Configuring a MetroCluster system with SAS disk shelves and FibreBridge 6500N

The FibreBridge 6500N is used with SAS disk shelves in MetroCluster systems. You can install FibreBridges as part of a new MetroCluster installation, as a hot-add to an existing MetroCluster system with SAS or FC disk shelves, or as a hot-swap to replace a failed FibreBridge. You can also hot-add a SAS disk shelf to a stack of SAS disk shelves.

Note: The guidelines in this document are for installing a stretch or fabric-attached MetroCluster configuration. For installing a shared-switch configuration, see the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.

MetroCluster configuration examples

Figure 1 and Figure 2 are examples of fully-cabled, stretch and fabric-attached MetroCluster systems. To see an example of a shared-switch configuration, see the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.
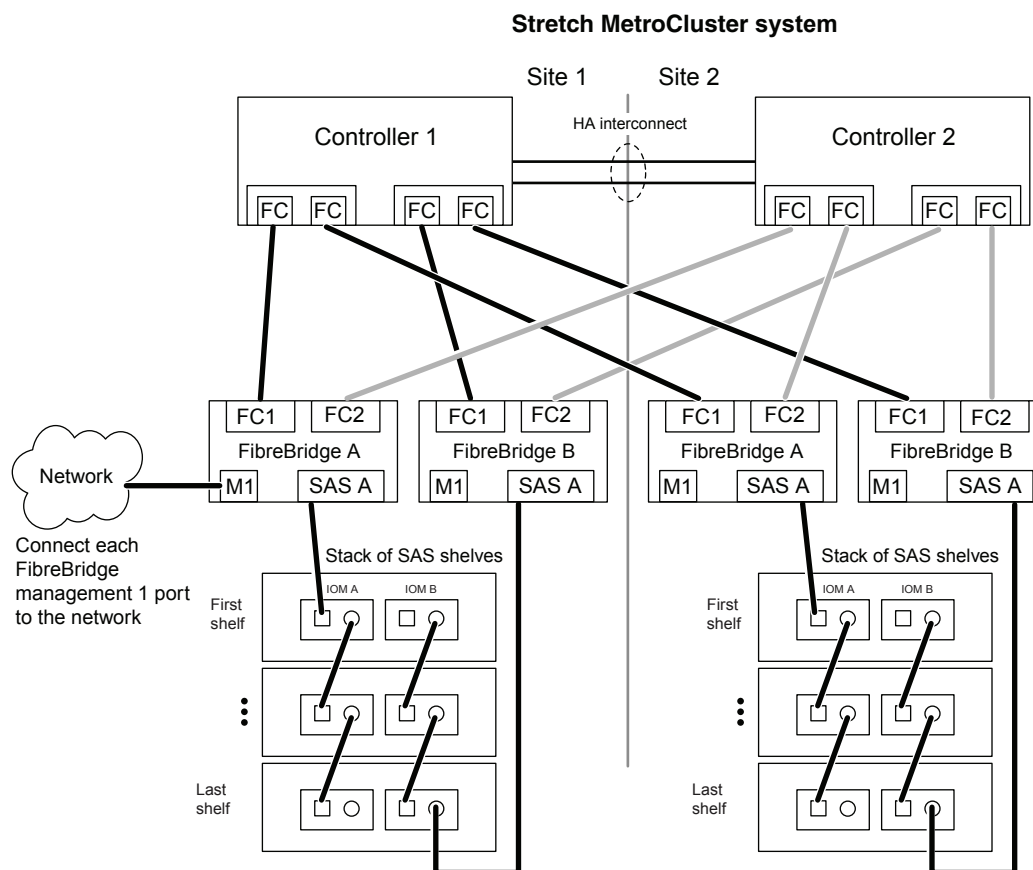

