser 3 and PCIe cards in slots 4 and 5 in the impaired controller module.

**Moving the boot media**

There are two boot media devices in the AFF A700s, a primary and a secondary or backup boot media. You must move them from the impaired node to the replacement node and install them into their respective slots in the replacement node.

**Before you begin**

The boot media are located under Riser 2, the middle PCIe riser module. This PCIe module must be removed to gain access to the boot media.

**Steps**

1. If you are not already grounded, properly ground yourself.

2. Locate the boot media:
   a. Open the air duct, if needed.
   b. If needed, remove Riser 2, the middle PCIe module, by unlocking the locking latch and then removing the riser from the controller module.
3. Remove the boot media from the controller module:
   a. Using a Phillips head screwdriver, remove the screw holding down the boot media and set the screw aside in a safe place.
   b. Grasping the sides of the boot media, gently rotate the boot media up, and then pull the boot media straight out of the socket and set it aside.

4. Move the boot media to the new controller module and install it:
   **Note:** Install the boot media into the same socket in the replacement controller module as it was installed in the impaired controller module; primary boot media socket (slot 1) to primary boot media socket, and secondary boot media socket (slot 2) to secondary boot media socket.
   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 motherboard.
   c. Secure the boot media to the motherboard using the boot media screw.
      Do not over-tighten the screw or you might damage the boot media.
Moving the fans

You must move the fans from the impaired controller module to the replacement module when replacing a failed controller module.

Steps

1. If you are not already grounded, properly ground yourself.

2. Remove the fan module by pinching the locking tabs on the side of the fan module, and then lifting the fan module straight out of the controller module.

3. Move the fan module to the replacement controller module, and then install the fan module by aligning its edges with the opening in the controller module, and then sliding the fan module into the controller module until the locking latches click into place.

4. Repeat these steps for the remaining fan modules.

Moving system DIMMs

To move the DIMMs, locate and move them from the impaired controller into the replacement controller and follow the specific sequence of steps.

Steps

1. If you are not already grounded, properly ground yourself.

2. Locate the DIMMs on your controller module.
3. 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.

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.

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

5. Locate the slot where you are installing the DIMM.

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.

   **Attention:** 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. Repeat these steps for the remaining DIMMs.
**Installing the NVRAM module**

To install the NVRAM module, you must follow the specific sequence of steps.

**Steps**

1. If you are not already grounded, properly ground yourself.
2. Install the riser into the controller module:
   a. Align the lip of the riser with the underside of the controller module sheet metal.
   b. Guide the riser along the pins in the controller module, and then lower the riser into the controller module.
   c. Swing the locking latch down and click it into the locked position.
      When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.
   d. Reinsert any SFP modules that were removed from the PCIe cards.

**Moving the NVRAM battery**

When replacing the controller module, you must move the NVRAM battery from the impaired controller module to the replacement controller module

**Steps**

1. If you are not already grounded, properly ground yourself.
2. Locate the NVRAM battery on the left side of the riser module, Riser 1.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NVRAM battery plug</td>
</tr>
<tr>
<td>2</td>
<td>Blue NVRAM battery locking tab</td>
</tr>
</tbody>
</table>

3. Locate the battery plug and 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. Grasp the battery and press the blue locking tab marked PUSH, and then lift the battery out of the holder and controller module.

5. Move the battery pack to the replacement controller module, and then install it in the NVRAM riser:
   a. Slide the battery pack down along the sheet metal side wall until the support tabs on the side wall hook into the slots on the battery pack, and the battery pack latch engages and locks into place.
   b. Press firmly down on the battery pack to make sure that it is locked into place.
   c. Plug the battery plug into the riser socket and make sure that the plug locks into place.

**Installing a PCIe riser**

To install a PCIe riser, you must follow a specific sequence of steps.

