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## Configuring a stretch MetroCluster system with SAS disk shelves and SAS optical cables

SAS optical cables can be used to cable SAS disk shelves in a stretch MetroCluster system to achieve greater distance connectivity. A stretch MetroCluster system can be a new system installation, an existing system cabled with SAS cables (not using FibreBridge 6500N bridges) for which you are replacing SAS cables or hot-adding a SAS disk shelf, or an existing system for which you are replacing SAS copper cables and FibreBridge 6500N bridges.

### About this document

This document contains the following procedures:

- “Installing a new system with SAS disk shelves using SAS optical cables” on page 3
- “Replacing SAS cables in a multipath HA configuration” on page 4
- “Hot-adding a SAS disk shelf using SAS optical cables” on page 6
- “Replacing FibreBridge 6500N bridges and SAS copper cables with SAS optical cables” on page 11

### Before you begin any procedure in this document

The following overall requirements must be met before completing any procedures in this document:

- Your system platform, disk shelves, and version of Data ONTAP that your system is running must support SAS optical cables.

The most current support information can be found in the *IBM System Storage N series Introduction and Planning Guide* at the N series support website (accessed and navigated as described in Websites)

- SAS optical multimode QSFP-to-QSFP cables can be used for controller-to-shelf and shelf-to-shelf connections, and are available in lengths up to 50 meters.
- If you are using SAS optical multimode MPO cables with MPO QSFP modules, the following parameters apply:
  - You can use these cables for controller-to-shelf and shelf-to-shelf connections.
  - The length of a single cable cannot exceed 150 meters for OM4 and 100 meters for OM3.
  - The total end-to-end path (sum of point-to-point paths from the controller to the last shelf) cannot exceed 510 meters.

The total path includes the set of breakout cables, patch panels, and inter-panel cables.

- If you are using SAS optical multimode breakout cables, the following parameters apply:
  - You can use these cables for controller-to-shelf and shelf-to-shelf connections.

If you use multimode breakout cables for a shelf-to-shelf connection, you can only use it once within a stack of disk shelves. You must use SAS optical multimode QSFP-to-QSFP or MPO cables with MPO QSFP modules to connect the remaining shelf-to-shelf connections.

- The point-to-point (QSFP-to-QSFP) path of any multimode cable cannot exceed 150 meters for OM4 and 100 meters for OM3.

The path includes the set of breakout cables, patch panels, and inter-panel cables.

- The total end-to-end path (sum of point-to-point paths from the controller to the last shelf) cannot exceed 510 meters.

The total path includes the set of breakout cables, patch panels, and inter-panel cables.

- Up to one pair of patch panels can be used in a path.
- You need to supply the patch panels and inter-panel cables.

The inter-panel cables must be the same mode as the SAS optical breakout cable: multimode.

- You received a set of QSFP-to-MPO cable modules with each set of SAS optical breakout cables, which you must attach to the MPO end of each SAS optical breakout cable.

The breakout cables have SC, LC, or MTRJ connectors on the opposite end, which connect to a patch panel.

- You must connect all eight (four pairs) of the SC, LC, or MTRJ breakout connectors to the patch panel.

- If you are using SAS optical singlemode breakout cables, the following parameters apply:

- You can use these cables for controller-to-shelf connections.

Shelf-to-shelf connections use multimode QSFP-to-QSFP cables or multimode MPO cables with MPO QSFP modules.

- The point-to-point (QSFP-to-QSFP) path of a single singlemode cable cannot exceed 500 meters.
- The total end-to-end path (sum of point-to-point paths from the controller to the last shelf) cannot exceed 510 meters.

The total path includes the set of breakout cables, patch panels, and inter-panel cables.

- Up to one pair of patch panels can be used in a path.
- You need to supply the patch panels and inter-panel cables.

The inter-panel cables must be the same mode as the SAS optical breakout cable: singlemode.

- You must connect all eight (four pairs) of the SC, LC, or MTRJ breakout connectors to the patch panel.

- The SAS cables can be SAS copper, SAS optical, or a mix depending on whether or not your system meets the requirements for using the type of cable.

If you are using a mix of SAS copper cables and SAS optical cables, the following rules apply:

- Shelf-to-shelf connections in a stack must be all SAS copper cables or all SAS optical cables.
- If the shelf-to-shelf connections are SAS optical cables, the shelf-to-controller connections to that stack must also be SAS optical cables.
- If the shelf-to-shelf connections are SAS copper cables, the shelf-to-controller connections to that stack can be SAS optical cables or SAS copper cables.