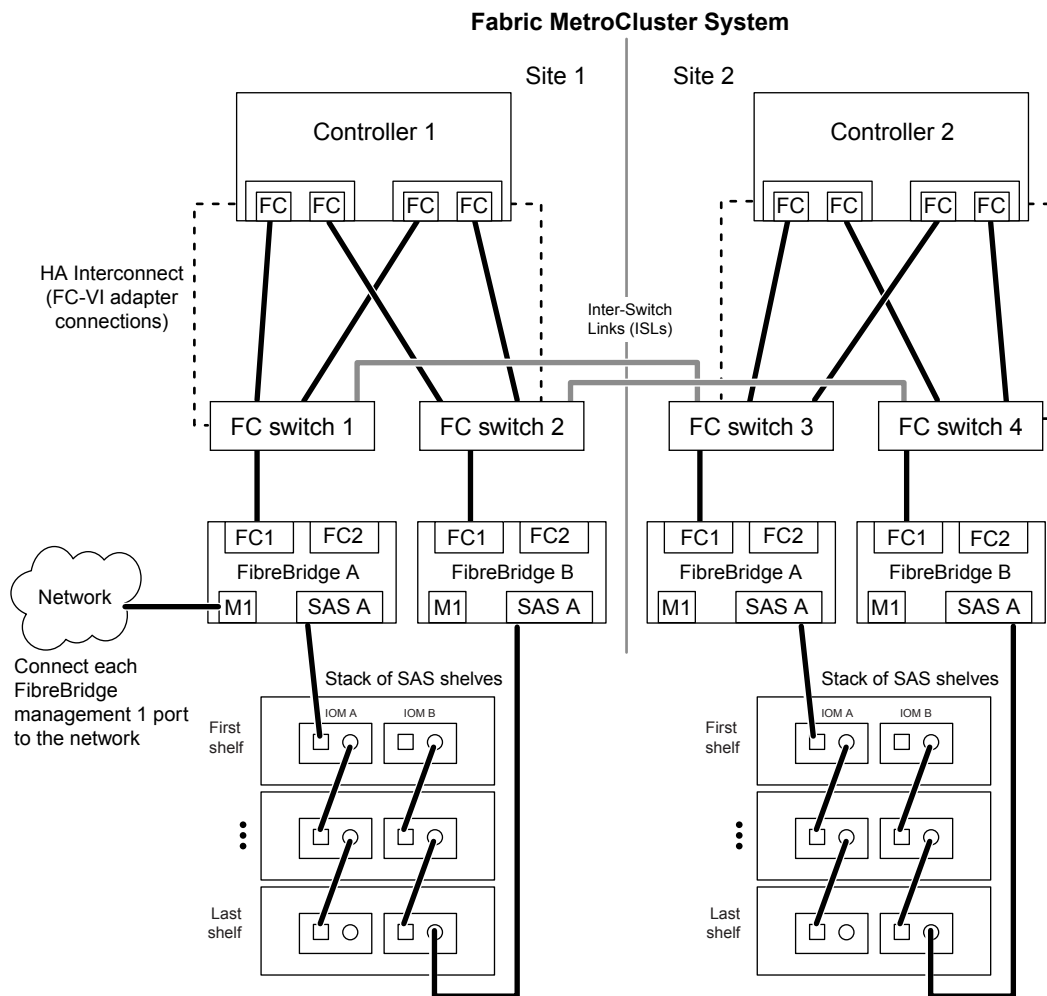*Figure 1. Stretch MetroCluster system*

Fabric MetroCluster System

Figure 2. Fabric MetroCluster system

Installing FibreBridges and SAS disk shelves as part of a new MetroCluster installation

You can install and cable FibreBridges and SAS disk shelves as part of a new MetroCluster installation.

For this procedure, it is recommended that you use these FibreBridge management interfaces: the ATTO ExpressNAV GUI and ATTO QuickNAV utility.

You can use the ATTO ExpressNAV GUI to configure, manage and update firmware on a FibreBridge. You can use the ATTO QuickNAV utility to set the initial IP address of the FibreBridge management ports.

You can use other interface options instead. For example, you can use a serial port or Telnet to configure and manage a FibreBridge, and to configure the Ethernet management 1 port. You can also use FTP to update the FibreBridge firmware. If you choose any of these interface options, you must follow the requirements listed under "Other FibreBridge management interface options" on page 23.

