



Hot-add shelf

Install and maintain

NetApp
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Table of Contents

- Hot-add shelf 1
 - Hot-add workflow - NS224 shelves 1
 - Requirements and best practices for a hot-add - NS224 shelves 1
 - Prepare for a hot-add - NS224 shelves 2
 - Install a shelf for a hot-add - NS224 shelves 8
 - Cable shelf for hot-add 9
 - Complete the hot-add - NS224 shelves 59

Hot-add shelf

Hot-add workflow - NS224 shelves

Follow these workflow steps to hot-add your NS224 shelf.

Before you begin

To hot-add an NS224 shelf, your HA pair must meet certain requirements. Review the [hot-add requirements and best practices](#).

1

Prepare to hot-add your shelf

Depending on your platform model, you might need to install additional RoCE-capable PCIe cards or I/O modules, configure the non-dedicated RoCE-capable Ethernet ports for storage use, recable an existing shelf across two sets of ports in different slots for resiliency against slot failure, and disable automatic drive assignment if you are manually assigning drive ownership.

2

Install your shelf

To install the shelf, install the rail kit for the shelf, and then install and secure your shelf in the telco rack or cabinet. Next, connect the power cords to power on the shelf and then assign a unique shelf ID to ensure the shelf is distinct within the HA pair.

3

Cable your shelf

Cable the shelf you are hot-adding so that it has two connections to each controller in the HA pair.

4

Complete your hot-add

If you disabled automatic drive assignment as part of the preparation for the hot-add, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed.

Requirements and best practices for a hot-add - NS224 shelves

Before hot-adding a shelf, be sure to review the requirements and best practices.

Requirements

To hot-add an NS224 shelf, your HA pair must meet certain requirements.

- **Supported ONTAP version:** Your platform model and version of ONTAP must support the NS224 shelf and drives you are hot-adding. See [NetApp Hardware Universe](#)
- **Number of shelves:** Your HA pair must have less than the maximum number of shelves supported, by at least the number of shelves you plan to hot-add.

You cannot have exceeded the maximum number of shelves supported by your HA pair after hot-adding

shelves. See [NetApp Hardware Universe](#).

- **Cabling:**

- Make sure you have the correct number and type of cables to connect the shelf. See [NetApp Hardware Universe](#).
- If you are hot-adding a shelf to an HA pair that already has an NS224 shelf, your HA pair cannot have any storage cabling error messages, and it must be cabled as multipath HA.

You can run [Active IQ Config Advisor](#) to view any storage cabling error messages and the corrective actions you should take.

Best practices

Familiarize yourself with the following best practices before hot-adding an NS224 shelf.

- **Best practice:** The best practice is to have the current version of the [Disk Qualification Package](#) installed before hot-adding a shelf.

Having the current version of the DQP installed allows your system to recognize and use newly qualified drives. This avoids system event messages about having noncurrent drive information and prevention of drive partitioning because drives are not recognized. The DQP also notifies you of noncurrent drive firmware.

- **Best practice:** The best practice is to run [Active IQ Config Advisor](#) before and after hot-adding a shelf.

Running Active IQ Config Advisor before hot-adding a shelf provides a snap shot of the existing shelf Ethernet (ENET) connectivity, verifies NVMe shelf module (NSM) firmware versions, and allows you to verify a shelf ID already in use in the HA pair.

Running Active IQ Config Advisor after hot-adding a shelf allows you to verify shelves are cabled correctly and that shelf IDs are unique within the HA pair.

- **Best practice:** The best practice is to have current versions of [NVMe shelf module \(NSM\) firmware](#) and [drive firmware](#) on your storage system before adding a new shelf.



Do not revert firmware to a version that does not support your shelf and its components.

Prepare for a hot-add - NS224 shelves

Complete the preparation tasks applicable to your HA pair before hot-adding an NS224 shelf.

When you are done with the applicable preparation tasks, go to [Install a shelf for a hot-add](#).

Install RoCE-capable PCIe cards or I/O modules

If your platform model supports the use of RoCE-capable PCIe cards or I/O modules, your HA pair must have enough available RoCE-capable Ethernet ports to support the number of shelves you are hot-adding.

Steps

1. For each shelf you are hot-adding, verify that there are two RoCE-capable ports on each controller.

These ports can be on board the controllers, on RoCE-capable PCIe cards, a combination of both, or on RoCE-capable I/O modules, as supported by your platform model.

2. If your HA pair does not have enough available RoCE-capable ports, install the additional PCIe cards or I/O modules into the correct controller slots, as supported by your platform model.
 - a. Identify the correct controller slots for your platform model. See [NetApp Hardware Universe](#).
 - b. See your platform model's documentation for PCIe card or I/O module installation instructions.

Configure RoCE-capable ports for storage use

If your HA pair has non-dedicated RoCE-capable Ethernet ports that you are using to hot-add an NS224 shelf, you must configure the ports for storage use (not networking use).

Before you begin

- Make sure you installed any additional RoCE-capable PCIe cards or I/O modules in each controller.

About this task

- For some platform models, when a RoCE-capable PCIe card or I/O module is installed in a supported slot on a controller, the ports automatically default to storage use (instead of networking); however, it is recommended that you complete the following procedure to verify the RoCE-capable ports are configured for storage use.
- If you determine that the non-dedicated RoCE-capable ports in your HA pair are not configured for storage use, it is a nondisruptive procedure to configure them.

Depending on the version of ONTAP your HA pair is running, you might need to reboot the controllers:

- If your HA pair is running a version of ONTAP 9.6, you need to reboot the controllers, one at a time.
- If your HA pair is running ONTAP 9.7 or later, you do not need to reboot the controllers, unless one or both controllers are in maintenance mode. This procedure assumes that neither controller is in maintenance mode.
- If in the future you need to change ports from storage use to networking use, enter the command, `storage port modify -node node_name -port port_name -mode network`.

Steps

1. Log in to the cluster using SSH or the serial console port.
2. Enter the following command to verify if the non-dedicated ports in the HA pair are configured for storage use:

```
storage port show
```

- If your HA pair is running ONTAP 9.8 or later, the non-dedicated ports display `storage` in the `Mode` column.
- If your HA pair is running ONTAP 9.7 or 9.6, the non-dedicated ports, which display `false` in the `Is Dedicated?` column, also display `enabled` in the `State` column.

When non-dedicated ports are not configured for storage use, the command output displays the following:



- If your HA pair is running ONTAP 9.8 or later, the non-dedicated ports display `network` in the `Mode` column.
- If your HA pair is running ONTAP 9.7 or 9.6, the non-dedicated ports, which display `false` in the `Is Dedicated?` column, also display `disabled` in the `State` column.

3. If the non-dedicated ports are configured for storage use, you are done with this procedure.

Otherwise, you need to configure the ports by completing steps 4 through 7.

4. Configure the non-dedicated ports for storage use, on one of the controllers:

You must repeat the applicable command for each port you are configuring.

If your HA pair is running...	Use this command...
ONTAP 9.8 or later	<code>storage port modify -node <i>node_name</i> -port <i>port_name</i> -mode storage</code>
ONTAP 9.7 or 9.6	<code>storage port enable -node <i>node_name</i> -port <i>port_name</i></code>


5. If your HA pair is running ONTAP 9.6, reboot the controller so that the port changes take effect: `system node reboot -node node_name -reason reason_for_the_reboot`.

Otherwise, go to the next step.



The reboot can take up to 15 minutes.

6. Repeat the steps for the second controller:

If your HA pair is running...	Then...
ONTAP 9.7 or later	<ol style="list-style-type: none">Repeat step 4.Go to step 7.
ONTAP 9.6	<ol style="list-style-type: none">Repeat steps 4 and 5.<div> The first controller must have already completed its reboot.</div>Go to step 7.

7. Verify that the non-dedicated ports on both controllers are configured for storage use: `storage port show`

- If your HA pair is running ONTAP 9.8 or later, the non-dedicated ports display `storage` in the `Mode` column.
- If your HA pair is running ONTAP 9.7 or 9.6, the non-dedicated ports, which display `false` in the `Is Dedicated?` column, also display `enabled` in the `State` column.

Recable existing shelves

Before hot-adding additional shelves, depending on your platform model, you might need to recable an existing shelf (after you have installed the additional RoCE-capable PCIe cards or I/O modules) across two sets of ports in different slots for resiliency against slot failure.

Before you begin

- Make sure you installed any additional RoCE-capable PCIe cards or I/O modules in each controller.
- Make sure that the non-dedicated ports on the RoCE-capable PCIe cards or I/O modules you installed are configured for storage use.

About this task

- Recabling port connections is a nondisruptive procedure when your shelf has multipath-HA connectivity.
- You move one cable at a time to always maintain connectivity to the shelf during this procedure.



Moving a cable does not require any wait time between unplugging the cable from one port and plugging it into another port.

- If needed, refer to the shelf cabling illustrations for your platform model in [Overview of cabling for a hot-add](#).

Steps

1. Recable the existing shelf's connections across two sets of RoCE-capable ports in different slots, as applicable to your platform model.

AFF A1K

Do one of the following if you are hot-adding a second shelf or a fourth shelf.



If you have an AFF A1K HA pair and you are hot-adding a third shelf and installing a third or fourth RoCE-capable I/O module in each controller, the third shelf is cabled to only the third or third and fourth I/O modules. You do not need to recable any existing shelves.

- If you are hot-adding a second shelf, recable the first shelf across the RoCE-capable I/O modules in slot 11 and slot 10 on each controller.

The substeps assume the existing shelf is cabled to a RoCE-capable I/O module in slot 11 on each controller.

- a. On controller A, move the cable from slot 11 port b (e11b) to slot 10 port b (e10b).
 - b. Repeat the same cable move on controller B.
- If you are hot-adding a fourth shelf, recable the third shelf across the RoCE-capable I/O modules in slot 9 and slot 8 on each controller.

The substeps assume the third shelf is cabled to a RoCE-capable I/O module in slot 9 on each controller.

- a. On controller A, move the cable from slot 9 port b (e9b) to slot 8 port b (e8b).
- b. Repeat the same cable move on controller B.

AFF A70 or AFF A90

If you are hot-adding a second shelf, recable the first shelf across the RoCE-capable I/O modules in slot 11 and slot 8 on each controller.

The substeps assume the existing shelf is cabled to a RoCE-capable I/O module in slot 11 on each controller.

- a. On controller A, move the cable from slot 11 port b (e11b) to slot 8 port b (e8b).
- b. Repeat the same cable move on controller B.

AFF A800 or AFF C800

If you are hot-adding a second shelf, recable the first shelf across the two sets of RoCE-capable ports in slot 5 and slot 3 on each controller.

The substeps assume the existing shelf is cabled to RoCE-capable PCIe cards in slot 5 on each controller.

- a. On controller A, move the cable from slot 5 port b (e5b) to slot 3 port b (e3b).
- b. Repeat the same cable move on controller B.

AFF A700

If you are hot-adding a second shelf, recable the first shelf across the two sets of RoCE-capable ports in slot 3 and slot 7 on each controller.

The substeps assume the existing shelf is cabled to RoCE-capable I/O modules in slot 3 on each controller.

- a. On controller A, move the cable from slot 3 port b (e3b) to slot 7 port b (e7b).
- b. Repeat the same cable move on controller B.

AFF A400 or AFF C400

If you are hot-adding a second shelf, depending on your platform model, do one of the following:

- On the AFF A400:

Recable the first shelf across the two sets of RoCE-capable ports, onboard e0c/e0d and in slot 5, on each controller.

The substeps assume the existing shelf is cabled to RoCE-capable onboard ports e0c/e0d on each controller.

- a. On controller A, move the cable from port e0d to slot 5 Port b (e5b).
- b. Repeat the same cable move on controller B.

- On the AFF C400:

Recable the first shelf across the two sets of RoCE-capable ports in slot 4 and slot 5, on each controller.

The substeps assume the existing shelf is cabled to RoCE-capable ports in slot 4 on each controller.

- a. On controller A, move the cable from slot 4 port a (e4a) to slot 5 port b (e5b).
- b. Repeat the same cable move on controller B.

2. Verify that the recabled shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

Disable automatic drive assignment

If you are manually assigning drive ownership for the NS224 shelf you are hot-adding, then you need to disable automatic drive assignment if it is enabled.

If you are unsure whether you should manually assign drive ownership, or want to understand the automatic assignment of drive ownership policies for your storage system, go to [About automatic assignment of disk ownership](#).

Steps

1. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either node.

If automatic drive assignment is enabled, the output shows `on` in the `Auto Assign` column (for each node).

2. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both nodes.

Install a shelf for a hot-add - NS224 shelves

You need to install an NS224 shelf in a cabinet or telco rack, connect the power cords (which automatically powers on the shelf), and set the shelf ID.

Before you begin

- Make sure you have a paper clip with one side straightened or a narrow-tipped ballpoint pen.

To change the shelf ID, you use the paper clip or ballpoint pen to access the shelf ID button behind the Operator Display Panel (ODP) for the change shelf ID step.

- Understand that a fully loaded NS224 shelf can weigh up to 66.78 lbs (30.29 kg) and requires two people to lift or use of a hydraulic lift. Avoid removing shelf components (from the front or rear of the shelf) to reduce the shelf weight, because shelf weight will become unbalanced.

Steps

1. Install the rail kit for the shelf, as needed, using the instructions included with the kit.



Do not flange-mount the shelf.

2. Install the shelf:

- a. Position the back of the shelf onto the rails, and then support the shelf from the bottom and slide it into the cabinet or telco rack.

If you are installing multiple shelves, place the first shelf directly above the controllers. Place the second shelf directly under the controllers. Repeat this pattern for any additional shelves.

- b. Secure the shelf to the cabinet or telco rack using the mounting screws included in the kit.

3. Connect the power:

- a. Connect the power cords to the shelf and secure them in place.

If they are AC power supplies, secure them in place with the power cord retainer.

If they are DC power supplies, secure them in place with the two thumb screws.

- b. Connect the power cords to different power sources for resiliency.

A shelf powers up when connected to a power source; it does not have power switches. When functioning correctly, a power supply's bicolored LED illuminates green.

4. Set the shelf ID to a number that is unique within the HA pair:

For more detailed instructions, see [Change a shelf ID - NS224 shelves](#).

- a. Remove the left end cap and locate the small hole to the right of the LEDs.
- b. Insert the end of a paper clip or similar tool into the small hole to reach the shelf ID button.
- c. Press and hold the button (for up to 15 seconds) until the first number on the digital display blinks, and then release the button.

If the ID takes longer than 15 seconds to blink, press and hold the button again, making sure to press it in all the way.

- d. Press and release the button to advance the number until you reach the desired number from 0 to 9.
- e. Repeat substeps 4c and 4d to set the second number of the shelf ID.

It can take up to three seconds (instead of 15 seconds) for the number to blink.

- f. Press and hold the button until the second number stops blinking.

After about five seconds, both numbers start blinking and the amber LED on the ODP illuminates.

- g. Power-cycle the shelf to make the shelf ID take effect.

You must unplug both power cords from the shelf, wait 10 seconds, and then plug them back in.

When power is restored to the power supplies, their bicolored LEDs illuminate green.

What's next?

Cable your hot-add shelf. Go to [Overview of cabling for a hot-add](#).

Cable shelf for hot-add

Overview of cabling for a hot-add - NS224 shelves

You cable each NS224 shelf you are hot-adding so that each shelf has two connections to each controller in the HA pair.