## About these procedures

The following general information applies to all procedures in this document:

- The use of SAS optical cables in a stack attached to FibreBridge 6500N bridges is not supported.
- Disk shelves connected with SAS optical cables require a version of disk shelf firmware that supports SAS optical cables.

Best practice is to update all disk shelves in the storage system with the latest version of disk shelf firmware.

**Note:** Do not revert disk shelf firmware to a version that does not support SAS optical cables.

- The cable QSFP connector end connects to a disk shelf or a SAS port on a controller.

The QSFP connectors are keyed; when oriented correctly into a SAS port the QSFP connector clicks into place and the disk shelf SAS port link LED, labeled LNK (Link Activity), illuminates green. Do not force a connector into a port.

- The terms *node* and *controller* are used interchangeably.
- The IBM N series interoperability matrix contains the most current compatibility and best practices information (accessed and navigated as described in Websites)

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## Installing a new system with SAS disk shelves using SAS optical cables

You can install a new system that has SAS disk shelves using all SAS optical cables for shelf-to-shelf, controller-to-shelf, controller-to-patch panel, and patch panel-to-shelf connections.

### Before you begin

- You must have met the requirements given at the beginning of this document.
- You ordered and received the appropriate type, number, and length of SAS optical cables required for your configuration.
- Your system must have the appropriate number of available SAS ports on each controller.  
If you are using SAS HBAs, your system must have the appropriate number of supported SAS HBAs installed.  
Information about SAS ports is available in the *Universal SAS and ACP Cabling Guide*.
- You must have determined the controller SAS ports you will be cabling by completing the SAS cabling worksheet in the *Universal SAS and ACP Cabling Guide*.
- You must have checked the IBM N series interoperability matrix to verify that your system meets all configuration requirements for the SAS optical cable.
- You must have checked the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode* to verify that your system meets all applicable stretch MetroCluster requirements as defined in the MetroCluster installation section.
- You must have downloaded the following documents from the N series support website (accessed and navigated as described in Websites) (for reference later in this procedure):
  - *Universal SAS and ACP Cabling Guide*
  - *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode*

### Procedure

1. Properly ground yourself.
2. Install the platforms. For instructions on installing the platforms, see the *Installation and Setup Instructions* that came with your platform.
3. Install the disk shelves, power them on, and set the shelf IDs. For instructions, see the *Hardware and Service Guide* that came with your disk shelf.
4. Create a port list to assign disk drives to the pools appropriately, using the information in the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode*.
5. Cable the shelf-to-shelf connection (daisy-chain the disk shelves) in each stack. For information about daisy-chaining disk shelves, see the *Installation and Service Guide* that came with your disk shelf.
6. Cable the first and last disk shelf in each stack to the controller SAS ports, using your completed SAS cabling worksheet. You will verify the SAS connections later.
7. Connect and configure the controllers following the procedure for the stretch MetroCluster configuration in the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode*. This includes cabling the HA interconnect link as appropriate for your configuration.
8. Boot the system to Maintenance mode by completing the following substeps:
  - a. Boot the system by entering the `boot_ontap` command.
  - b. Halt the boot process by pressing `Ctrl-C`.
  - c. Select the Maintenance mode option from the display menu. The system boots to Maintenance mode.
9. Verify the SAS connections by entering the following command at the Maintenance mode prompt of either controller:

```
sasadmin expander_map
```

10. The next step depends on the output.

If...	Then...
The output lists all IOMs	The IOMs have connectivity; go to the next step.
Any IOMs are not shown (either the output does not show an IOM because it is cabled incorrectly, or the output does not show all the IOMs downstream from the incorrectly cabled IOM.)	Repeat Steps 5 and 6 to correct cabling errors, then go to Step 9.

11. Assign the attached disk shelves to the appropriate pools by using the “Assigning disk pools in a stretch MetroCluster configuration” procedure in the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode*. Be sure to also complete the “Verifying disk paths” procedure that you are pointed to afterwards.

12. Verify that the disk shelves in the storage system have the latest version of disk shelf firmware by completing the following substeps:

- a. Enter the following command at the storage system console (from normal mode):  
`sasadmin expander_map`
- b. Locate the disk shelf firmware information for the disk shelves in the output. 0151 is the disk shelf firmware version for shelf number one (Slot A/IOM A) in the storage system:  
 Expanders on channel 4a:  
 Level 3: WWN 500a0980000840ff, ID 1, Serial Number ' SHU0954292G114C', Product 'DS424IOM6 ', Rev '0151', Slot A
- c. Compare the firmware information in the command output with the disk shelf firmware information at [www.ibm.com/storage/support/nseries](http://www.ibm.com/storage/support/nseries) to determine the most current disk shelf firmware version.