**Steps**

1. If you are not already grounded, properly ground yourself.

2. Install the riser into the controller module:
   a. Align the lip of the riser with the underside of the controller module sheet metal.
   b. Guide the riser along the pins in the controller module, and then lower the riser into the controller module.
   c. Swing the locking latch down and click it into the locked position.
      When locked, the locking latch is flush with the top of the riser and the riser sits squarely in the controller module.
   d. Reinsert any SFP modules that were removed from the PCIe cards.

3. Repeat the preceding steps for Riser 3 and PCIe cards in slots 4 and 5 in the impaired controller module.

**Moving the power supply**

You must move the power supply and power supply blank from the impaired controller module to the replacement controller module when you replace a controller module.

**Steps**

1. If you are not already grounded, properly ground yourself.

2. Rotate the cam handle such that it can be used to pull power supply out of the controller module while pressing the locking tab.

   **Caution:** The power supply 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.
3. Move the power supply to the new controller module, and then install it.

4. Using both hands, support and align the edges of the power supply with the opening in the controller module, and then gently push the power supply 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.

   **Attention:** To avoid damaging the internal connector, do not use excessive force when sliding the power supply into the system.

5. Remove the PSU blanking panel from the impaired controller module, and then install it in the replacement controller module.

**Installing the controller module**

After all the components have been moved from the impaired controller module to the replacement controller module, you must install the replacement controller module into the chassis and then boot it to Maintenance mode.

**Steps**

1. If you are not already grounded, properly ground yourself.

2. If you have not already done so, close the air duct:
   a. Swing the air duct all the way down to the controller module.
   b. Slide the air duct toward the risers until the locking tabs click into place.
   c. Inspect the air duct to make sure that it is properly seated and locked into place.
3. Align the end of the controller module with the opening in the chassis, and then gently push the controller module halfway into the system.

   **Note:** Do not completely insert the controller module in the chassis until instructed to do so.

4. Cable the management and console ports so that you can access the system to perform the tasks in the following sections.

5. Plug the power cord into the power supply, reinstall the power cable locking collar, and then connect the power supply to the power source.

6. Complete the reinstallation of the controller module:

   a. If you have not already done so, reinstall the cable management device.

   b. Firmly push the controller module into the chassis until it meets the midplane and is fully seated.

      The locking latches rise when the controller module is fully seated.

      **Attention:** Do not use excessive force when sliding the controller module into the chassis to avoid damaging the connectors.

      The controller module begins to boot as soon as it is fully seated in the chassis. Be prepared to interrupt the boot process.

   c. Rotate the locking latches upward, tilting them so that they clear the locking pins, and then lower them into the locked position.

   d. Interrupt the boot process by pressing **Ctrl-C** when you see *Press Ctrl-C for Boot Menu*.

   e. Select the option to boot to Maintenance mode from the displayed menu.
7. If your system is configured to support 10 GbE cluster interconnect and data connections on 40 GbE NICs or onboard ports, convert these ports to 10 GbE connections by using the `nicadmin convert` command from Maintenance mode.  
   **Note:** Be sure to exit Maintenance mode after completing the conversion.

**Verifying and setting the HA state of the controller module**

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

**Steps**

1. In Maintenance mode from the new controller module, verify that all components display the same `HA` state:
   
   ```
   ha-config show
   ```
   
<table>
<thead>
<tr>
<th>If your system is in...</th>
<th>The HA state for all components should be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>An HA pair</td>
<td>ha</td>
</tr>
<tr>
<td>A stand-alone configuration</td>
<td>non-ha</td>
</tr>
</tbody>
</table>