This cabling section describes how to cable the NS224 shelf to the following storage systems:

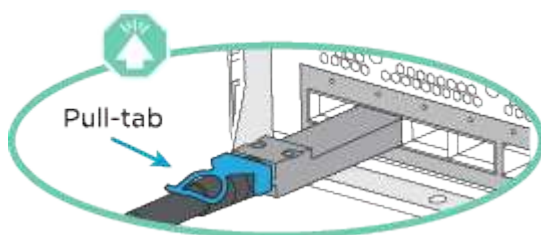
- [Cable to AFF systems](#)
- [Cable to ASA systems](#)
- [Cable to EOA systems](#)

About this task

- Familiarize yourself with proper cable connector orientation, and the location and labeling of ports on the NS224 NSM100 shelf modules.
 - Cables are inserted with the connector pull-tab facing up.

When a cable is inserted correctly, it clicks into place.

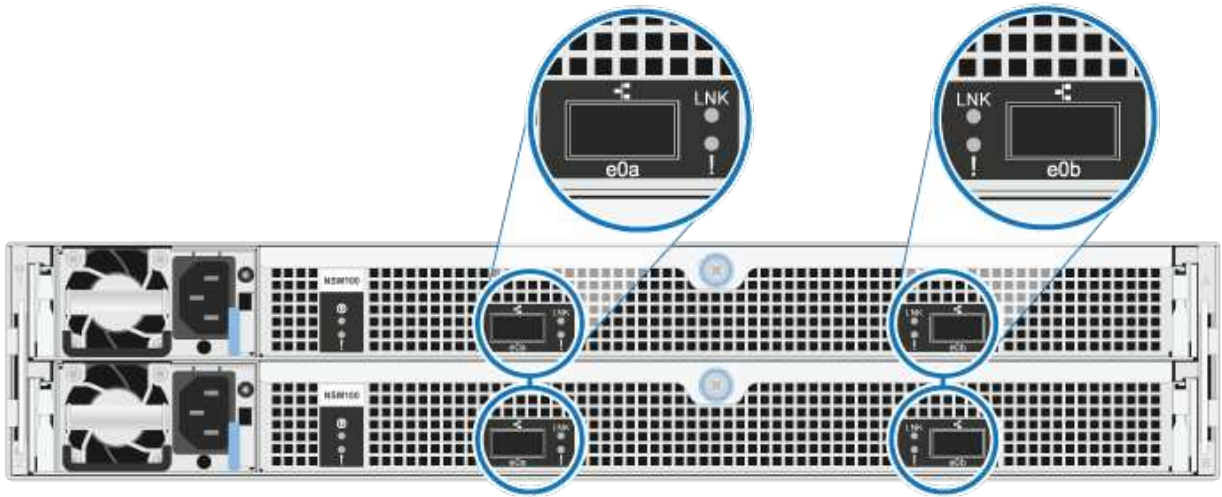
After you connect both ends of the cable, the shelf and controller port LNK (green) LEDs illuminate. If a port LNK LED does not illuminate, reseal the cable.



- You can use the following illustration to help you physically identify the shelf NSM100 ports, e0a and e0b.

An NS224 shelf contains two NSM100 modules. The top module goes in slot A (NSM A) and the bottom module goes in slot B (NSM B).

Each NSM100 module includes 2 x 100GbE QSFP28 ports: e0a and e0b.



- After you have cabled a hot-added shelf, ONTAP recognizes the shelf:
 - Drive ownership is assigned if automatic drive assignment is enabled.
 - NSM shelf firmware and drive firmware should be updated automatically, if needed.



Firmware updates can take up to 30 minutes.

Cable shelf to AFF systems - NS224 shelves

You cable each NS224 shelf you are hot-adding so that each shelf has two connections to each controller in the HA pair.

Cable shelf to AFF A1K

You can hot-add up to three additional NS224 shelves (for a total of four shelves) to an AFF A1K HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has at least one existing NS224 shelf.
- This procedure addresses the following hot-add scenarios:
 - Hot-adding a second shelf to an HA pair with two RoCE-capable I/O modules in each controller. (You have installed a second I/O module and recabled the first shelf to both I/O modules or already had the first shelf cabled to two I/O modules. You will cable the second shelf to both I/O modules).
 - Hot-adding a third shelf to an HA pair with three RoCE-capable I/O modules in each controller. (You have installed a third I/O module and will cable the third shelf to only the third I/O module).
 - Hot-adding a third shelf to an HA pair with four RoCE-capable I/O modules in each controller. (You have installed a third and fourth I/O module and will cable the third shelf to the third and fourth I/O modules).
 - Hot-adding a fourth shelf to an HA pair with four RoCE-capable I/O modules in each controller. (You have installed a fourth I/O module and recabled the third shelf to the third and fourth I/O modules or already had the third shelf cabled to the third and fourth I/O modules. You will cable the fourth shelf to both the third and fourth I/O module).

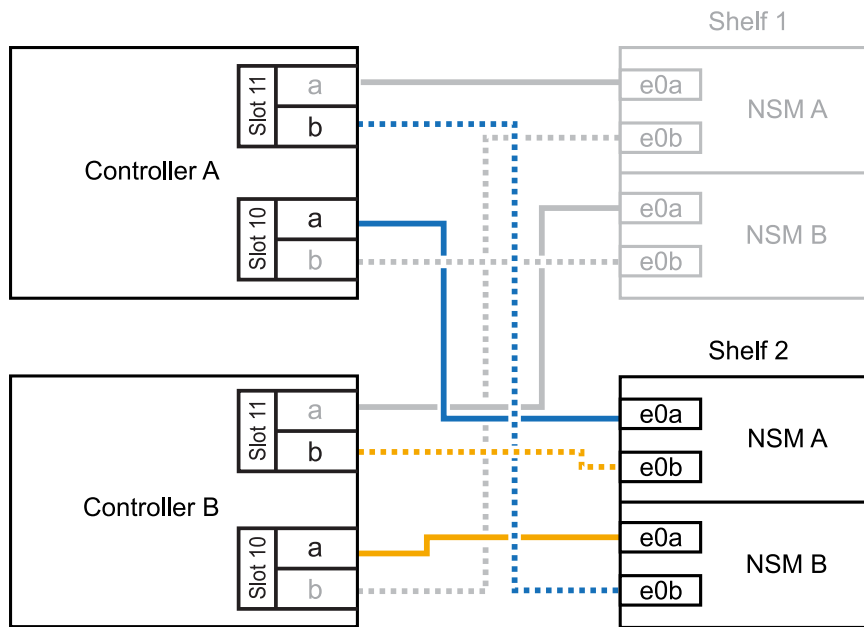
Steps

1. If the NS224 shelf you are hot-adding will be the second NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

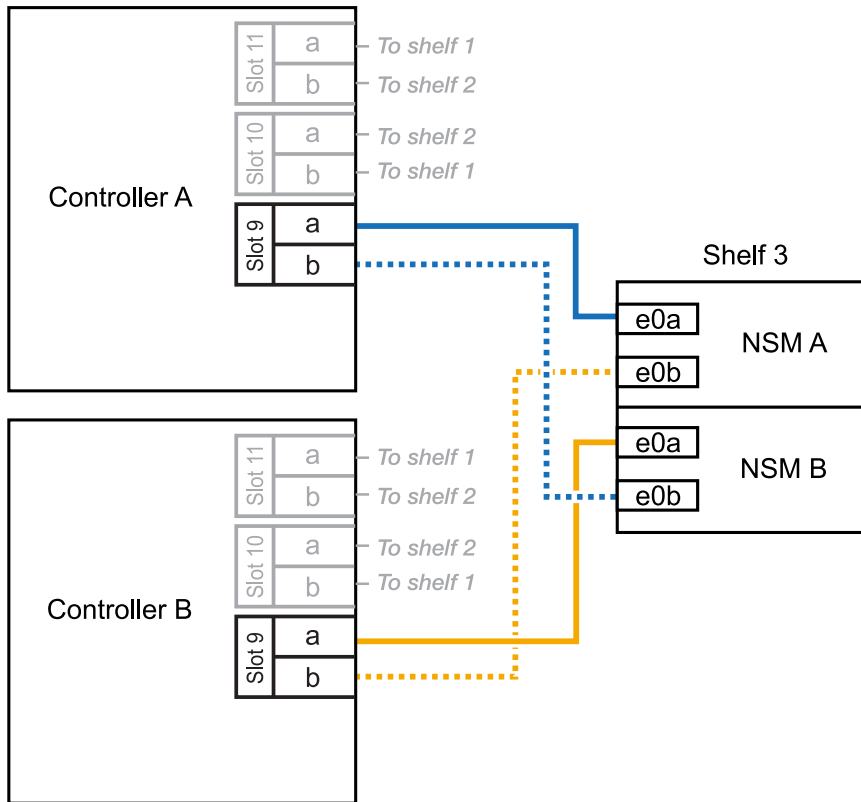
- a. Cable shelf NSM A port e0a to controller A slot 10 port a (e10a).
- b. Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- c. Cable shelf NSM B port e0a to controller B slot 10 port a (e10a).
- d. Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration highlights the cabling for the second shelf in the HA pair with two RoCE-capable I/O modules in each controller:



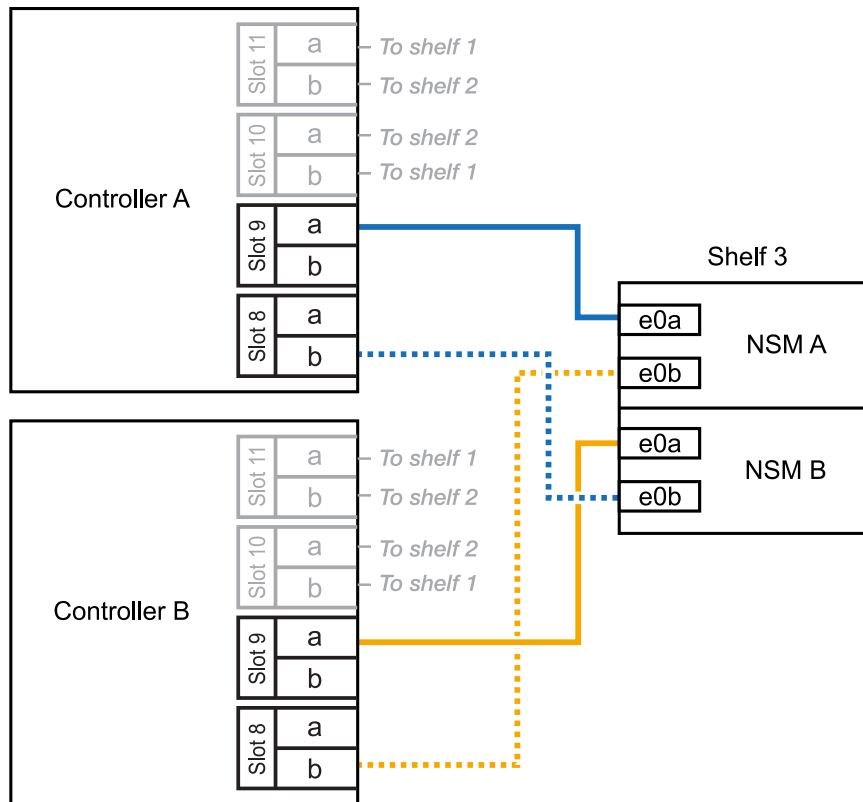
2. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair with three RoCE-capable I/O modules in each controller, complete the following substeps. Otherwise, go to the next step.
 - a. Cable shelf NSM A port e0a to controller A slot 9 port a (e9a).
 - b. Cable shelf NSM A port e0b to controller B slot 9 port b (e9b).
 - c. Cable shelf NSM B port e0a to controller B slot 9 port a (e9a).
 - d. Cable shelf NSM B port e0b to controller A slot 9 port b (e9b).

The following illustration highlights the cabling for the third shelf in the HA pair with three RoCE-capable I/O modules in each controller:



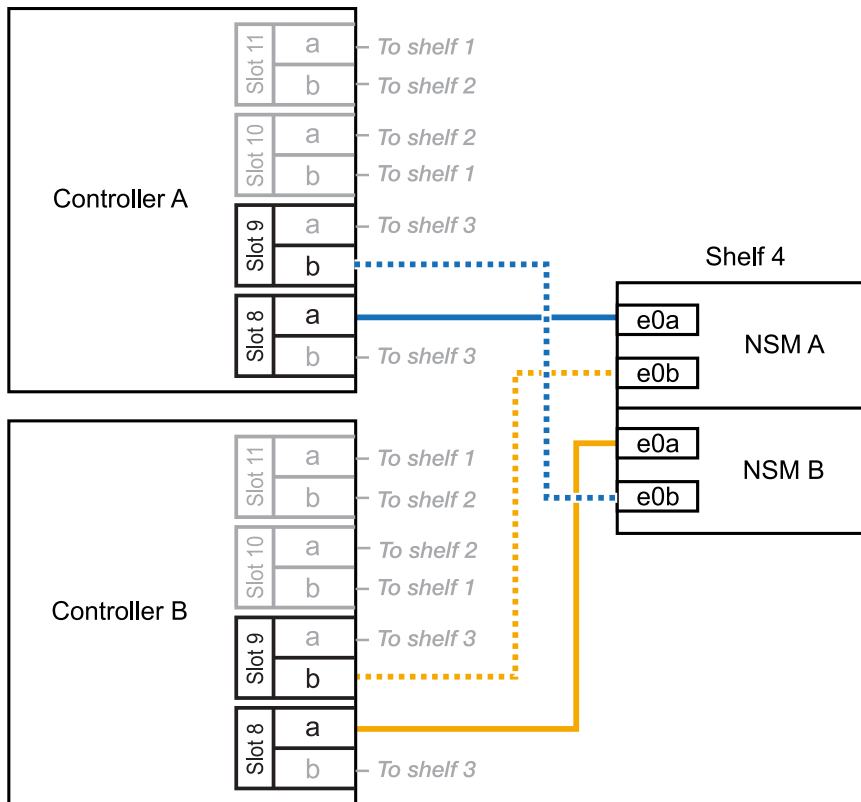
3. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair with four RoCE-capable I/O modules in each controller, complete the following substeps. Otherwise, go to the next step.
 - a. Cable shelf NSM A port e0a to controller A slot 9 port a (e9a).
 - b. Cable shelf NSM A port e0b to controller B slot 8 port b (e8b).
 - c. Cable shelf NSM B port e0a to controller B slot 9 port a (e9a).
 - d. Cable shelf NSM B port e0b to controller A slot 8 port b (e8b).

The following illustration highlights the cabling for the third shelf in the HA pair with four RoCE-capable I/O modules in each controller:



4. If the NS224 shelf you are hot-adding will be the fourth NS224 shelf in the HA pair with four RoCE-capable I/O modules in each controller, complete the following substeps.
 - a. Cable shelf NSM A port e0a to controller A slot 8 port a (e8a).
 - b. Cable shelf NSM A port e0b to controller B slot 9 port b (e9b).
 - c. Cable shelf NSM B port e0a to controller B slot 8 port a (e8a).
 - d. Cable shelf NSM B port e0b to controller A slot 9 port b (e9b).