Preparing for the installation

Before you install FibreBridges as part of your new MetroCluster system, ensure that you follow these requirements:

- Data ONTAP 8.1 or later should be installed on the system.
- For fabric-attached MetroCluster configurations, each FC switch should have one FC port to connect to a FibreBridge.
- For stretch MetroCluster configurations, each controller should have one QLogic 8 Gb or 4 Gb FC port to connect to a FibreBridge.

  The QLogic 8 Gb or 4 Gb ports should be on board or on PCIe HBAs. For example, in a configuration of one stack of SAS disk shelves and two FibreBridges at each site, four FC ports should be used on each controller.

  Note: For improved performance, you should use 8-Gb ports when possible.
- An ATTO-supported web browser should be installed so that you can use the ATTO ExpressNAV GUI. Recommended browsers are Internet Explorer 8 or Mozilla Firefox 3. The *ATTO FibreBridge 6500N Installation and Operation Manual* contains a list of supported web browsers.

To install FibreBridges as part of your new MetroCluster system:

1. Download the following documents from the N series support website (accessed and navigated as described in "Websites" on page 26):
   - MetroCluster Compatibility Matrix
   - *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*
   - If you are installing a fabric-attached MetroCluster system, *Brocade Switch Configuration Guide for Fabric-attached MetroClusters*
   - *Hardware and Service Guide* for your disk shelf model
   - *ATTO FibreBridge 6500N Installation and Operation Manual*

2. Go to the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26) and download the:
   a. ATTO QuickNAV utility (to the computer you will use for setup)
   b. FibreBridge 6500N firmware file. You will update the firmware on each FibreBridge later, when instructed in Hot-adding the stack of shelves. Make a copy of the FibreBridge 6500N Firmware and release notes for reference later.

3. Check the MetroCluster Compatibility Matrix to ensure that the system meets configuration requirements for the FibreBridge.

4. Check the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide* to ensure that the system meets the MetroCluster requirements as defined in the MetroCluster installation.

5. Gather the hardware and information needed to use the recommended FibreBridge management interfaces—the ATTO ExpressNAV GUI and the ATTO QuickNAV utility—by completing the following substeps:
   a. Get a standard Ethernet cable to connect the FibreBridge Ethernet management 1 port to the network.
   b. Determine a user name and password for accessing the FibreBridge. It is recommended that you change the default user name and password.
   c. Obtain an IP address, subnet mask, and gateway information for the Ethernet management 1 port on each FibreBridge.
   d. Disable VPN clients on the computer that you use for setup. Active VPN clients cause the QuickNAV-scan for FibreBridges to fail.

6. Get the 4ea 6MM screws and 4ea nut clips shipped with the FibreBridge to secure the FibreBridges to the front of the rack. The openings in the FibreBridge "L" brackets are compliant with rack standard ETA-310-X for 19-inch (482.6 mm) racks.

Installing the new system

Before you start installing the new system, ensure the following:

- Multipath HA is the only supported configuration for MetroCluster systems using FibreBridges. Both controllers must have access through the FibreBridges to the disk shelves in each stack.
- A stack of SAS disk shelves can contain shelves of SATA disk drives and shelves of SAS disk drives. However, you cannot mix SATA and SAS disk drives in the same disk shelf.
- You should use an equal number of disk shelves at each site.
- The system connectivity requirements, such as maximum distances for disk shelves, FC switches, and backup tape devices using 50 micron multimode fiber optic cables, also apply to FibreBridges. The *N series Introduction and Planning Guide* has detailed information about system connectivity requirements.

Follow these instructions to install the new system:

1. Ensure that the power source is connected to a protective earth ground and complies with local electrical codes. Improper grounding may result in an electrical shock or damage to the unit.
2. Install the platforms and, if applicable, the FC switches. For instructions on installing the platforms, see the Installation and Setup Instructions provided with the platform. For instructions on installing FC switches, see the *Brocade Switch Configuration Guide for Fabric-attached MetroClusters*.
3. Install the disk shelves, power them on, and set the shelf IDs. For instructions, see the *Hardware and Service Guide* for your disk shelf model.