13. The next step depends on how current the disk shelf firmware is.

If the firmware version in the command output is...	Then...
The same as or later than the most current version on the N series support website (accessed and navigated as described in Websites)	Complete Steps 14 and 15. No disk shelf firmware update is needed.
An earlier version than the most current version on the N series support website (accessed and navigated as described in Websites)	Complete Steps 14 through 16. You need to update the disk shelf firmware.

14. Configure the system and enable licenses as needed using the information about configuring an HA pair in the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode* .

15. Boot the storage system and begin setup.

16. If, in Step 13, you had an earlier version of disk shelf firmware than the most current version on the N series support website (accessed and navigated as described in Websites), download the disk shelf firmware file by using the procedure at [www.ibm.com/storage/support/nseries](http://www.ibm.com/storage/support/nseries). You can run the commands from either node.

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## Replacing SAS cables in a multipath HA configuration

You can nondisruptively replace SAS cables in a multipath HA configuration. The SAS cables mentioned here include SAS copper and SAS optical cables.

### Before you begin

You must have met the requirements given at the beginning of this document.

## About this task

- *Replacing* a SAS cable means that you are replacing a cable using the same exact ports for a controller-to-shelf or shelf-to-shelf connection.

Situations where you might want to replace a SAS cable can include when a cable has failed, a longer cable is needed, SAS optical cables are preferred instead of SAS copper cables, or SAS copper cables are necessary instead of SAS optical cables.

- Disk shelves connected with SAS optical cables require a version of disk shelf firmware that supports SAS optical cables.

Best practice is to update all disk shelves in the storage system with the latest version of disk shelf firmware.

**Note:** Do not revert disk shelf firmware to a version that does not support SAS optical cables.

- You cannot change any disks, disk shelves, or components of a controller module as part of these procedures.

## Procedure

1. Verify that your stretch MetroCluster system is Multi-Path HA by running the following command at the console of both controllers:

```
sysconfig
```

**Note:** It might take up to a minute for the system to complete discovery.

The configuration is listed in the **System Storage** configuration field. It should be the fourth line of output.

### CAUTION:

**If your system configuration is shown as something other than Multi-Path HA, you cannot continue with this procedure.**

2. If you are replacing SAS copper cables with SAS optical cables, verify that the disk shelves in the storage system have the latest version of disk shelf firmware by completing the following substeps; otherwise, go to Step 4.
  - a. Enter the following command at the storage system console:

```
sasadmin expander_map
```
  - b. Locate the disk shelf firmware information for the disk shelves in the output. 0151 is the disk shelf firmware version for shelf number one (Slot A/IOM A) in the storage system:

```
Expanders on channel 4a:  
Level 3: WWN 500a0980000840ff, ID 1, Serial Number ' SHU0954292G114C', Product 'DS424IOM6', Rev '0151', Slot A
```
  - c. Compare the firmware information in the command output with the disk shelf firmware information at [www.ibm.com/storage/support/nseries](http://www.ibm.com/storage/support/nseries) to determine the most current disk shelf firmware version.
3. The next step depends on how current the disk shelf firmware is.

If the firmware version in the command output is...	Then...
The same as or later than the most current version on the N series support website (accessed and navigated as described in Websites)	No disk shelf firmware update is needed.
An earlier version than the most current version on the N series support website (accessed and navigated as described in Websites)	Download the disk shelf firmware file by using the procedure at <a href="http://www.ibm.com/storage/support/nseries">www.ibm.com/storage/support/nseries</a> . You can run the commands from either controller.

4. Replace SAS cables by completing the following substeps:

**Note:** When replacing a SAS cable, wait a minimum of 10 seconds before plugging in the new cable so that the system can detect the cable change.

You can ignore cabling messages that might appear on the console.

- a. Replace cables on side A one cable at a time. The Side A cables are the cables connected to IOM A of each disk shelf.
- b. Verify that you have correctly replaced the SAS cables by entering the following command at the console of either controller:  
sysconfig  
The output should be the same as Step 1: the system should be Multi-Path HA, and the SAS port and attached disk shelf information should be the same.  
If the output is something other than Multi-Path HA, you must identify the cabling error, correct it, and run the sysconfig command again.
- c. Repeat substeps a and b for Side B. The Side B cables are the cables connected to IOM B of each disk shelf.

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## Hot-adding a SAS disk shelf using SAS optical cables

You can hot-add a SAS disk shelf to an existing stack of SAS disk shelves or to a SAS HBA or onboard SAS port on the controller (as a new stack). Hot-adding a disk shelf involves installing, cabling, and verifying the disk drive and disk shelf firmware versions.