The following illustration highlights the cabling for the fourth shelf in the HA pair with four RoCE-capable I/O modules in each controller:



5. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenabling automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A70 or AFF A90

You can hot-add up to two NS224 shelves to an AFF A70 or AFF A90 HA pair when additional storage (to the internal shelf) is needed.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has only internal storage (no external shelves) and that you are hot-adding up to two additional shelves and two RoCE-capable I/O modules in each controller.
- This procedure addresses the following hot-add scenarios:
 - Hot-adding the first shelf to an HA pair with one RoCE-capable I/O module in each controller.
 - Hot-adding the first shelf to an HA pair with two RoCE-capable I/O modules in each controller.
 - Hot- adding the second shelf to an HA pair with two RoCE-capable I/O modules in each controller.

Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (one RoCE-capable I/O module) in each controller module, and this is the only NS224 shelf in your HA pair, complete the following substeps.

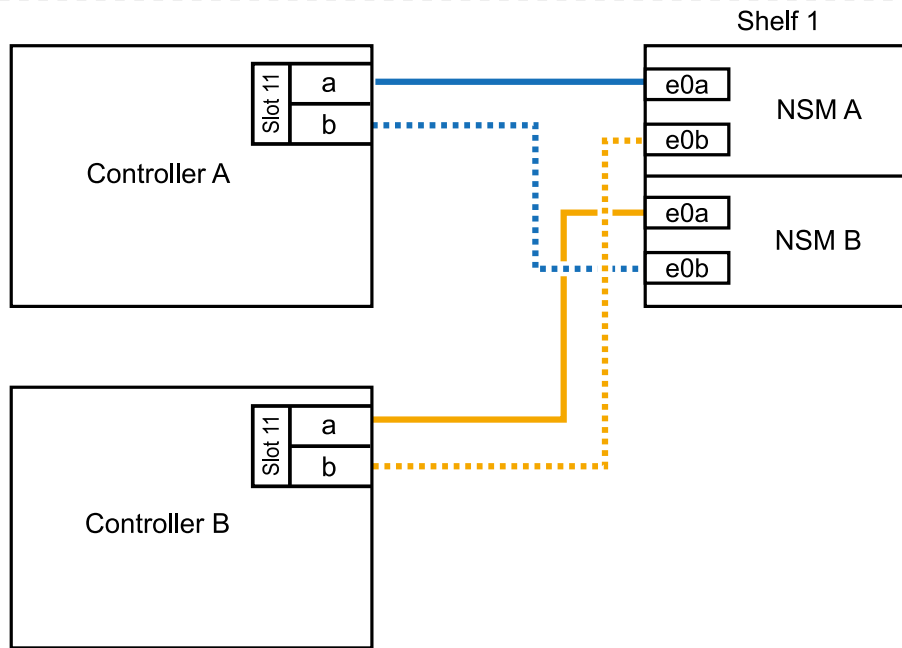
Otherwise, go to the next step.



This step assumes you installed the RoCE-capable I/O module in slot 11.

- a. Cable shelf NSM A port e0a to controller A slot 11 port a (e11a).
- b. Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- c. Cable shelf NSM B port e0a to controller B slot 11 port a (e11a).
- d. Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration shows cabling for one hot-added shelf using one RoCE-capable I/O module in each controller module:



2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (two RoCE-capable I/O modules) in each controller module, complete the applicable substeps.



This step assumes you installed the RoCE-capable I/O modules in slots 11 and 8.

Shelves	Cabling
Shelf 1	<p>a. Cable NSM A port e0a to controller A slot 11 port a (e11a).</p> <p>b. Cable NSM A port e0b to controller B slot 8 port b (e8b).</p> <p>c. Cable NSM B port e0a to controller B slot 11 port a (e11a).</p> <p>d. Cable NSM B port e0b to controller A slot 8 port b (e8b).</p> <p>e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.</p> <p>The following illustration shows cabling for one hot-added shelf using two RoCE-capable I/O modules in each controller module:</p>

Shelves	Cabling
Shelf 2	<p>a. Cable NSM A port e0a to controller A slot 8 port a (e8a).</p> <p>b. Cable NSM A port e0b to controller B slot 11 port b (e11b).</p> <p>c. Cable NSM B port e0a to controller B slot 8 port a (e8a).</p> <p>d. Cable NSM B port e0b to controller A slot 11 port b (e11b).</p> <p>e. Go to step 3.</p> <p>The following illustration shows cabling for two hot-added shelf using two RoCE-capable I/O modules in each controller module:</p>

3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A250 or AFF C250

When additional storage is needed, you can hot-add a maximum of one NS224 shelf to an AFF A250 or AFF C250 HA pair.

Before you begin

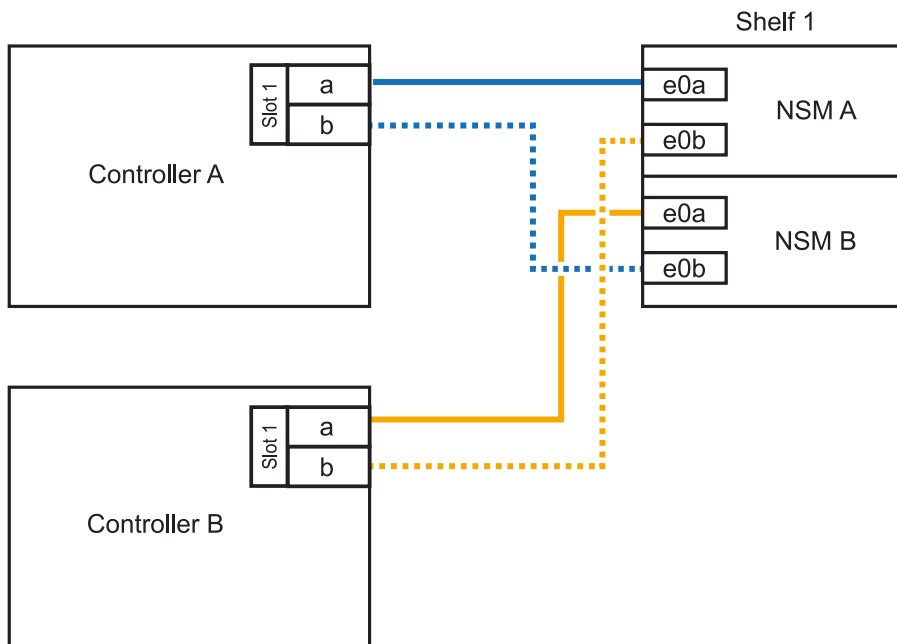
- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

When viewed from the rear of the platform chassis, the RoCE-capable card port on the left is port "a" (e1a) and the port on the right is port "b" (e1b).

Steps

1. Cable the shelf connections:
 - a. Cable shelf NSM A port e0a to controller A slot 1 port a (e1a).
 - b. Cable shelf NSM A port e0b to controller B slot 1 port b (e1b).
 - c. Cable shelf NSM B port e0a to controller B slot 1 port a (e1a).
 - d. Cable shelf NSM B port e0b to controller A slot 1 port b (e1b).The following illustration shows the shelf cabling when completed.



2. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A400 or AFF C400

How you cable an NS224 shelf for a hot-add depends on whether you have an AFF A400 or AFF C400 HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

Cable shelf to an AFF A400 HA pair

For an AFF A400 HA pair, you can hot-add up to two shelves and use onboard ports e0c/e0d and ports in slot 5 as needed.

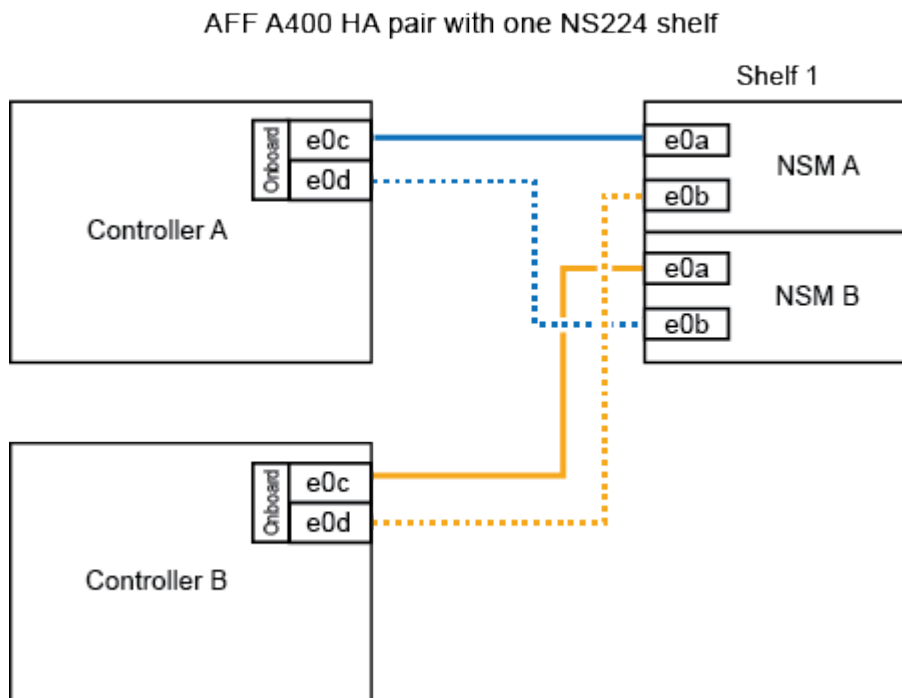
Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (onboard RoCE-capable ports) on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A port e0c.
- b. Cable shelf NSM A port e0b to controller B port e0d.
- c. Cable shelf NSM B port e0a to controller B port e0c.
- d. Cable shelf NSM B port e0b to controller A port e0d.

The following illustration shows cabling for one hot-added shelf using one set of RoCE-capable ports on each controller:

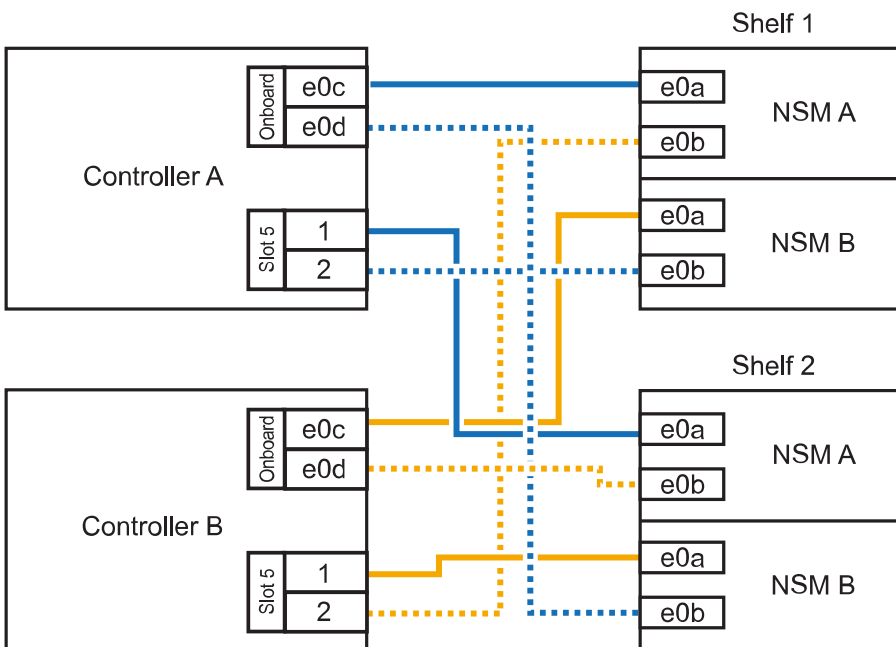


2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (on board and PCIe card RoCE-capable ports) on each controller, complete the following substeps.

Shelves	Cabling
Shelf 1	<ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A port e0c. b. Cable NSM A port e0b to controller B slot 5 port 2 (e5b). c. Cable NSM B port e0a to controller B port e0c. d. Cable NSM B port e0b to controller A slot 5 port 2 (e5b). e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.
Shelf 2	<ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 5 port 1 (e5a). b. Cable NSM A port e0b to controller B port e0d. c. Cable NSM B port e0a to controller B slot 5 port 1 (e5a). d. Cable NSM B port e0b to controller A port e0d. e. Go to step 3.

The following illustration shows cabling for two hot-added shelves:

AFF A400 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

4. If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then re enable automatic drive assignment, if needed. See [Complete the hot-add](#).

Otherwise, you are done with this procedure.

Cable shelf to an AFF C400 HA pair

For an AFF C400 HA pair, you can hot-add up to two shelves and use ports in slot 4 and 5 as needed.

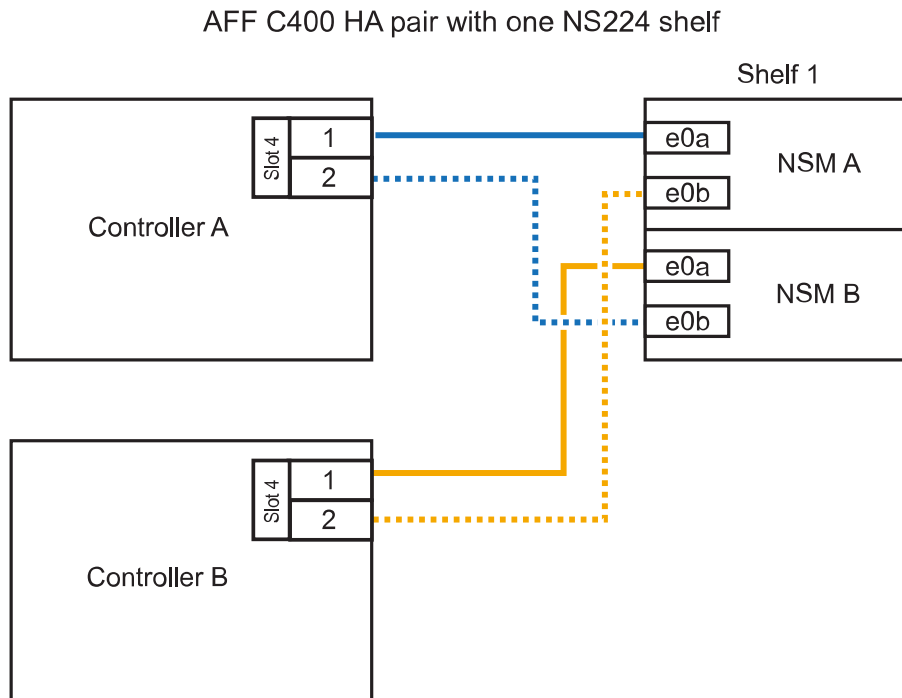
Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A slot 4 port 1 (e4a).
- b. Cable shelf NSM A port e0b to controller B slot 4 port 2 (e4b).
- c. Cable shelf NSM B port e0a to controller B slot 4 port 1 (e4a).
- d. Cable shelf NSM B port e0b to controller A slot 4 port 2 (e4b).