   Note: You must power-cycle each disk shelf to make the IDs active. Shelf IDs must be unique for each SAS disk shelf within the entire storage system.

4. Install each FibreBridge by completing the following substeps:
   a. Attach the 4ea nut clips to the front of the Rack at the EIA position you wish to install the FibreBridge.
   b. Secure the "L" brackets on the front of the FibreBridge to the front of the rack with four screws.
   c. Connect each FibreBridge to a power source and turn them on.

   Note: Ensure that each FibreBridge is connected to a different power source. The FibreBridge Ready LED might take up to 30 seconds to illuminate, indicating that the FibreBridge has completed its power-on self test sequence. For information about power requirements and LEDs, see the *ATTO FibreBridge 6500N Installation and Operation Manual*.

5. Connect the Ethernet management 1 port on each FibreBridge to the network using an Ethernet cable.

   Note: You can use the Ethernet management 1 port to quickly download the FibreBridge firmware (using ATTO ExpressNAV or FTP interface options), retrieve core files, and extract logs.

6. Set up and configure each FibreBridge by completing the following substeps:
   a. Configure the Ethernet management 1 port for each FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 2.0.

      Note: When you run QuickNAV and ExpressNAV to configure an Ethernet management port, you can configure only the port that is connected by the Ethernet cable. For example, if you want to configure the Ethernet management 2 port, you will need to connect the Ethernet cable to port 2 and run QuickNAV and ExpressNAV.

   b. Configure each FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 3.0. Note the user name and password that you designate.

7. Update the firmware on each FibreBridge to the latest version by following the instructions at the ATTO FibreBridge 6500N Firmware - Installation and upgrade instructions link. See the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26).

8. Cable the disk shelves to the FibreBridges by completing the following substeps:

   a. Daisy-chain the disk shelves in each stack. For information about daisy-chaining disk shelves, see the *Installation and Service Guide* for your disk shelf model.

   b. For each stack of disk shelves, cable IOM A square port of the first shelf to SAS port A on FibreBridge A.

   c. For each stack of disk shelves, cable IOM B circle port of the last shelf to SAS port A on FibreBridge B.

   Each FibreBridge has one path to its stack of disk shelves; FibreBridge A connects to the A-side of the stack through the first shelf, and FibreBridge B connects to the B-side of the stack through the last shelf.

   Note: The FibreBridge SAS port B is disabled.

   Figure 3 shows a set of FibreBridges cabled to a stack of three disk shelves:

FC1	FC2		FC1	FC2
FibreBridge A			FibreBridge B	
M1	SAS A		M1	SAS A

Stack of SAS shelves
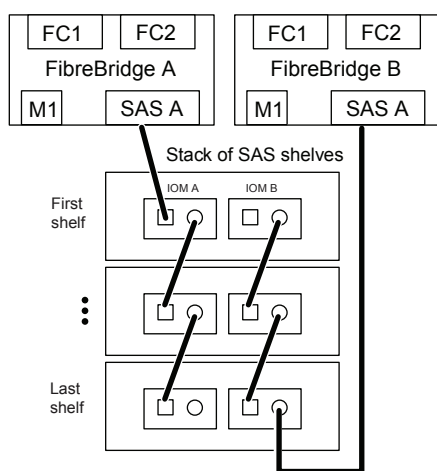
First shelf — IOM A   IOM B

Last shelf

Figure 3. FibreBridges connected to a SAS stack

9. Verify that each FibreBridge can see the disk drives and disk shelves it is connected to.

If you use the...	Then...
ATTO ExpressNAV GUI	1. Enter the IP address of the FibreBridge in a web browser. The ATTO FibreBridge 6500N home page opens.
	2. On the home page, click the **enter here** link and enter the user name and password that you designated when you configured the FibreBridge. The ATTO FibreBridge 6500N status page opens.
	3. In the left menu, click **Advanced**.
	4. Enter the following command and click Submit: `sastargets`
Serial port connection	Enter the following command: `sastargets`