### Before you begin

- You must have met the requirements given at the beginning of this document.
- You must have verified that your storage system meets the requirements for the disk shelf (and disk drives) that you are hot-adding.
- You ordered and received the appropriate type, number, and length of SAS optical cables required for your configuration.
- You have met the following requirements if you are hot-adding a single disk shelf or a stack of disk shelves directly to a system controller:
  - Each controller in your storage system must have enough available PCI SAS HBA or onboard SAS ports.
  - You must have completed the “Completing the SAS cabling worksheet” so that you know how to cable your disk shelf or stack of shelves to the controller.

See the *Universal SAS and ACP Cabling Guide* for “Controller-to-shelf connection rules” and the “Completing the SAS cabling worksheet”.

- If you are hot-adding a disk shelf with SAS optical cables to a stack of disk shelves that is connected with SAS copper cables, you can temporarily have both cable types present in the stack.

After hot-adding the disk shelf, you must replace the SAS copper cables for the rest of the shelf-to-shelf connections in the stack and the shelf-to-controller connections from the first and last disk shelf in the stack so that the stack meets the cabling rules for using SAS optical and SAS copper cables. This means that you must have ordered the appropriate number of SAS optical cables.

**Note:** Cables can be replaced nondisruptively in multipath HA configurations.

### About this task

- If you need to, you can use longer cables to connect the hot-added shelf.  
This is a cable replacement and for Multipath HA systems can be done nondisruptively (in Step 1 of the “Cabling the hot-added disk shelf” procedure).
- If you are hot-adding a disk shelf to an existing stack, this procedure is written for hot-adding the disk shelf to the logical last disk shelf of the stack.
- If you are hot-adding more than one disk shelf, hot-add one at a time.

- If you are installing the disk shelf in an equipment rack or IBM N series cabinet, you must install the two-post telco tray kit or four-post rail kit that came with your disk shelf.

## Installing a disk shelf for a hot-add

Installing the new SAS disk shelf involves securing the disk shelf in a rack using the applicable two-post telco tray kit or the four-post rail kit and setting the disk shelf ID.

### About this task

Disk shelves do not need to be grounded; grounding is done through the power cords.

### Procedure

1. Properly ground yourself.
2. Install the two-post telco tray kit or the four-post rail kit for your disk shelf model using the installation flyer that came with the kit.

**Attention:** If you are installing multiple disk shelves, you should install them from the bottom to the top of the rack for the best stability.

Do not ear-mount the disk shelf into a telco-type rack; the disk shelf will collapse from the rack under its own weight.

**Attention:** For two-post mid-mount installations, you must use the mid-mount brackets in addition to the two-post telco tray kit.

3. Install and secure the disk shelf onto the support brackets and rack. To make the disk shelf lighter and easier to maneuver, remove the power supplies and I/O modules (IOMs). Avoid removing the disk drives or carriers if possible because excessive handling can lead to internal damage.

**Attention:** A fully populated EXN3000 disk shelf can weigh approximately 110 lbs (49.9 kg).

A fully populated EXN3500 disk shelf can weigh approximately 49 lbs (22 kg).

4. Reinstall any power supplies and IOMs you removed to install your disk shelf into the rack.
5. Repeat Steps 3 and 4 for each disk shelf you are installing if you are adding multiple disk shelves.
6. Connect the power supplies for each disk shelf:
  - a. Connect the power cords first to the disk shelves, securing them in place with the power cord retainer, and then to different power sources for resiliency.

**Note:** If you have a disk shelf with four power supplies, connect power supplies in slots 1 and 3 to one power source and power supplies in slots 2 and 4 to a different power source.

- b. Turn on the power supplies for each disk shelf and wait for the disk drives to spin up. When the disk shelf has the maximum number of supported power supplies, all disk drives or carriers spin up at the same time. However, if one or two power supplies have faulted in a disk shelf with four power supplies, or if one power supply has faulted in a disk shelf with two power supplies, disk drives spin up in sets of six at 12-second intervals.
7. Change the shelf ID for each disk shelf you hot-added by completing the following substeps: You can verify IDs already in use by entering the `sasadmin shelf` command at the system console of either node.
    - a. Change the shelf ID to a valid ID that is unique from the other SAS disk shelves in the storage system.
    - b. Power-cycle the disk shelf to make the shelf ID take effect.

See “Changing the disk shelf ID” in the hardware and service guides of EXN3000, EXN3500, and EXN3200 for more detailed instructions.

## Cabling the hot-added disk shelf

Cabling the hot-added disk shelf involves cabling the SAS connections and, if applicable, assigning disk drive ownership.