The following illustration shows cabling for one hot-added shelf using one set of RoCE-capable ports on each controller:

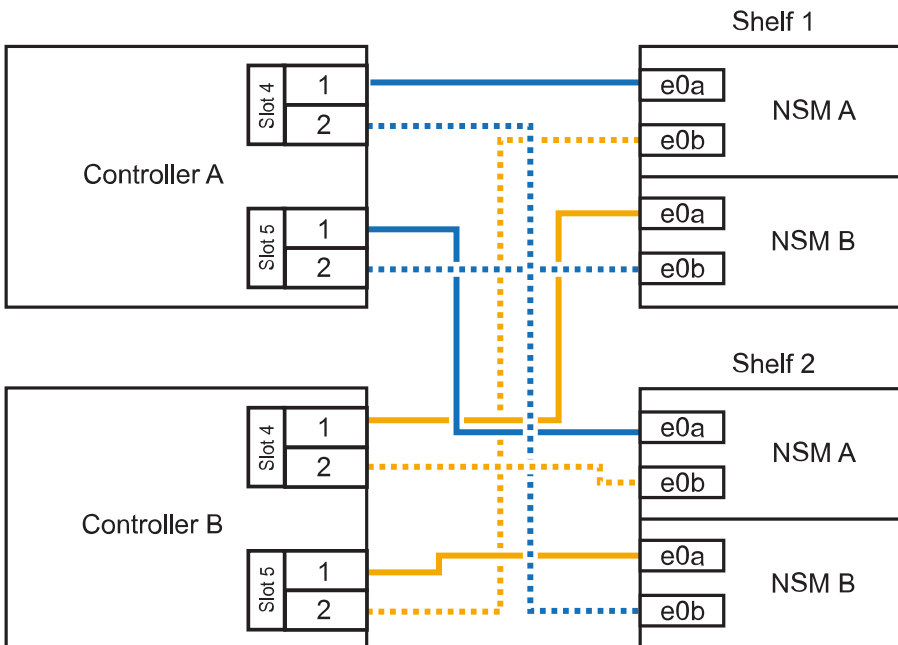


2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports on each controller, complete the following substeps.

Shelves	Cabling
Shelf 1	<ul style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 4 port 1 (e4a). b. Cable NSM A port e0b to controller B slot 5 port 2 (e5b). c. Cable NSM B port e0a to controller B port slot 4 port 1 (e4a). d. Cable NSM B port e0b to controller A slot 5 port 2 (e5b). e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.
Shelf 2	<ul style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 5 port 1 (e5a). b. Cable NSM A port e0b to controller B slot 4 port 2 (e4b). c. Cable NSM B port e0a to controller B slot 5 port 1 (e5a). d. Cable NSM B port e0b to controller A slot 4 port 2 (e4b). e. Go to step 3.

The following illustration shows cabling for two hot-added shelves:

AFF C400 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A800 or AFF C800

How you cable an NS224 shelf in an AFF A800 or AFF C800 HA pair depends on the number of shelves you are hot-adding and the number of RoCE-capable port sets (one or two) you are using on the controllers.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (one RoCE-capable PCIe card) on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

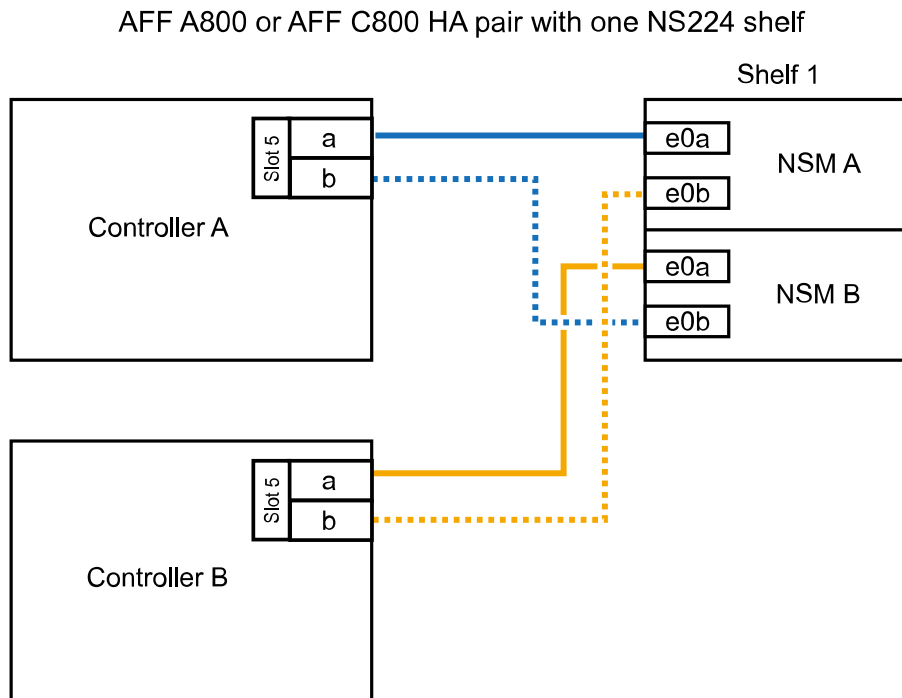
Otherwise, go to the next step.



This step assumes you installed the RoCE-capable PCIe card in slot 5.

- a. Cable shelf NSM A port e0a to controller A slot 5 port a (e5a).
- b. Cable shelf NSM A port e0b to controller B slot 5 port b (e5b).
- c. Cable shelf NSM B port e0a to controller B slot 5 port a (e5a).
- d. Cable shelf NSM B port e0b to controller A slot 5 port b (e5b).

The following illustration shows cabling for one hot-added shelf using one RoCE-capable PCIe card on each controller:





2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (two RoCE-capable

PCIe cards) on each controller, complete the applicable substeps.

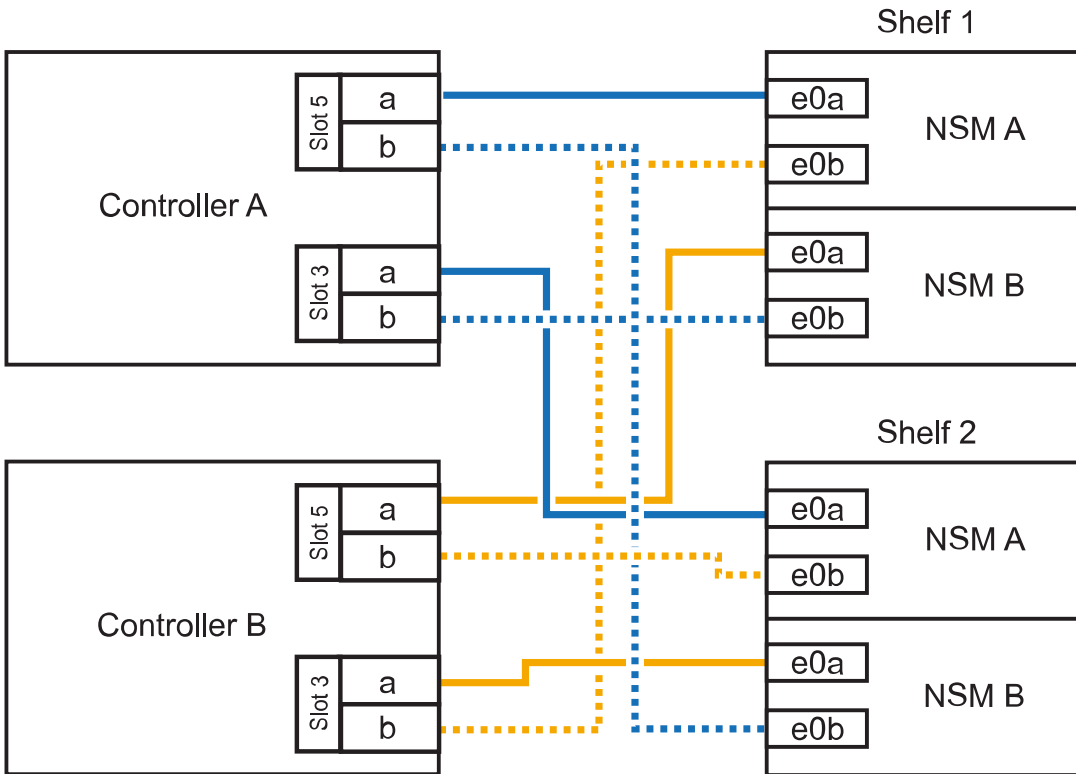


This step assumes you installed the RoCE-capable PCIe cards in slot 5 and slot 3.

Shelves	Cabling
Shelf 1	<div> These substeps assume you are beginning the cabling by cabling shelf port e0a to the RoCE-capable PCIe card in slot 5, instead of slot 3.</div> <div><ol style="list-style-type: none">Cable NSM A port e0a to controller A slot 5 port a (e5a).Cable NSM A port e0b to controller B slot 3 port b (e3b).Cable NSM B port e0a to controller B slot 5 port a (e5a).Cable NSM B port e0b to controller A slot 3 port b (e3b).If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.</div>
Shelf 2	<div> These substeps assume you are beginning the cabling by cabling shelf port e0a to the RoCE-capable PCIe card in slot 3, instead of slot 5 (which correlates with the cabling substeps for shelf 1).</div> <div><ol style="list-style-type: none">Cable NSM A port e0a to controller A slot 3 port a (e3a).Cable NSM A port e0b to controller B slot 5 port b (e5b).Cable NSM B port e0a to controller B slot 3 port a (e3a).Cable NSM B port e0b to controller A slot 5 port b (e5b).Go to step 3.</div>

The following illustration shows cabling for two hot-added shelves:

AFF A800 or AFF C800 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A900

When additional storage is needed, you can hot-add up to three additional NS224 drive shelves (for a total of four shelves) to an AFF A900 HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has at least one existing NS224 shelf and that you are hot-adding up to three additional shelves.
- If your HA pair has only one existing NS224 shelf, this procedure assumes that the shelf is cabled across two RoCE-capable 100GbE I/O modules on each controller.

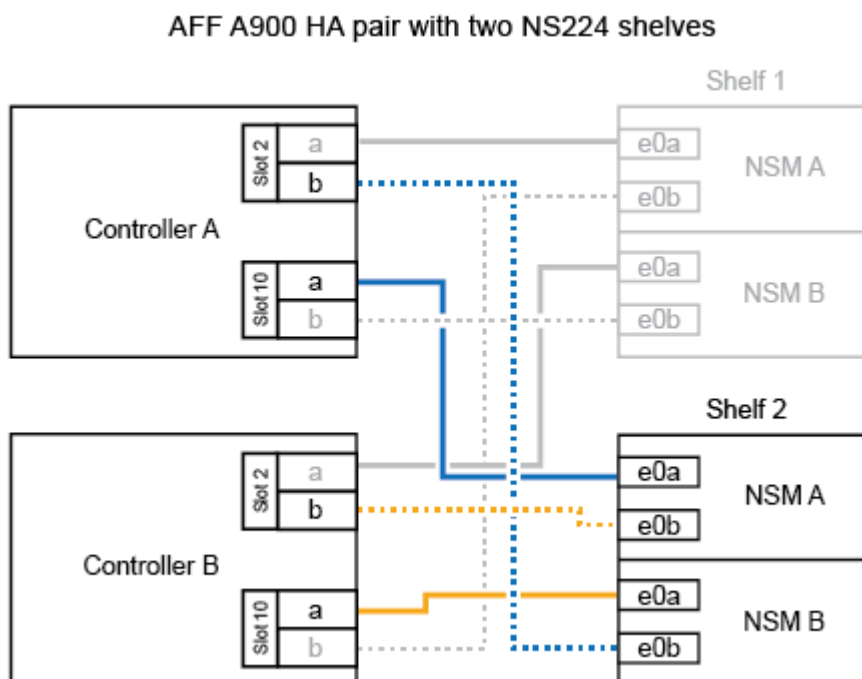
Steps

1. If the NS224 shelf you are hot-adding will be the second NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A slot 10 port a (e10a).
- b. Cable shelf NSM A port e0b to controller B slot 2 port b (e2b).
- c. Cable shelf NSM B port e0a to controller B slot 10 port a (e10a).
- d. Cable shelf NSM B port e0b to controller A slot 2 port b (e2b).

The following illustration shows the second shelf cabling (and the first shelf).

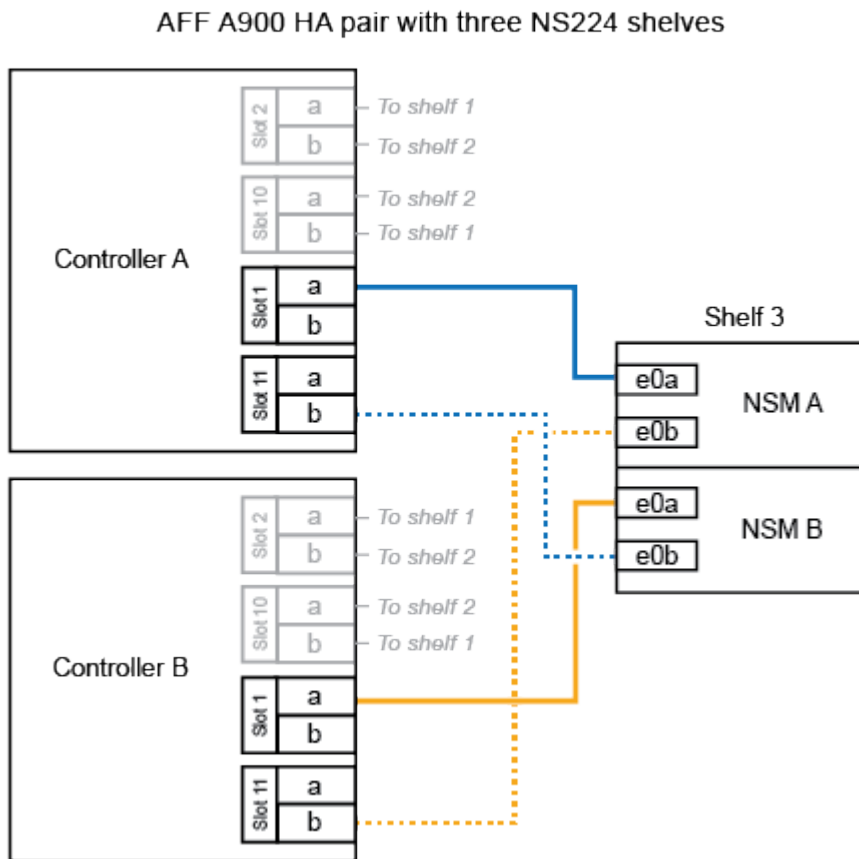


2. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- Cable shelf NSM A port e0a to controller A slot 1 port a (e1a).
- Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- Cable shelf NSM B port e0a to controller B slot 1 port a (e1a).
- Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration shows the third shelf cabling.