The devices (disks and disk shelves) to which the FibreBridge is connected displays in the output. The lines in the output are sequentially numbered so you can quickly count the devices. For example, the following output shows that 10 disks are connected.

```
Tgt VendorID ProductID       Type       SerialNumber
  0 NETAPP   X410_S15K6288A15 DISK       3QP1CLE300009940UHJV
  1 NETAPP   X410_S15K6288A15 DISK       3QP1ELF600009940V1BV
  2 NETAPP   X410_S15K6288A15 DISK       3QP1G3EW00009940U2M0
  3 NETAPP   X410_S15K6288A15 DISK       3QP1EWMP00009940U1X5
  4 NETAPP   X410_S15K6288A15 DISK       3QP1FZLE00009940G8YU
  5 NETAPP   X410_S15K6288A15 DISK       3QP1FZLF00009940TZKZ
  6 NETAPP   X410_S15K6288A15 DISK       3QP1CEB400009939MGXL
  7 NETAPP   X410_S15K6288A15 DISK       3QP1G7A900009939FNTT
  8 NETAPP   X410_S15K6288A15 DISK       3QP1FY0T00009940G8PA
  9 NETAPP   X410_S15K6288A15 DISK       3QP1FXW600009940VERQ
```

> **Note:** If the "response truncated" message displays at the beginning of the output, you can Telnet to the FibreBridge and enter the same command to view the output.

10. In the output, verify that the bridge is connected to all the disks and disk shelves in the stack it is supposed to be connected to.

If the output is...	Then...
Correct	Repeat step 9 for the remaining FibreBridges.
Incorrect	1. Check for loose SAS cables or correct the SAS cabling by repeating step 8. 2. Repeat step 9.

11. Cable each FibreBridge to the controllers or FC switches, depending on the MetroCluster configuration, as shown inFigure 1 and Figure 2:

If you have a...	Then...
Stretch MetroCluster configuration	1. Cable FC port 1 of each FibreBridge A to an 8 Gb or 4 Gb FC port on the controller at Site 1. 2. Cable FC port 2 of each FibreBridge A to the FC port of the same speed on the controller at Site 2. 3. Repeat substeps 1 and 2 for FibreBridge B. **Note:** For resilience, connect FibreBridges to different ASIC/chip sets. For example, if you are using onboard ports, cable each FibreBridge to a different port set, such as 0a and 0c or 0b and 0d. If you are using HBAs, connect each FibreBridge to a different HBA.
Fabric-attached MetroCluster configuration	1. Cable FC port 1 of FibreBridge A to FC switch 1 at Site 1. 2. Cable FC port 1 of FibreBridge B to FC switch 2 at Site 1. 3. Repeat substeps 1 and 2 for Site 2. Figure 2 indicates attaching the second pair of FibreBridges (A and B) to FC switches (3 and 4) for site 2. **Note:** You can connect the FibreBridge to any available port on the FC switch. Whichever port you choose, use the same port consistently on each FC switch. This is for ease of manageability. For example, if you choose FC switch port 3, use only that port on each FC switch. **Note:** The FC port 2 on the FibreBridge remains unused.

12. Connect and configure the controllers, and if applicable the FC switches, following the MetroCluster configuration procedure in the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*:

a. If applicable, configure the FC switches.

b. Cable the FC-VI and inter-switch link as appropriate for your configuration.

c. Assign disk ownership by using the Assigning disk pools information in the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.

> **Note:** If you are splitting a single stack of disk shelves between two controllers, you must disable disk autoassignment before assigning disk ownership. Else, when you assign a single disk drive, the remaining disk drives might be automatically assigned to the same controller and pool.
>
> To disable disk autoassignment, run the following command at the console of both controllers:
>
> ```
> options disk.auto_assign off
> ```

d. Configure the system and enable licenses as needed using the information about configuring an HA pair in the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.

13. Verify disk shelf connectivity by entering the following command at the system console of either controller:

```
sysconfig -v
```

The output shows the following:

Each FibreBridge on a separate line and, for fabric-attached MetroCluster configurations, under each FC port to which it is visible; for stretch MetroCluster configurations, directly connected.