### Before you begin

- You must have met the requirements given at the beginning of this document.
- You must have met all the requirements in the “Hot-adding a SAS disk shelf using SAS optical cables” section and installed your disk shelf.

### About this task

- This procedure is written with the assumption that you originally cabled your system so that the controllers connect to the last disk shelf in the stack through the disk shelf's circle ports instead of the square ports.
- Disk shelves connected with SAS optical cables require a version of disk shelf firmware that supports SAS optical cables.

Best practice is to update all disk shelves in the storage system with the latest version of disk shelf firmware.

**Note:** Do not revert disk shelf firmware to a version that does not support SAS optical cables.

### Procedure

1. Cable the SAS connections.

If you are cabling a disk shelf...	Then...
To an existing stack of disk shelves	<ol style="list-style-type: none"><li>1. Disconnect the SAS cable from the I/O Module (IOM) A circle port on the last shelf in the stack. You can leave the other end of the cable connected to the controller to minimize confusion, or replace the cable with a longer cable if needed.</li><li>2. Connect (daisy-chain) the IOM A circle port of the last disk shelf in the stack to the IOM A square port of the new disk shelf, using the SAS cables that came with the new disk shelf.</li><li>3. Connect the cable that you removed in substep a to the IOM A circle port of the new disk shelf.</li><li>4. Verify that all cables are securely fastened.</li><li>5. Repeat Substeps a through d for IOM B. The storage system recognizes the new disk shelf after all the drives spin up.</li></ol>
To an existing SAS HBA or onboard SAS port	<ol style="list-style-type: none"><li>1. Use the “Cabling SAS ports” procedure in the <i>Universal SAS and ACP Cabling Guide</i>.</li><li>2. Verify that all cables are securely fastened.</li></ol>

If a disk shelf error message appears on the console after you complete SAS cabling, you need to use the information in “SAS cabling error messages” in the *Universal SAS and ACP Cabling Guide* to determine the corrective actions that you should take.

2. Verify SAS connectivity by completing the applicable substeps: You can run these commands from the system console of either node.
  - a. Enter the following command to find out what the adapter name is:  
sasadmin expander\_map



- b. Enter the following command to verify that all disk drives can be seen by the system:
 

```
sasadmin shelf adapter_name
```

 The system displays a representation of your disk shelf populated with all the disk drives it sees.
- c. Enter the following command to verify that all IOMs (expanders) can be seen by the system (SAS channels and controller ports):
 

```
sasadmin expander_map adapter_name
```

 The following example of output from this command shows that a single expander, IOM B (slot B), in shelf 3 (ID 3) is attached to port 4a (channel 4a) on the controller:
 

```
Expanders on channel 4a:
Level 1: WWN 500a098000049c3f, ID 3, Serial Number 1006SZ00196, Product 'DS224IOM6 ', Rev '0134', Slot B
```
3. Check whether your system has disk autoassignment enabled by entering the following command at the console of either node:
 

```
options disk.auto_assign
```

 If disk autoassignment is enabled, the output shows `disk.auto_assign on`.
4. If your system does not have disk autoassignment enabled or disk drives in the same stack are owned by both nodes, assign disk drives to the appropriate pools by using the “Assigning disk pools in a stretch MetroCluster configuration” procedure in the *Data ONTAP High Availability and MetroCluster Configuration Guide for 7-Mode*. Be sure to also complete the “Verifying disk paths” procedure that you are pointed to afterwards.
5. If you hot-added a disk shelf with SAS optical cables to a stack of disk shelves that are connected with SAS copper cables, replace the SAS copper cables for the rest of the shelf-to-shelf connections and the controller-to-shelf connections so that the stack meets the cabling rules stated at the beginning of this document; otherwise, go to the next step. You can use the cable replacement procedure in the “Replacing SAS Cables in a multipath HA configuration” section of this document.
6. Go to “Verifying the disk drive and disk shelf firmware versions”.

## Verifying the disk drive and disk shelf firmware versions

Because Data ONTAP does not always automatically update the disk drive and disk shelf firmware on hot-added SAS disk shelves, you must verify that the disk drive and disk shelf firmware are the most current versions. If they are not, you must manually update the firmware.

### Procedure

1. Check the console for a message containing `dbfu.selected:info` and text stating selected for background disk firmware update to determine whether or not you need to manually update the disk drive firmware. For example, the output could look as follows:

```
Fri Jul 19 13:05:23 PDT [svt-8040-02: bdfu.selected:info]:
Disk svt-16g-sw4:4.126L64 [NETAPP X420_SFIRF300A10 NQ03] S/N [3SE0W95500009017R4SV]
selected for background disk firmware.
```

After assigning disk drives on the hot-added disk shelf, the disk drive firmware updates should have begun automatically on each disk drive with downrev firmware. A repeated message similar to what is shown above appears on the console every three to five minutes—the time it takes to update downrev firmware on a disk drive—showing the firmware update progress.