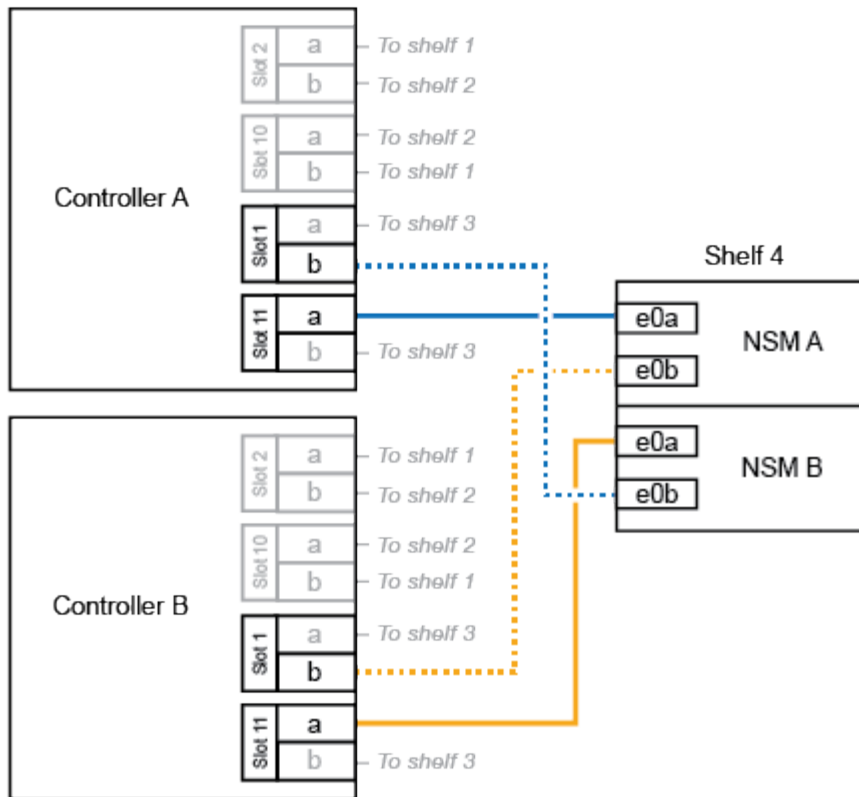
3. If the NS224 shelf you are hot-adding will be the fourth NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- Cable shelf NSM A port e0a to controller A slot 11 port a (e11a).
- Cable shelf NSM A port e0b to controller B slot 1 port b (e1b).
- Cable shelf NSM B port e0a to controller B slot 11 port a (e11a).
- Cable shelf NSM B port e0b to controller A slot 1 port b (e1b).

The following illustration shows the fourth shelf cabling.

AFF A900 HA pair with four NS224 shelves



4. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA systems - NS224 shelves

You cable each NS224 shelf you are hot-adding so that each shelf has two connections to each controller in the HA pair.

Cable shelf to ASA A1K

You can hot-add up to three additional NS224 shelves (for a total of four shelves) to an ASA A1K HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has at least one existing NS224 shelf.
- This procedure addresses the following hot-add scenarios:
 - Hot-adding a second shelf to an HA pair with two RoCE-capable I/O modules in each controller. (You have installed a second I/O module and recabled the first shelf to both I/O modules or already had the first shelf cabled to two I/O modules. You will cable the second shelf to both I/O modules).
 - Hot-adding a third shelf to an HA pair with three RoCE-capable I/O modules in each controller. (You have installed a third I/O module and will cable the third shelf to only the third I/O module).
 - Hot-adding a third shelf to an HA pair with four RoCE-capable I/O modules in each controller. (You have installed a third and fourth I/O module and will cable the third shelf to the third and fourth I/O modules).
 - Hot-adding a fourth shelf to an HA pair with four RoCE-capable I/O modules in each controller. (You have installed a fourth I/O module and recabled the third shelf to the third and fourth I/O modules or already had the third shelf cabled to the third and fourth I/O modules. You will cable the fourth shelf to both the third and fourth I/O module).

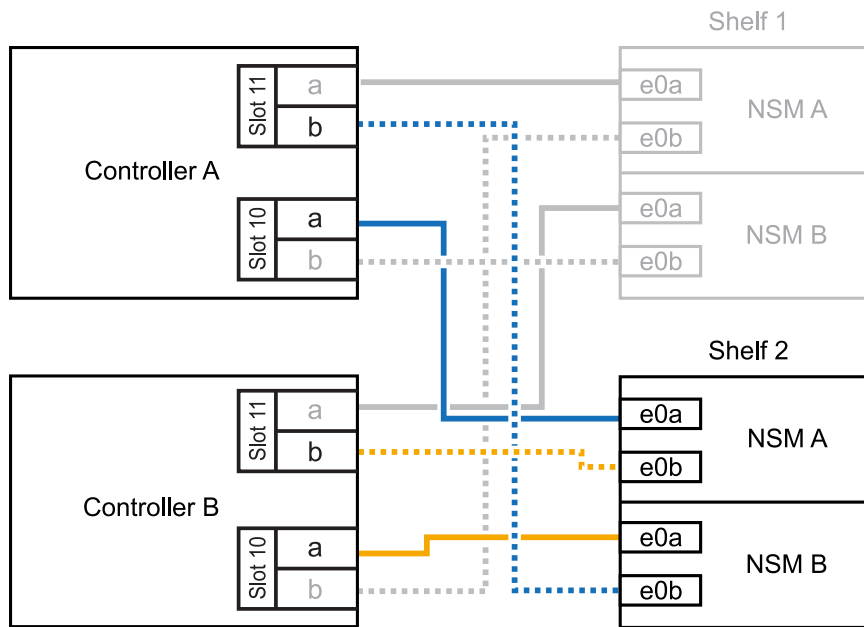
Steps

1. If the NS224 shelf you are hot-adding will be the second NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

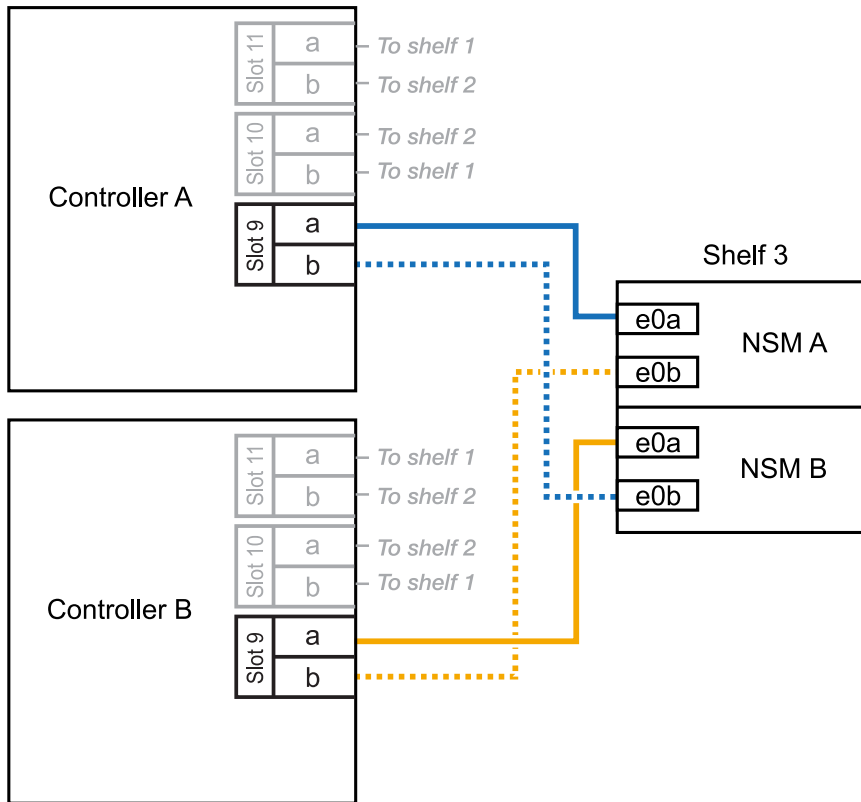
- a. Cable shelf NSM A port e0a to controller A slot 10 port a (e10a).
- b. Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- c. Cable shelf NSM B port e0a to controller B slot 10 port a (e10a).
- d. Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration highlights the cabling for the second shelf in the HA pair with two RoCE-capable I/O modules in each controller:



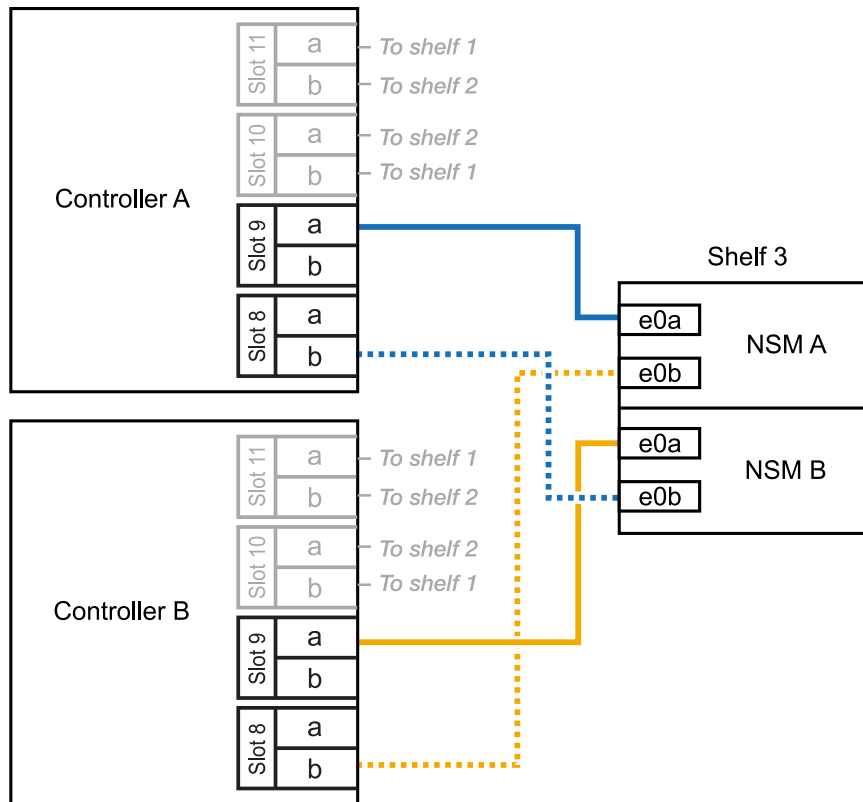
2. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair with three RoCE-capable I/O modules in each controller, complete the following substeps. Otherwise, go to the next step.
 - a. Cable shelf NSM A port e0a to controller A slot 9 port a (e9a).
 - b. Cable shelf NSM A port e0b to controller B slot 9 port b (e9b).
 - c. Cable shelf NSM B port e0a to controller B slot 9 port a (e9a).
 - d. Cable shelf NSM B port e0b to controller A slot 9 port b (e9b).

The following illustration highlights the cabling for the third shelf in the HA pair with three RoCE-capable I/O modules in each controller:



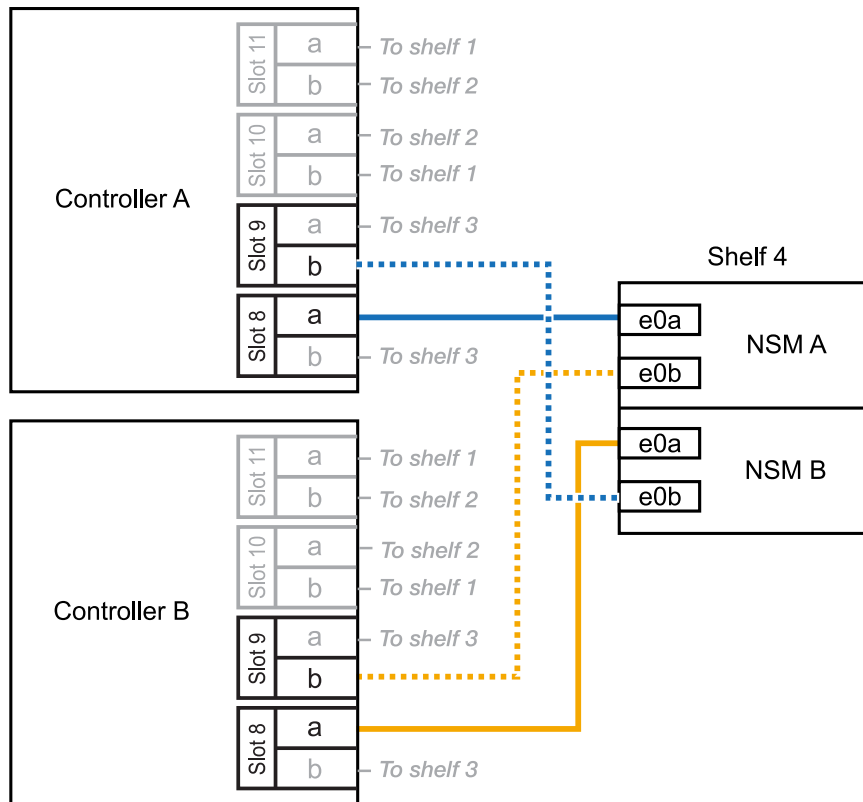
3. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair with four RoCE-capable I/O modules in each controller, complete the following substeps. Otherwise, go to the next step.
 - a. Cable shelf NSM A port e0a to controller A slot 9 port a (e9a).
 - b. Cable shelf NSM A port e0b to controller B slot 8 port b (e8b).
 - c. Cable shelf NSM B port e0a to controller B slot 9 port a (e9a).
 - d. Cable shelf NSM B port e0b to controller A slot 8 port b (e8b).

The following illustration highlights the cabling for the third shelf in the HA pair with four RoCE-capable I/O modules in each controller:



4. If the NS224 shelf you are hot-adding will be the fourth NS224 shelf in the HA pair with four RoCE-capable I/O modules in each controller, complete the following substeps.
 - a. Cable shelf NSM A port e0a to controller A slot 8 port a (e8a).
 - b. Cable shelf NSM A port e0b to controller B slot 9 port b (e9b).
 - c. Cable shelf NSM B port e0a to controller B slot 8 port a (e8a).
 - d. Cable shelf NSM B port e0b to controller A slot 9 port b (e9b).

The following illustration highlights the cabling for the fourth shelf in the HA pair with four RoCE-capable I/O modules in each controller:



5. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenabling automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA A70 or ASA A90

You can hot-add up to two NS224 shelves to an ASA A70 or ASA A90 HA pair when additional storage (to the internal shelf) is needed.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has only internal storage (no external shelves) and that you are hot-adding up to two additional shelves and two RoCE-capable I/O modules in each controller.
- This procedure addresses the following hot-add scenarios:
 - Hot-adding the first shelf to an HA pair with one RoCE-capable I/O module in each controller.
 - Hot-adding the first shelf to an HA pair with two RoCE-capable I/O modules in each controller.
 - Hot- adding the second shelf to an HA pair with two RoCE-capable I/O modules in each controller.

Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (one RoCE-capable I/O module) in each controller module, and this is the only NS224 shelf in your HA pair, complete the following substeps.

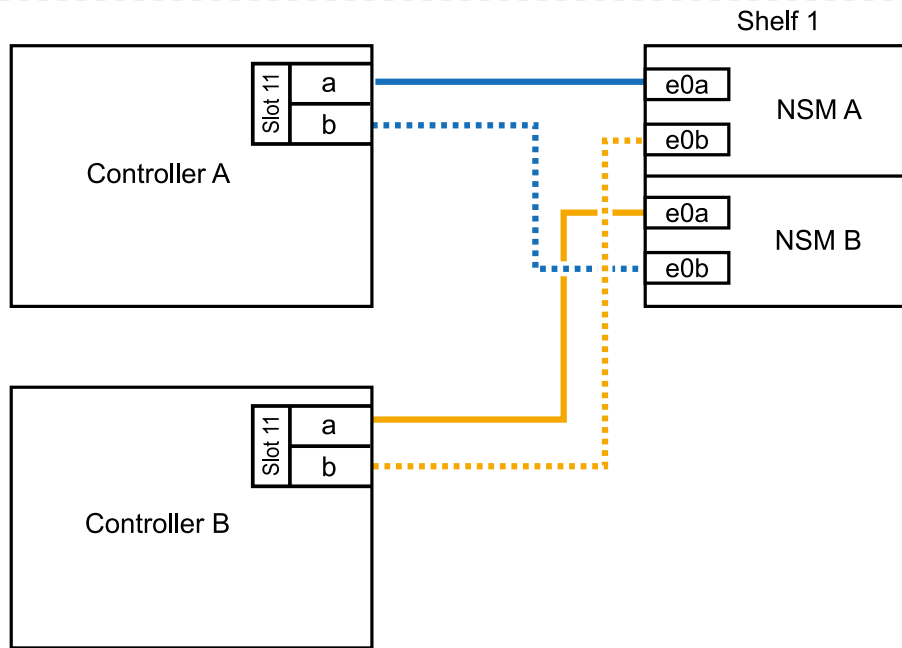
Otherwise, go to the next step.