For example, output for a fabric-attached MetroCluster configuration would look like:

```
FC-to-SAS Bridge:
Brocade300-1:9.126L0 : ATTO FibreBridge6500N 1.11 FB6500N100189
Brocade300-2:1.126L0 : ATTO FibreBridge6500N 1.11 FB6500N100162
```

For example, output for a stretch MetroCluster configuration would look like:

```
FC-to-SAS Bridge:
125L0 : ATTO FibreBridge6500N 1.10 FB6500N100053
125L0 : ATTO FibreBridge6500N 1.10 FB6500N100048
```

Each disk shelf on a separate line under each FC port to which it is visible (for fabric-attached or stretch MetroCluster configurations).

```
Shelf 0: IOM6 Firmware rev. IOM6 A: 0111 IOM6 B: 0111
Shelf 1: IOM6 Firmware rev. IOM6 A: 0111 IOM6 B: 0111
```

Each disk drive on a separate line under each FC port to which it is visible (for fabric-attached or stretch MetroCluster configurations).

For example, output for a fabric-attached MetroCluster configuration would look like:

```
Brocade300-1:9.126L1 : NETAPP X421_HCOBD450A10 NA01 418.0GB (879097968 520B/sect)
Brocade300-1:9.126L2 : NETAPP X421_HCOBD450A10 NA01 418.0GB (879097968 520B/sect)
```

For example, output for a stretch MetroCluster configuration would look like:

```
125L1 : NETAPP X421_HCOBD450A10 NA01 40.0GB (82262416 520B/sect)
125L2 : NETAPP X421_HCOBD450A10 NA01 40.0GB (82262416 520B/sect)
```

Hot-adding a stack of SAS disk shelves and FibreBridges to an existing MetroCluster system

You can hot-add a stack of SAS disk shelves and set of FibreBridges to an existing MetroCluster system that has SAS or FC disk shelves.

For this procedure, it is recommended that you use these FibreBridge management interfaces: the ATTO ExpressNAV GUI and ATTO QuickNAV utility.

You can use the ATTO ExpressNAV GUI to configure, manage and update firmware on a FibreBridge. You can use the ATTO QuickNAV utility to set the initial IP address of the FibreBridge management ports.

You can use other interface options instead. For example, you can use a serial port or Telnet to configure and manage a FibreBridge, and to configure the Ethernet management 1 port. You can also use FTP to update the FibreBridge firmware. If you choose any of these interface options, you must follow the requirements listed under "Other FibreBridge management interface options" on page 23.

Preparing for the hot-add

Before you hot-add a stack of SAS disk shelves and FibreBridges, ensure that you follow these requirements:

- The system platforms should be supported. The *IBM System Storage N series Introduction and Planning Guide* has the latest information about supported platforms.
- Data ONTAP 8.1 or later should be installed on the system.
- The latest firmware should be installed on all the disk drives and disk shelves in the system.
- For fabric-attached MetroCluster configurations, each FC switch should have one FC port to connect to one FibreBridge.

  Note: If you are hot-adding to a system with FC disk shelves, depending on the FC switch compatibility, you might need to upgrade the FC switch.
- For stretch MetroCluster configurations, each controller should have one QLogic 8 Gb or 4 Gb FC port to connect to one FibreBridge.

  The QLogic 8 Gb or 4 Gb ports should be on board or on PCIe HBAs. For example, in a configuration of one stack of SAS disk shelves and two FibreBridges at each site, four FC ports should be used on each controller.

  Note: For improved performance, you should use 8 Gb ports when possible.
- An ATTO-supported web browser should be installed so that you can use the ATTO ExpressNAV GUI. Recommended browsers are Internet Explorer 8 or Mozilla Firefox 3. The *ATTO FibreBridge 6500N Installation and Operation Manual* contains a list of supported web browsers.