If...	Then...
There is similar output	Go to the next step.  Disk drives with downrev firmware have been detected and the firmware is being updated automatically.

If...	Then...
There is no similar output	<p>Wait for an hourly message on the console and take the applicable action:</p> <ul style="list-style-type: none"> <li>• If there is no message on the console about disk drive firmware, this means that the disk drive firmware is current and no action is needed.</li> <li>• If there is a message containing <code>disk.fw.downrevWarning</code> and text stating disks have downrev firmware that you need to update, update the disk drive firmware by completing the following substeps:  For example, actual output could look similar to Sun May 5 04:00:01 PDT [svt-6040-01: <code>disk.fw.downrevWarning:warning</code>]: 1 disks have downrev firmware that you need to update. <ol style="list-style-type: none"> <li>1. Download the disk drive firmware using the procedure at <a href="http://www.ibm.com/storage/support/nseries">www.ibm.com/storage/support/nseries</a>.</li> <li>2. Enter the following command at the storage system console to update the disk drive firmware:  <code>disk_fw_update</code>  You must run this command on both nodes.  <b>Attention:</b> Running this command will delay I/O on the disk drives on which you are updating the firmware.</li> </ol> </li> </ul>

2. Verify that the disk shelf firmware is the most current version:
  - a. Enter the following command at the storage system console:  
`sasadmin expander_map`
  - b. Locate the disk shelf firmware information for the hot-added disk shelf in the output. 0151 is the disk shelf firmware version for shelf number one (Slot A/IOM A) in the storage system:  
Expanders on channel 4a:  
Level 3: WWN 500a0980000840ff, ID 1, Serial Number ' SHU0954292G114C', Product 'DS424IOM6', Rev '0151', Slot A
  - c. Compare the firmware information in the command output with the disk shelf firmware information at [www.ibm.com/storage/support/nseries](http://www.ibm.com/storage/support/nseries) to determine the most current disk shelf firmware version.
3. The next step depends on how current the disk shelf firmware is.

If the firmware version in the command output is...	Then...
The same as or later than the most current version on the N series support website (accessed and navigated as described in Websites)	No disk shelf firmware update is needed.
An earlier version than the most current version on the N series support website (accessed and navigated as described in Websites)	Download the disk shelf firmware file by using the procedure at <a href="http://www.ibm.com/storage/support/nseries">www.ibm.com/storage/support/nseries</a> .  You can run the commands from either node.

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## Replacing FibreBridge 6500N bridges and SAS copper cables with SAS optical cables

You must halt both controllers of the stretch MetroCluster to replace all FibreBridge 6500N bridges, shelf-to-shelf SAS copper cables, and bridge-to-shelf SAS copper cables with SAS optical cables.

### Before you begin

- You must have met the requirements given at the beginning of this document.
- You ordered and received the appropriate type, number, and length of SAS optical cables required for your configuration.
- You ordered and received the appropriate number and type of SAS HBAs for each controller.

Each controller requires two SAS ports for each stack to which it is connected. For example, one stack at Site 1 and one stack at Site 2 requires four ports on each controller.

You install the SAS HBAs in Step 9 of this procedure, after you halt your system.

Information about SAS ports is available in the *Universal SAS and ACP Cabling Guide*.

- You must have downloaded the *Universal SAS and ACP Cabling Guide* from the N series support website (accessed and navigated as described in Websites).

### About this task

- Disk shelves connected with SAS optical cables require a version of disk shelf firmware that supports SAS optical cables.