This step assumes you installed the RoCE-capable I/O module in slot 11.

- a. Cable shelf NSM A port e0a to controller A slot 11 port a (e11a).
- b. Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- c. Cable shelf NSM B port e0a to controller B slot 11 port a (e11a).
- d. Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration shows cabling for one hot-added shelf using one RoCE-capable I/O module in each controller module:



2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (two RoCE-capable I/O modules) in each controller module, complete the applicable substeps.



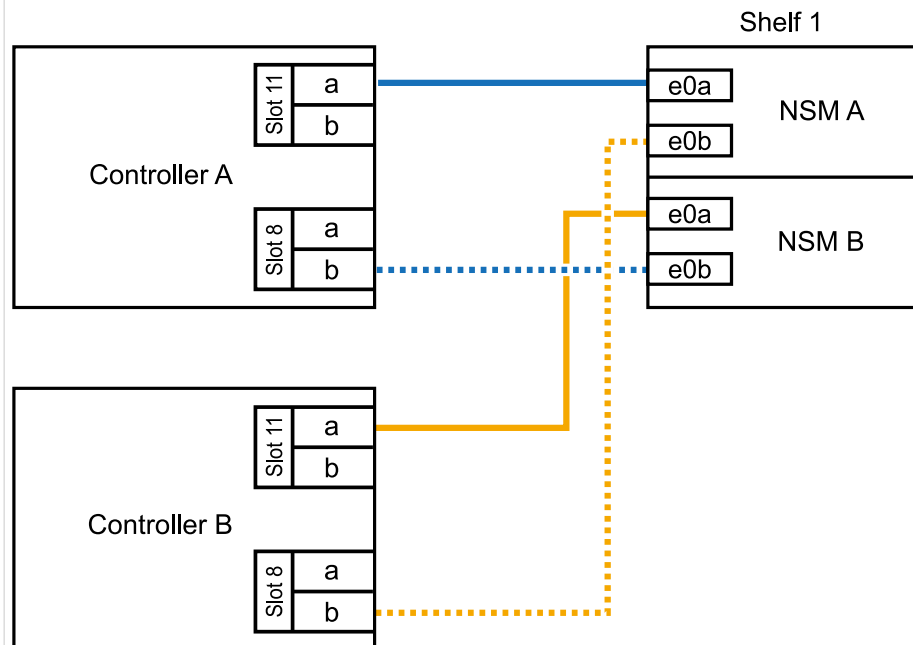
This step assumes you installed the RoCE-capable I/O modules in slots 11 and 8.

Shelves**Cabling**

Shelf 1

- a. Cable NSM A port e0a to controller A slot 11 port a (e11a).
- b. Cable NSM A port e0b to controller B slot 8 port b (e8b).
- c. Cable NSM B port e0a to controller B slot 11 port a (e11a).
- d. Cable NSM B port e0b to controller A slot 8 port b (e8b).
- e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.

The following illustration shows cabling for one hot-added shelf using two RoCE-capable I/O modules in each controller module:



Shelves	Cabling
Shelf 2	<p>a. Cable NSM A port e0a to controller A slot 8 port a (e8a).</p> <p>b. Cable NSM A port e0b to controller B slot 11 port b (e11b).</p> <p>c. Cable NSM B port e0a to controller B slot 8 port a (e8a).</p> <p>d. Cable NSM B port e0b to controller A slot 11 port b (e11b).</p> <p>e. Go to step 3.</p> <p>The following illustration shows cabling for two hot-added shelf using two RoCE-capable I/O modules in each controller module:</p>

3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA A250 or ASA C250

When additional storage is needed, you can hot-add a maximum of one NS224 shelf to an AFF A250 or AFF C250 HA pair.

Before you begin

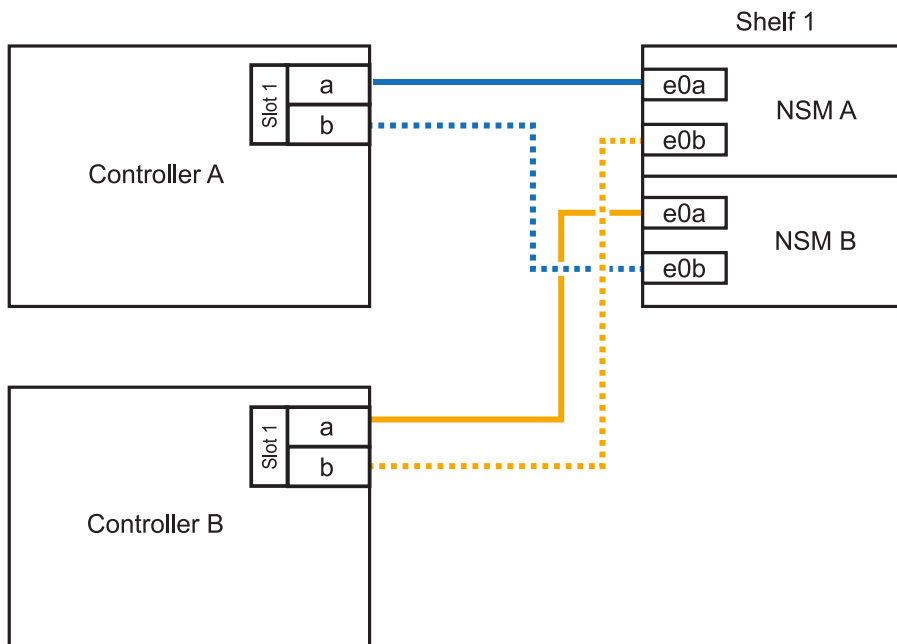
- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

When viewed from the rear of the platform chassis, the RoCE-capable card port on the left is port "a" (e1a) and the port on the right is port "b" (e1b).

Steps

1. Cable the shelf connections:
 - a. Cable shelf NSM A port e0a to controller A slot 1 port a (e1a).
 - b. Cable shelf NSM A port e0b to controller B slot 1 port b (e1b).
 - c. Cable shelf NSM B port e0a to controller B slot 1 port a (e1a).
 - d. Cable shelf NSM B port e0b to controller A slot 1 port b (e1b).The following illustration shows the shelf cabling when completed.



2. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA A400 or ASA C400

How you cable an NS224 shelf for a hot-add depends on whether you have an AFF A400 or AFF C400 HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

Cable shelf to an AFF A400 HA pair

For an AFF A400 HA pair, you can hot-add up to two shelves and use onboard ports e0c/e0d and ports in slot 5 as needed.

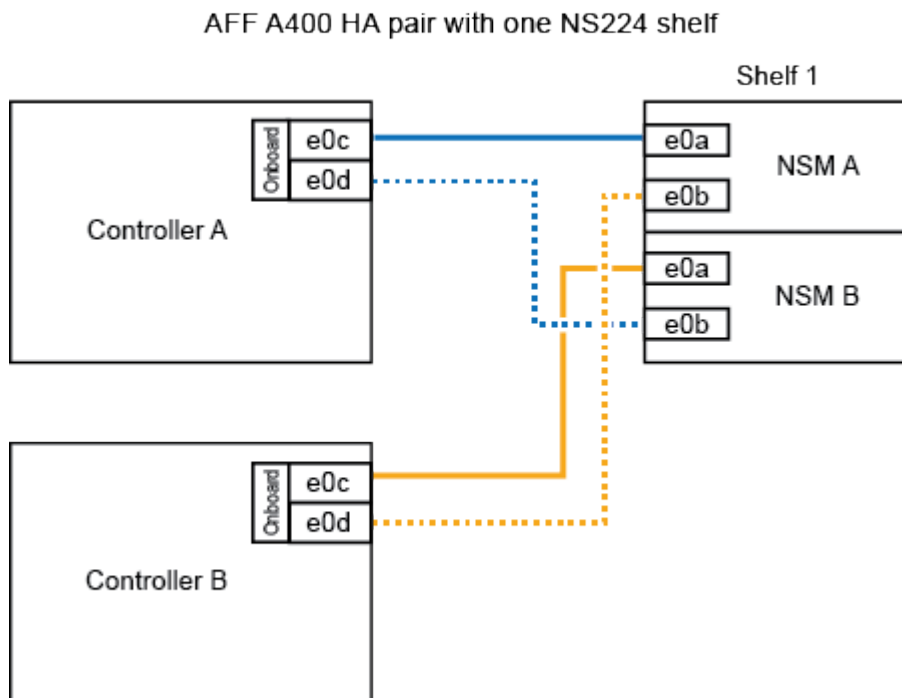
Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (onboard RoCE-capable ports) on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A port e0c.
- b. Cable shelf NSM A port e0b to controller B port e0d.
- c. Cable shelf NSM B port e0a to controller B port e0c.
- d. Cable shelf NSM B port e0b to controller A port e0d.

The following illustration shows cabling for one hot-added shelf using one set of RoCE-capable ports on each controller:

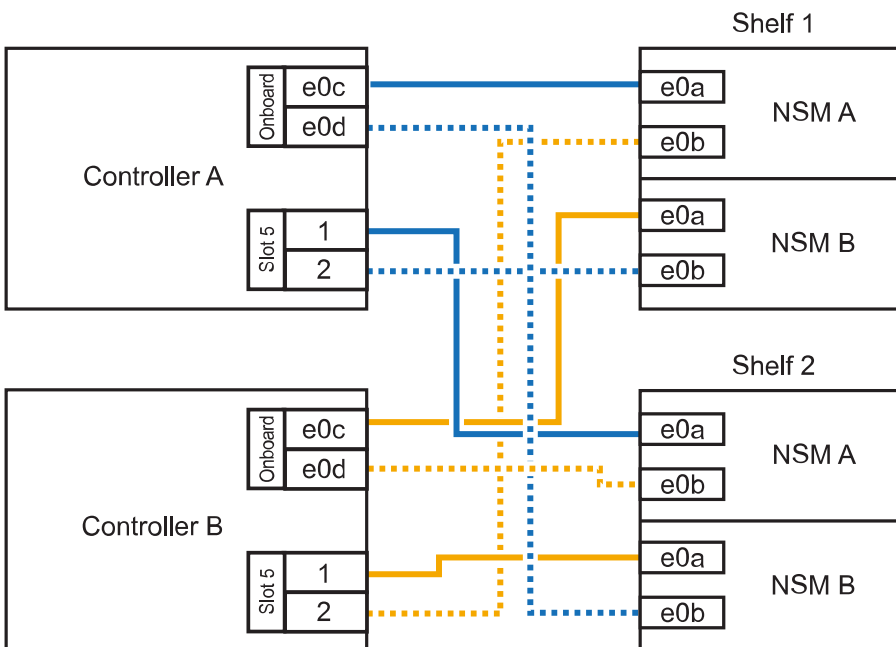


2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (on board and PCIe card RoCE-capable ports) on each controller, complete the following substeps.

Shelves	Cabling
Shelf 1	<ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A port e0c. b. Cable NSM A port e0b to controller B slot 5 port 2 (e5b). c. Cable NSM B port e0a to controller B port e0c. d. Cable NSM B port e0b to controller A slot 5 port 2 (e5b). e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.
Shelf 2	<ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 5 port 1 (e5a). b. Cable NSM A port e0b to controller B port e0d. c. Cable NSM B port e0a to controller B slot 5 port 1 (e5a). d. Cable NSM B port e0b to controller A port e0d. e. Go to step 3.

The following illustration shows cabling for two hot-added shelves:

AFF A400 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

4. If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then re enable automatic drive assignment, if needed. See [Complete the hot-add](#).

Otherwise, you are done with this procedure.

Cable shelf to an AFF C400 HA pair

For an AFF C400 HA pair, you can hot-add up to two shelves and use ports in slot 4 and 5 as needed.

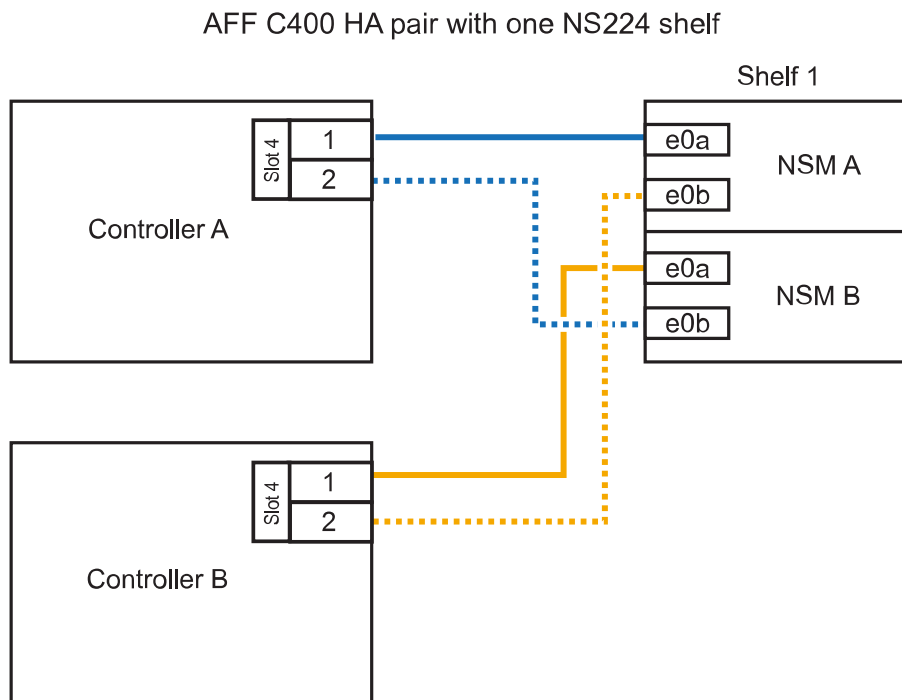
Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A slot 4 port 1 (e4a).
- b. Cable shelf NSM A port e0b to controller B slot 4 port 2 (e4b).
- c. Cable shelf NSM B port e0a to controller B slot 4 port 1 (e4a).
- d. Cable shelf NSM B port e0b to controller A slot 4 port 2 (e4b).