To prepare for the hot-add:

1. Download the following documents from the N series support website (accessed and navigated as described in "Websites" on page 26):
   - MetroCluster Compatibility Matrix
   - *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*
   - *Hardware and Service Guide* for your disk shelf model
   - *ATTO FibreBridge 6500N Installation and Operation Manual*
2. Go to the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website(accessed and navigated as described in "Websites" on page 26) and download the:

Note: You need to download this utility only if you did no do so when you installed the original FibreBridge.

    a. ATTO QuickNAV utility (to the computer you will use for setup)

    b. FibreBridge 6500N firmware file. You will update the firmware on each FibreBridge later, when instructed in Hot-adding the stack of shelves. Make a copy of the FibreBridge 6500N Firmware and release notes for reference later.

3. Check the MetroCluster Compatibility Matrix to verify that the disk shelf you are hot-adding is supported.

4. Check the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide* to verify that your system meets the MetroCluster requirements as defined in the MetroCluster installation.

5. Gather the hardware and information needed to use the recommended FibreBridge management interfaces—the ATTO ExpressNAV GUI and ATTO QuickNAV utility—by completing the following substeps:

    a. Get a standard Ethernet cable to connect the FibreBridge Ethernet management 1 port to the network.

    b. Determine a user name and password for accessing the FibreBridge. It is recommended that you change the default user name and password.

    c. Obtain an IP address, subnet mask, and gateway information for the Ethernet management 1 port on each FibreBridge.

    d. Disable VPN clients on the computer that you use for setup. Active VPN clients cause the QuickNAV-scan for FibreBridges to fail.

6. Get the 4ea 6MM screws and 4ea nut clips shipped with the FibreBridge to secure the FibreBridges to the front of the rack. The openings in the FibreBridge "L" brackets are compliant with rack standard ETA-310-X for 19-inch (482.6 mm) racks.

Hot-adding the stack of shelves and FibreBridges

Follow these instructions to hot-add a stack of shelves and FibreBridges:

- This is a nondisruptive procedure if the FibreBridge requirements in the MetroCluster Compatibility Matrix are met.

- Multipath HA is the only supported configuration for MetroCluster systems using FibreBridges. Both controllers must have access through the FibreBridges to the disk shelves in each stack.

- You should hot-add an equal number of disk shelves at each site.

- A stack of SAS disk shelves can contain shelves of SATA disk drives and shelves of SAS disk drives. However, you cannot mix SATA and SAS disk drives in the same disk shelf.

- The system connectivity requirements, such as maximum distances for disk shelves, FC switches, and backup tape devices using 50 micron multimode fiber optic cables, also apply to FibreBridges. The *N series Introduction and Planning Guide* has detailed information about system connectivity requirements.

  Attention: To hot-add a disk shelf, you must run the following command to update the disk drive firmware on the hot-added disk shelf:

  ```
  disk_fw_update
  ```

  Running this command can be disruptive if an earlier version of the firmware is installed on the disk drives in the system.

To hot-add a stack of shelves and FibreBridges:

1. Ensure that the power source is connected to a protective earth ground and complies with local electrical codes. Improper grounding may result in an electrical shock or damage to the unit.

2. Install the disk shelves, power them on, and set the shelf IDs. For instructions, see the *Hardware and Service Guide* for the disk shelf model.

Note: You must power-cycle each disk shelf to make the IDs active. Shelf IDs must be unique for each SAS disk shelf within the entire storage system.

3. Install each FibreBridge by completing the following substeps:

   a. Attach the 4ea nut clips to the front of the Rack at the EIA position you wish to install the FibreBridge.

   b. Secure the "L" brackets on the front of the FibreBridge to the front of the rack with four screws.

   c. Connect each FibreBridge to a power source and turn them on.

   Note: Ensure that each FibreBridge is connected to a different power source. The FibreBridge Ready LED might take up to 30 seconds to illuminate, indicating that the FibreBridge has completed its power-on self test sequence. For information about power requirements and LEDs, see the *ATTO FibreBridge 6500N Installation and Operation Manual*.

4. Connect the Ethernet management 1 port on each FibreBridge to the network using an Ethernet cable.

   Note: You can use the Ethernet management 1 port to quickly download the FibreBridge firmware (using ATTO ExpressNAV or FTP interface options), retrieve core files, and extract logs.