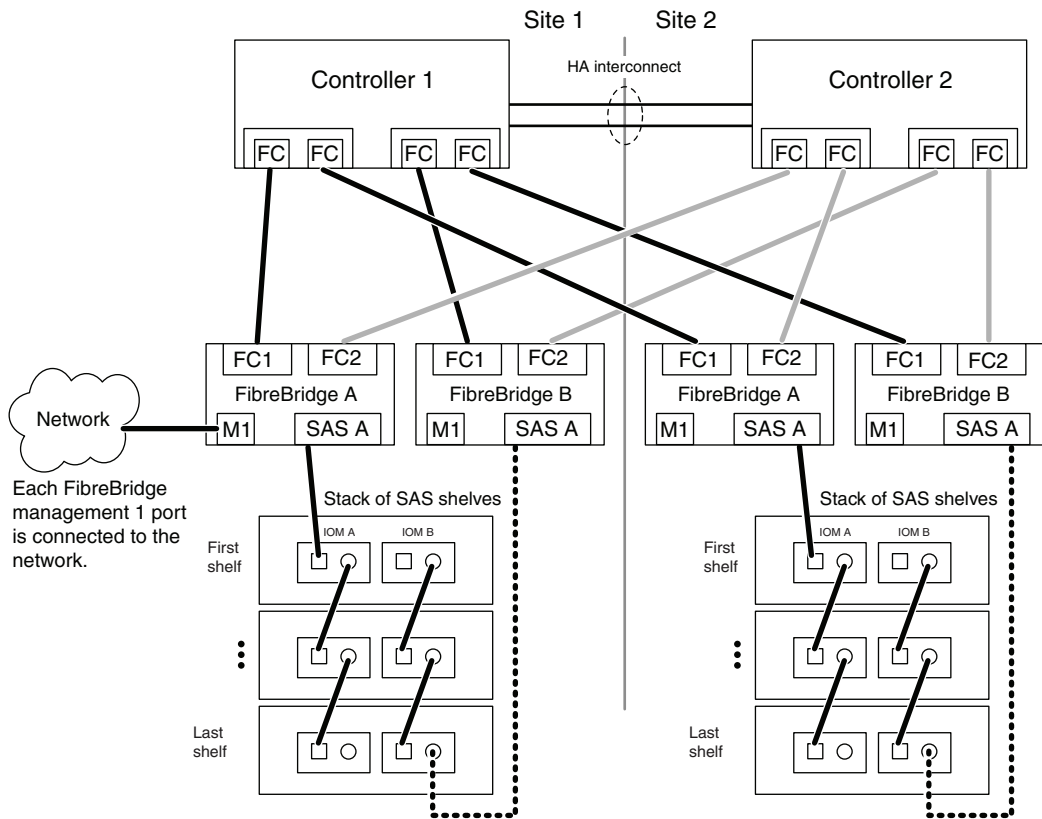
Best practice is to update all disk shelves in the storage system with the latest version of disk shelf firmware.

**Note:** Do not revert disk shelf firmware to a version that does not support SAS optical cables.

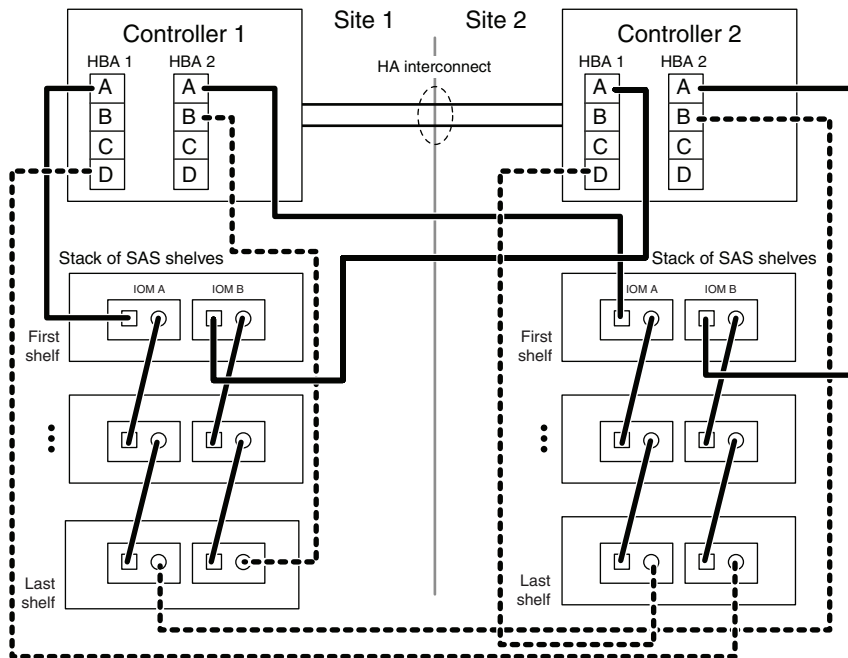
- Commands are entered at the console of either controller unless otherwise noted.
- This procedure assumes that you are replacing bridges and SAS copper cables on all stacks on your system.

You replace bridges and cables one stack at a time (by repeating step 9 through 11).