The following illustration shows cabling for one hot-added shelf using one set of RoCE-capable ports on each controller:

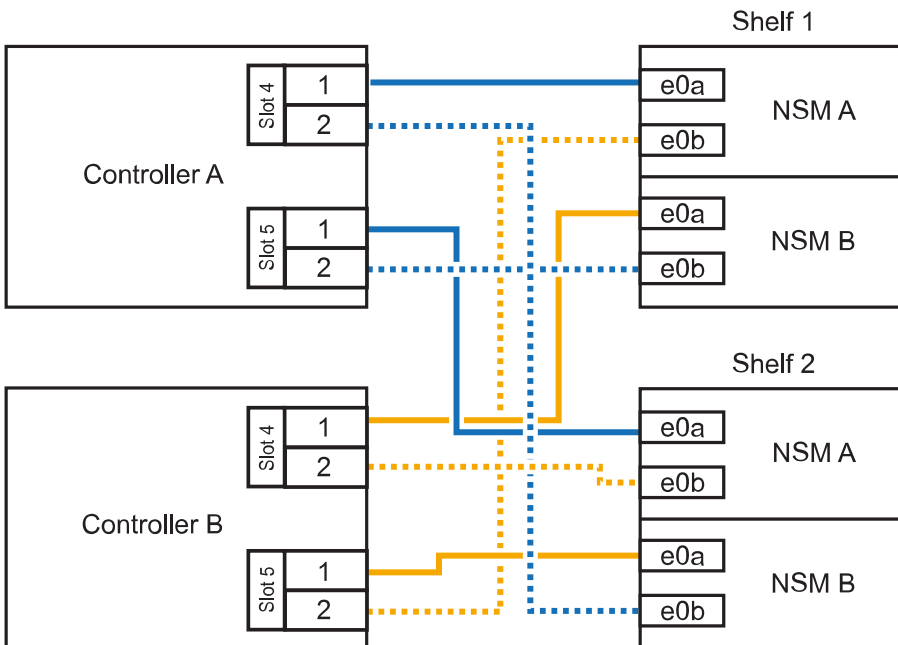


2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports on each controller, complete the following substeps.

Shelves	Cabling
Shelf 1	<ul style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 4 port 1 (e4a). b. Cable NSM A port e0b to controller B slot 5 port 2 (e5b). c. Cable NSM B port e0a to controller B port slot 4 port 1 (e4a). d. Cable NSM B port e0b to controller A slot 5 port 2 (e5b). e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.
Shelf 2	<ul style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 5 port 1 (e5a). b. Cable NSM A port e0b to controller B slot 4 port 2 (e4b). c. Cable NSM B port e0a to controller B slot 5 port 1 (e5a). d. Cable NSM B port e0b to controller A slot 4 port 2 (e4b). e. Go to step 3.

The following illustration shows cabling for two hot-added shelves:

AFF C400 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA A800 or ASA C800

How you cable an NS224 shelf in an AFF A800 or AFF C800 HA pair depends on the number of shelves you are hot-adding and the number of RoCE-capable port sets (one or two) you are using on the controllers.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (one RoCE-capable PCIe card) on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

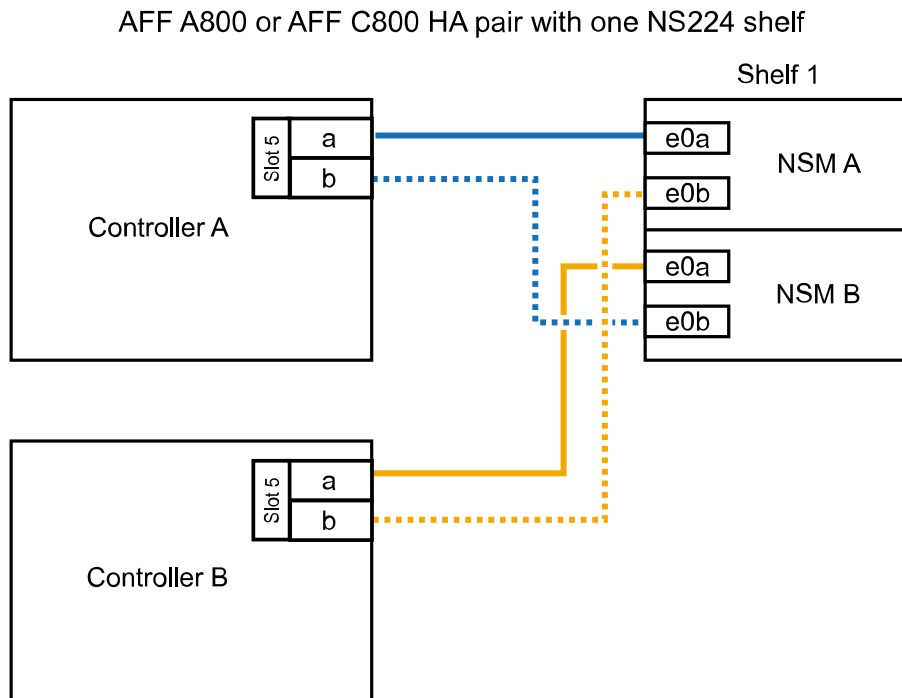
Otherwise, go to the next step.



This step assumes you installed the RoCE-capable PCIe card in slot 5.

- a. Cable shelf NSM A port e0a to controller A slot 5 port a (e5a).
- b. Cable shelf NSM A port e0b to controller B slot 5 port b (e5b).
- c. Cable shelf NSM B port e0a to controller B slot 5 port a (e5a).
- d. Cable shelf NSM B port e0b to controller A slot 5 port b (e5b).

The following illustration shows cabling for one hot-added shelf using one RoCE-capable PCIe card on each controller:





2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (two RoCE-capable

PCIe cards) on each controller, complete the applicable substeps.

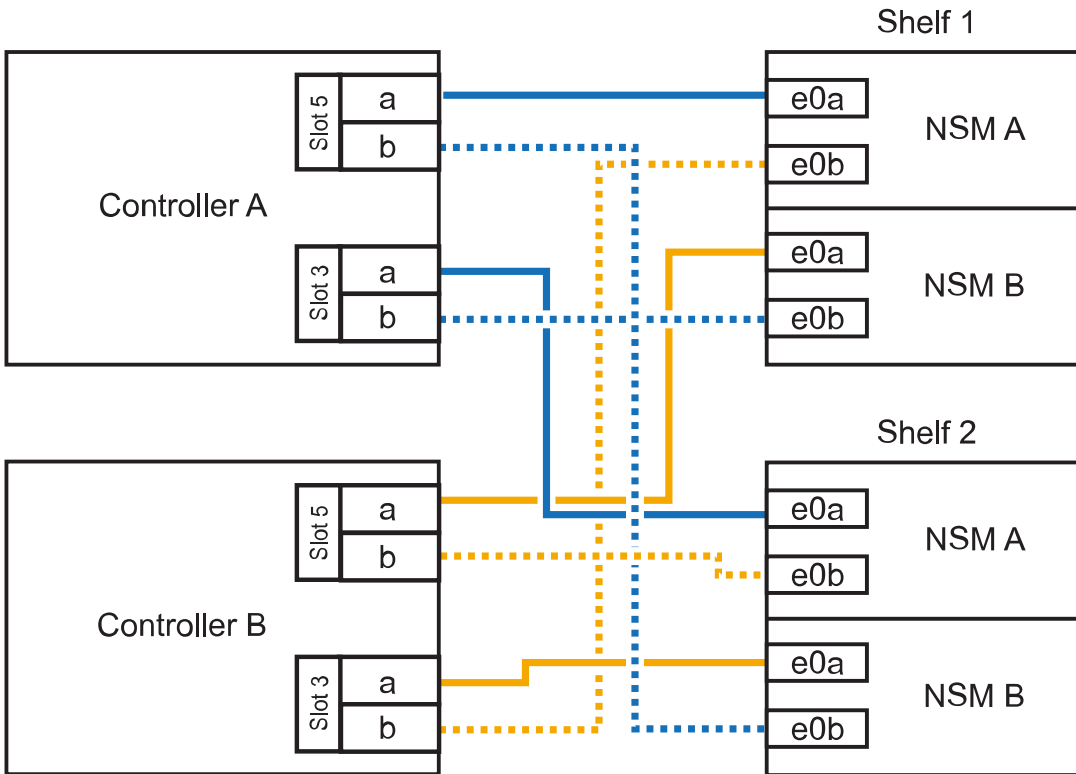


This step assumes you installed the RoCE-capable PCIe cards in slot 5 and slot 3.

Shelves	Cabling
Shelf 1	<div><p>These substeps assume you are beginning the cabling by cabling shelf port e0a to the RoCE-capable PCIe card in slot 5, instead of slot 3.</p><ul style="list-style-type: none">a. Cable NSM A port e0a to controller A slot 5 port a (e5a).b. Cable NSM A port e0b to controller B slot 3 port b (e3b).c. Cable NSM B port e0a to controller B slot 5 port a (e5a).d. Cable NSM B port e0b to controller A slot 3 port b (e3b).e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.</div>
Shelf 2	<div><p>These substeps assume you are beginning the cabling by cabling shelf port e0a to the RoCE-capable PCIe card in slot 3, instead of slot 5 (which correlates with the cabling substeps for shelf 1).</p><ul style="list-style-type: none">a. Cable NSM A port e0a to controller A slot 3 port a (e3a).b. Cable NSM A port e0b to controller B slot 5 port b (e5b).c. Cable NSM B port e0a to controller B slot 3 port a (e3a).d. Cable NSM B port e0b to controller A slot 5 port b (e5b).e. Go to step 3.</div>

The following illustration shows cabling for two hot-added shelves:

AFF A800 or AFF C800 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to ASA A900

When additional storage is needed, you can hot-add up to three additional NS224 drive shelves (for a total of four shelves) to an AFF A900 HA pair.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

- This procedure assumes that your HA pair has at least one existing NS224 shelf and that you are hot-adding up to three additional shelves.
- If your HA pair has only one existing NS224 shelf, this procedure assumes that the shelf is cabled across two RoCE-capable 100GbE I/O modules on each controller.

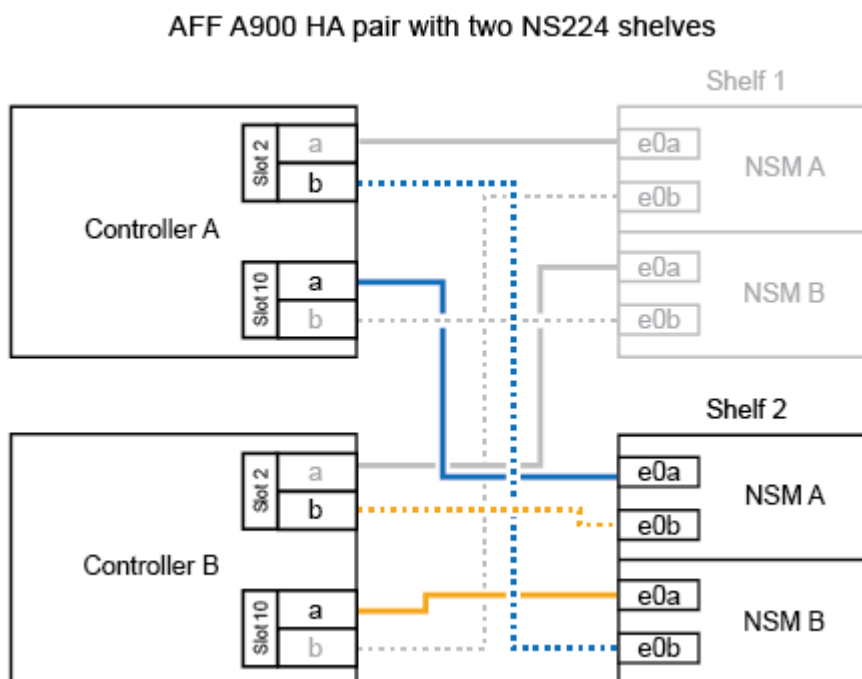
Steps

1. If the NS224 shelf you are hot-adding will be the second NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- a. Cable shelf NSM A port e0a to controller A slot 10 port a (e10a).
- b. Cable shelf NSM A port e0b to controller B slot 2 port b (e2b).
- c. Cable shelf NSM B port e0a to controller B slot 10 port a (e10a).
- d. Cable shelf NSM B port e0b to controller A slot 2 port b (e2b).

The following illustration shows the second shelf cabling (and the first shelf).

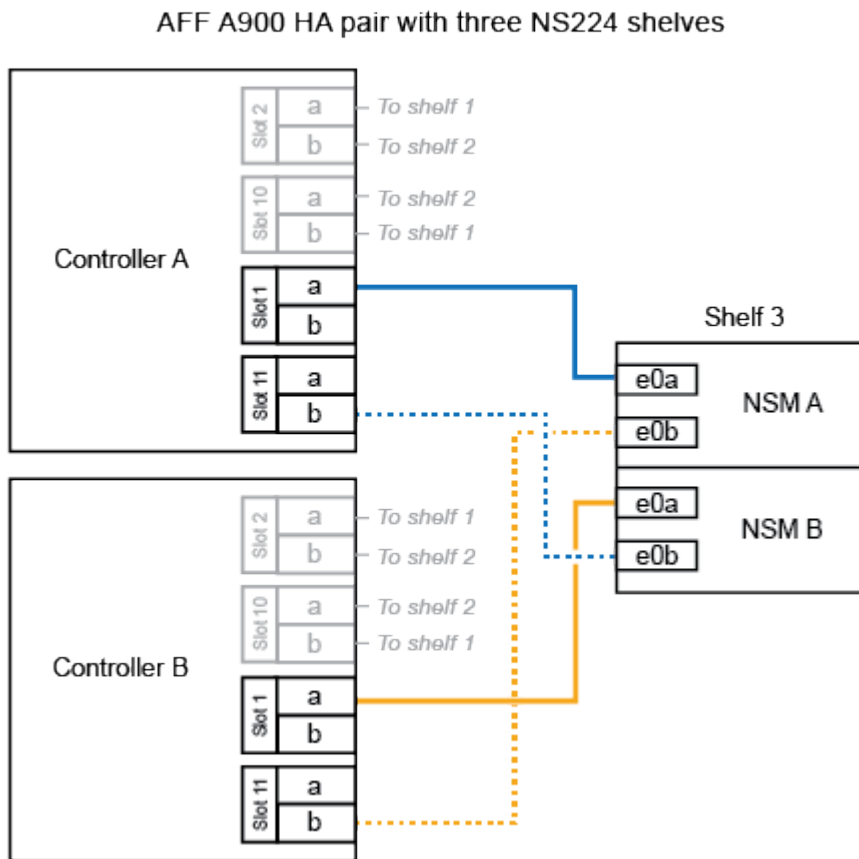


2. If the NS224 shelf you are hot-adding will be the third NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- Cable shelf NSM A port e0a to controller A slot 1 port a (e1a).
- Cable shelf NSM A port e0b to controller B slot 11 port b (e11b).
- Cable shelf NSM B port e0a to controller B slot 1 port a (e1a).
- Cable shelf NSM B port e0b to controller A slot 11 port b (e11b).

The following illustration shows the third shelf cabling.