2. 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-state
   ```

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

**Running diagnostics**

After you have replaced a component in your system, you should run diagnostic tests on that component.

**Before you begin**

Your system must be at the LOADER prompt to start diagnostics.

**About this task**

All commands in the diagnostic procedures are issued from the node where the component is being replaced.

**Steps**

1. If the node to be serviced is not at the LOADER prompt, reboot the node:
   
   ```
   halt
   ```
   
   After you issue the command, you should wait until the system stops at the LOADER prompt.

2. At the LOADER prompt, access the special drivers specifically designed for system-level diagnostics to function properly:
   
   ```
   boot_diags
   ```

3. Select `Scan system` from the displayed menu to enable running the diagnostics tests.

4. Select `Test system` from the displayed menu to run diagnostics tests.

5. Proceed based on the result of the preceding step:
   
   - If the test failed, correct the failure, and then rerun the test.
• If the test reported no failures, select **Reboot** from the menu to reboot the system.

### Completing system restoration

To complete the replacement procedure and restore your system to full operation, you must recable the storage, restore the NetApp Storage Encryption configuration (if necessary), and install licenses for the new controller.

### Recabling the system

After running diagnostics, you must recable the controller module's storage and network connections.

**Steps**

1. Recable the system.
2. Verify that the cabling is correct by using Config Advisor.
   a. Download and install Config Advisor from the NetApp Support Site.
   
   ```
   mysupport.netapp.com
   ```
   b. Enter the information for the target system, and then click **Collect Data**.
   c. Click the **Cabling** tab, and then examine the output.
   Make sure that all disk shelves are displayed and all disks appear in the output, correcting any cabling issues you find.
   d. Check other cabling by clicking the appropriate tab, and then examining the output from Config Advisor.

### Installing licenses for the replacement node in ONTAP

You must install new licenses for the replacement 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 replacement node. However, if the impaired 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 replacement node as soon as possible.

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.

**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.

   **NetApp Support**

   *Note:* 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
```

**Restoring Storage and Volume Encryption functionality**

After replacing the controller module or NVRAM module for a storage system that you previously configured to use Storage or Volume Encryption, you must perform additional steps to provide uninterrupted Encryption functionality. You can skip this task on storage systems that do not have Storage or Volume Encryption enabled.

**Step**

1. Restore Storage or Volume Encryption functionality by using the appropriate procedure in the *NetApp Encryption Power Guide*.

   *ONTAP 9 NetApp Encryption Power Guide*

   Use one of the following procedures, depending on whether you are using onboard or external key management:
   
   - “Restoring onboard key management encryption keys”
   - “Restoring external key management encryption keys”

**Verifying LIFs and registering the serial number**

Before returning the replacement node to service, you should verify that the LIFs are on their home ports, and register the serial number of the replacement node if AutoSupport is enabled, 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 LIFs are listed as `false`, revert them to their home ports:

   `network interface revert *`

2. Register the system serial number with NetApp Support.

<table>
<thead>
<tr>
<th>If...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>AutoSupport is enabled</td>
<td>Send an AutoSupport message to register the serial number.</td>
</tr>
<tr>
<td>AutoSupport is not enabled</td>
<td>Call NetApp Support to register the serial number.</td>
</tr>
</tbody>
</table>

3. If automatic giveback was disabled, reenable it:

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

**Setting and verifying system time after replacing the controller**

You should check the time and date on the replacement controller module against the healthy controller module in an HA pair, or against a reliable time server in a stand-alone configuration. If the time and date do not match, you must reset them on the replacement controller module to prevent possible outages on clients due to time differences.

**About this task**

It is important that you apply the commands in the steps on the correct systems:

- The *replacement node* is the new node that replaced the impaired node as part of this procedure.
• The healthy node is the HA partner of the replacement node

Steps

1. In `admin` privilege on the replacement node, check the system time on the nodes:
   ```bash
   cluster date show
   ```
   The date and time are displayed for all nodes in the cluster.

2. If necessary, set the time on the replacement node to match the healthy node:
   ```bash
   cluster date modify -dateandtime "target_date_and_time"
   ```

3. Check the date and time from the replacement node:
   ```bash
   cluster date show
   ```

4. Exit `admin` privilege.

Completing the replacement process

After you replace the part, you can return the failed part to NetApp, as described in the RMA instructions shipped with the kit. Contact technical support at NetApp Support, 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

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