- You cannot change any disks, disk shelves, or components of a controller module as part of this procedure.
- The following illustration of a stretch MetroCluster system with FibreBridge 6500N bridges and SAS copper cables can be used as a reference when replacing the bridges and SAS copper cables:



The following illustration is an example of what a N7x50T series would look like after cabling the system with SAS optical cables (having replaced the FibreBridge 6500N bridges and SAS copper cables):



## Procedure

1. Complete the SAS cabling worksheet in the *Universal SAS and ACP Cabling Guide*. You need to know the controller SAS ports you plan to use to cable your system (with SAS optical cables).

2. Verify that your system is Multi-Path HA by running the following command at the console of both nodes:  
sysconfig

**Note:** It might take up to a minute for the system to complete discovery.

The configuration is listed in the **System Storage** configuration field. It should be the fourth line of output.

**CAUTION:**

**If your system configuration is shown as something other than Multi-Path HA, identify the cabling issue and correct it before continuing with this procedure.**

3. Verify that the disk shelves in the storage system have the latest version of disk shelf firmware by completing the following substeps:
  - a. Enter the following command at the storage system console:  
sysconfig -v
  - b. Locate the disk shelf firmware information for the disk shelves in the output. 0151 is the disk shelf firmware version for shelf number one (for each IOM6) in the storage system:  
Shelf 1: IOM6 Firmware rev. IOM6 A: 0151 IOM6 B: 0151
  - c. Compare the firmware information in the command output with the disk shelf firmware information at [www.ibm.com/storage/support/nseries](http://www.ibm.com/storage/support/nseries) to determine the most current disk shelf firmware version.
4. The next step depends on how current the disk shelf firmware is.

If the firmware version in the command output is...	Then...
The same as or later than the most current version on the N series support website (accessed and navigated as described in Websites)	No disk shelf firmware update is needed.
An earlier version than the most current version on the N series support website (accessed and navigated as described in Websites)	Download the disk shelf firmware file by using the procedure at <a href="http://www.ibm.com/storage/support/nseries">www.ibm.com/storage/support/nseries</a> . You can run the commands from either node.

5. Check the status of both nodes by entering the following command at the system console of either node:  
cf status
6. Take one of the following actions, depending on the result of the cf status command:

If...	Then...
Neither node is in takeover mode	Go to Step 7 in this procedure.
One of the nodes is in takeover mode	<ol style="list-style-type: none"> <li>1. Correct the problem that caused the takeover.</li> <li>2. Enter the cf giveback command from the target node console.</li> <li>3. Go back to the beginning of this procedure.</li> </ol>

7. Disable controller failover by entering the following command from either node:  
cf disable
8. If you ordered additional HBAs, install them at this time; otherwise, go to the next step.
9. Enter the following command from the system console to perform a clean shutdown:  
halt
10. Select one of the disk shelf stacks and remove the cabling by completing the following substeps: You can begin on any stack.

- a. Remove the controller-to-bridge FC cables. You are removing a total of four FC cables, two from each controller.  
  
**Note:** Best practice is to remove the cables from the controller ports first.
  - b. Remove the M1 port-to-bridge cable. You are removing a total of two cables, one from each bridge to the network.
  - c. Remove the bridge-to-stack SAS copper cables. You are removing a total of two SAS copper cables, one from the first shelf in the stack and one from the last shelf in the stack.
  - d. If needed, you can remove the bridges from the rack.
11. Cable the controller-to-stack connections with SAS optical cables by completing the following substeps: Use the cabling worksheet you completed in Step 1 so you know which SAS ports to use on the controllers.
- a. Connect the first shelf in the stack to each controller.
  - b. Connect the last shelf in the stack to each controller.

The stack of disk shelves is now connected to both controllers with SAS optical cables.

12. Replace the stack shelf-to-shelf SAS copper cables with SAS optical cables.
13. Repeat Step 10 through 12 for each remaining stack; and then proceed to the next step.
14. Boot the nodes by entering the following command on either node:  
`boot_ontap`
15. Verify that you correctly replaced the SAS cables by entering the following command on at the console of either node:  
`sysconfig`  
The output should be the same as Step 2: the system should be Multi-Path HA. However, the SAS ports and attached disk shelf information will have changed because disk shelves were moved from FC ports (connected through the bridges) to SAS ports on the controllers.
16. Enable controller failover by entering the following command on either node:  
`cf enable`
17. Verify that controller failover is enabled by entering the following command on either node:  
`cf status`

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## Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:  
[www.ibm.com/storage/nas/](http://www.ibm.com/storage/nas/)
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:  
[www.ibm.com/storage/support/nseries/](http://www.ibm.com/storage/support/nseries/)  
This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:  
[www.ibm.com/systems/storage/network/interophome.html](http://www.ibm.com/systems/storage/network/interophome.html)
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:

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