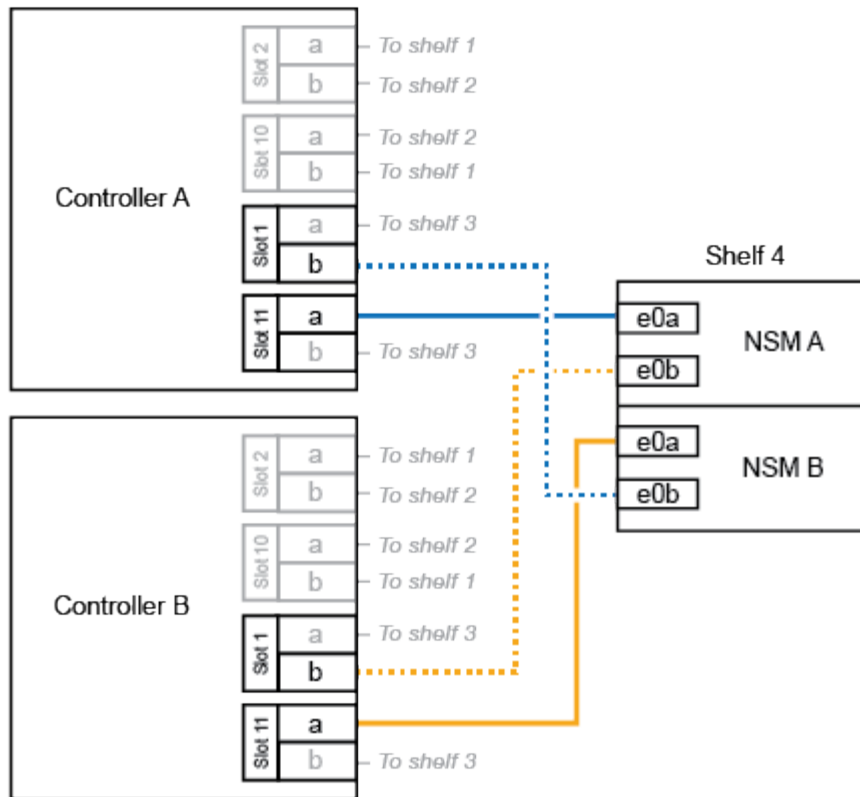
3. If the NS224 shelf you are hot-adding will be the fourth NS224 shelf in the HA pair, complete the following substeps.

Otherwise, go to the next step.

- Cable shelf NSM A port e0a to controller A slot 11 port a (e11a).
- Cable shelf NSM A port e0b to controller B slot 1 port b (e1b).
- Cable shelf NSM B port e0a to controller B slot 11 port a (e11a).
- Cable shelf NSM B port e0b to controller A slot 1 port b (e1b).

The following illustration shows the fourth shelf cabling.

AFF A900 HA pair with four NS224 shelves



4. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to end-of-availability systems - NS224 shelves

You cable each NS224 shelf you are hot-adding so that each shelf has two connections to each controller in the HA pair.

Cable shelf to AFF A320

You can hot-add a second shelf to an existing HA pair when additional storage is needed.

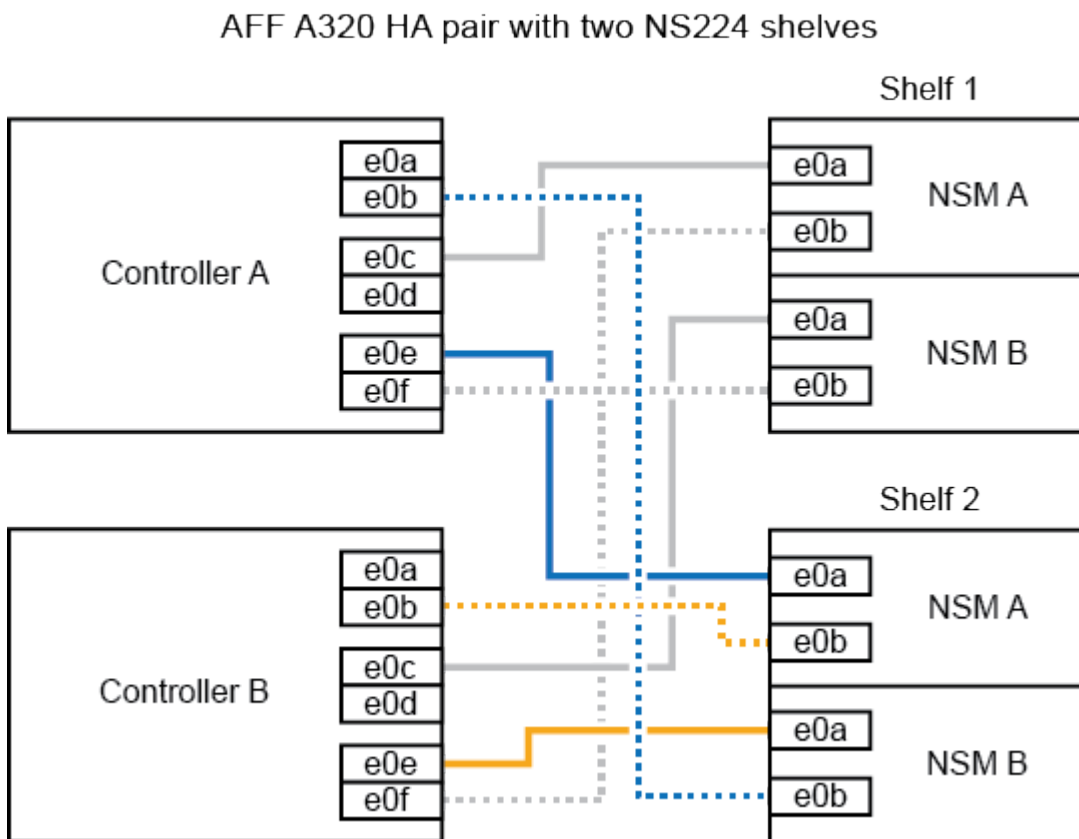
Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

Steps

1. Cable the shelf to the controllers.
 - a. Cable NSM A port e0a to controller A port e0e.
 - b. Cable NSM A port e0b to controller B port e0b.
 - c. Cable NSM B port e0a to controller B port e0e.
 - d. Cable NSM B port e0b to controller A port e0b.

The following illustration shows cabling for the hot-added shelf (shelf 2):



2. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to

manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to AFF A700

How you cable an NS224 shelf to an AFF A700 HA pair depends on the number of shelves you are hot-adding and the number of RoCE-capable port sets (one or two) you are using on the controllers.

Before you begin

- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).
- If you are hot-adding the initial NS224 shelf (no NS224 shelf exists in your HA pair), you must install a core dump module (X9170A, NVMe 1TB SSD) in each controller to support core dumps (store core files).

See [Replace the caching module or add/replace a core dump module — AFF A700 and FAS9000](#).

Steps

1. If you are hot-adding one shelf using one set of RoCE-capable ports (one RoCE capable I/O module) on each controller, and this is the only NS224 shelf in your HA pair, complete the following substeps.

Otherwise, go to the next step.

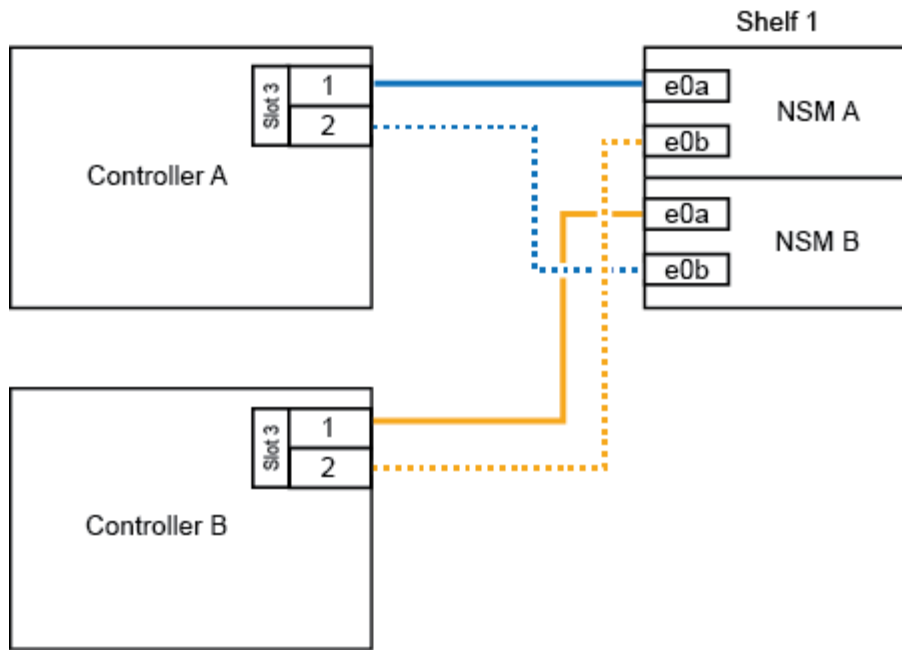


This step assumes that you installed the RoCE-capable I/O module in slot 3, instead of slot 7, on each controller.

- a. Cable shelf NSM A port e0a to controller A slot 3 port a.
- b. Cable shelf NSM A port e0b to controller B slot 3 port b.
- c. Cable shelf NSM B port e0a to controller B slot 3 port a.
- d. Cable shelf NSM B port e0b to controller A slot 3 port b.

The following illustration shows cabling for one hot-added shelf using one RoCE-capable I/O module in each controller:

AFF A700 HA pair with one NS224 shelf

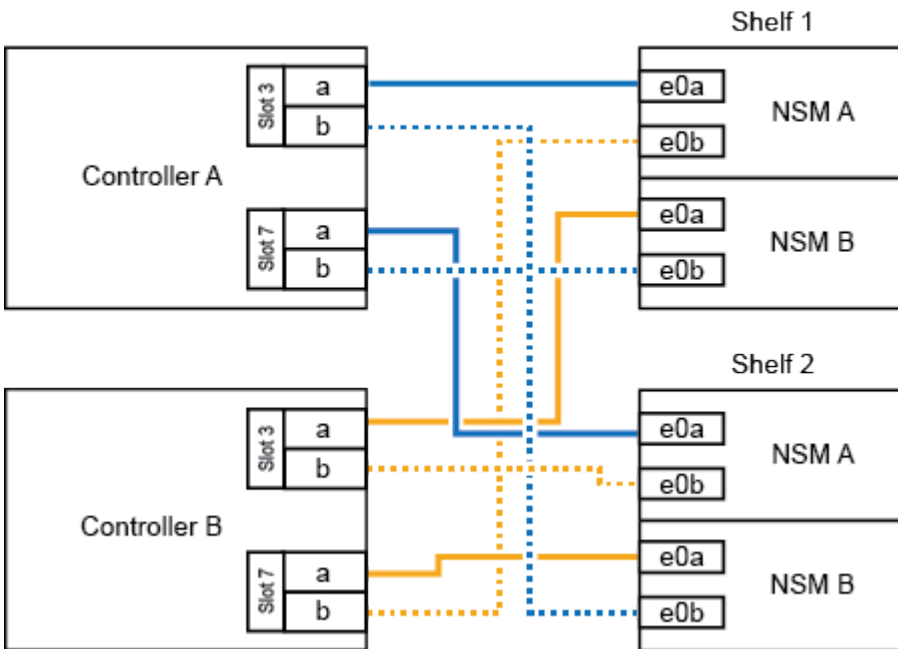


2. If you are hot-adding one or two shelves using two sets of RoCE-capable ports (two RoCE-capable I/O modules) in each controller, complete the applicable substeps.

Shelves	Cabling
Shelf 1	<p>i These substeps assume that you are beginning the cabling by cabling shelf port e0a to the RoCE-capable I/O module in slot 3, instead of slot 7.</p> <ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 3 port a. b. Cable NSM A port e0b to controller B slot 7 port b. c. Cable NSM B port e0a to controller B slot 3 port a. d. Cable NSM B port e0b to controller A slot 7 port b. e. If you are hot-adding a second shelf, complete the “Shelf 2” substeps; otherwise, go to step 3.
Shelf 2	<p>i These substeps assume that you are beginning the cabling by cabling shelf port e0a to the RoCE-capable I/O module in slot 7, instead of slot 3 (which correlates with the cabling substeps for shelf 1).</p> <ol style="list-style-type: none"> a. Cable NSM A port e0a to controller A slot 7 port a. b. Cable NSM A port e0b to controller B slot 3 port b. c. Cable NSM B port e0a to controller B slot 7 port a. d. Cable NSM B port e0b to controller A slot 3 port b. e. Go to step 3.

The following illustration shows cabling for the first and second hot-added shelves:

AFF A700 HA pair with two NS224 shelves



3. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenabling automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Cable shelf to FAS500f

When additional storage is needed, you can hot-add one NS224 shelf to a FAS500f HA pair.

Before you begin

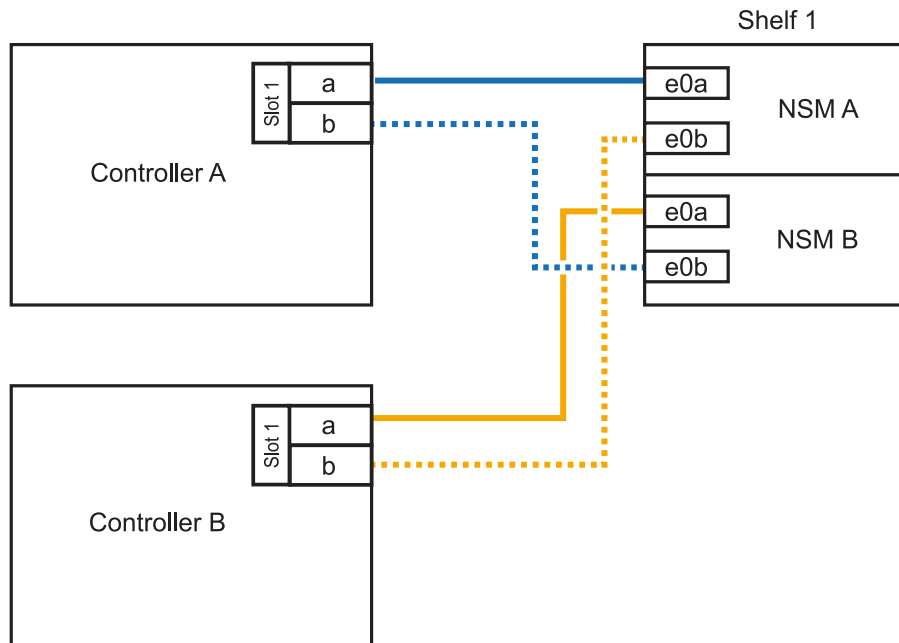
- You must have reviewed the [hot-add requirements and best practices](#).
- You must have completed the applicable procedures in [Prepare-to hot-add a shelf](#).
- You must have installed the shelves, powered them on, and set the shelf IDs as described in [Install a shelf for a hot-add](#).

About this task

When viewed from the rear of the platform chassis, the RoCE-capable card port on the left is port "a" (e1a) and the port on the right is port "b" (e1b).

Steps

1. Cable the shelf connections:
 - a. Cable shelf NSM A port e0a to controller A slot 1 port a (e1a).
 - b. Cable shelf NSM A port e0b to controller B slot 1 port b (e1b).
 - c. Cable shelf NSM B port e0a to controller B slot 1 port a (e1a).
 - d. Cable shelf NSM B port e0b to controller A slot 1 port b (e1b).The following illustration shows the shelf cabling when completed.



2. Verify that the hot-added shelf is cabled correctly using [Active IQ Config Advisor](#).

If any cabling errors are generated, follow the corrective actions provided.

What's next?

If you disabled automatic drive assignment as part of the preparation for this procedure, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed. Go to [Complete the hot-add](#).

Otherwise, you are done with the hot-add shelf procedure.

Complete the hot-add - NS224 shelves

If you disabled automatic drive assignment as part of the preparation for the NS224 shelf hot-add, you need to manually assign drive ownership and then reenable automatic drive assignment, if needed.

Before you begin

You must have already cabled your shelf as instructed for your HA pair. See [Overview of cabling for a hot-add](#).

Steps

1. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller.

2. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller.

You can use the wild card character to assign more than one drive at once.

3. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenale automatic drive assignment on both controllers.

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