5. Set up and configure each FibreBridge by completing the following substeps:

   a. Configure the Ethernet management 1 port for each FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 2.0.

      Note: When you run QuickNAV and ExpressNAV to configure an Ethernet management port, you can configure only the port that is connected by the Ethernet cable. For example, if you want to configure the Ethernet management 2 port, you will need to connect the Ethernet cable to port 2 and run QuickNAV and ExpressNAV.

   b. Configure each FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 3.0. Note the user name and password that you designate.

6. Update the firmware on each FibreBridge to the latest version by following the instructions at the ATTO FibreBridge 6500N Firmware - Installation and upgrade instructions link. See the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26).

7. Cable the disk shelves to the FibreBridges by completing the following substeps:

   a. Daisy-chain the disk shelves in each stack. For information about daisy-chaining disk shelves, see the *Installation and Service Guide* for your disk shelf model.

   b. For each stack of disk shelves, cable IOM A square port of the first shelf to SAS port A on FibreBridge A.

   c. For each stack of disk shelves, cable IOM B circle port of the last shelf to SAS port A on FibreBridge B.

   Each FibreBridge has one path to its stack of disk shelves; FibreBridge A connects to the A-side of the stack through the first shelf, and FibreBridge B connects to the B-side of the stack through the last shelf.

   Note: The FibreBridge SAS port B is disabled.

   Figure 4 shows a set of FibreBridges cabled to a stack of three disk shelves:
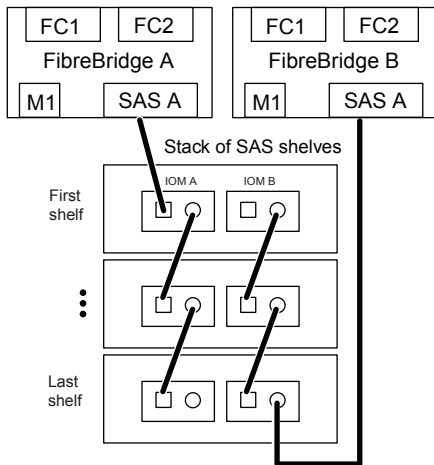
Figure 4. FibreBridges connected to a SAS stack

8. Verify that each FibreBridge can see the disk drives and disk shelves it is connected to.

If you use the...	Then...
ATTO ExpressNAV GUI	1. Enter the IP address of the FibreBridge in a web browser. The ATTO FibreBridge 6500N home page opens. 2. On the home page, click the **enter here** link and enter the user name and password that you designated when you configured the FibreBridge. The ATTO FibreBridge 6500N status page opens. 3. In the left menu, click **Advanced**. 4. Enter the following command and click Submit: `sastargets`
Serial port connection	Enter the following command: `sastargets`

The devices (disks and disk shelves) to which the FibreBridge is connected displays in the output. The lines in the output are sequentially numbered so you can quickly count the devices. For example, the following output shows that 10 disks are connected.

```
Tgt VendorID ProductID       Type       SerialNumber
  0 NETAPP    X410_S15K6288A15 DISK       3QP1CLE300009940UHJV
  1 NETAPP    X410_S15K6288A15 DISK       3QP1ELF600009940V1BV
  2 NETAPP    X410_S15K6288A15 DISK       3QP1G3EW00009940U2M0
  3 NETAPP    X410_S15K6288A15 DISK       3QP1EWMP00009940U1X5
  4 NETAPP    X410_S15K6288A15 DISK       3QP1FZLE00009940G8YU
  5 NETAPP    X410_S15K6288A15 DISK       3QP1FZLF00009940TZKZ
  6 NETAPP    X410_S15K6288A15 DISK       3QP1CEB400009939MGXL
  7 NETAPP    X410_S15K6288A15 DISK       3QP1G7A900009939FNTT
  8 NETAPP    X410_S15K6288A15 DISK       3QP1FY0T00009940G8PA
  9 NETAPP    X410_S15K6288A15 DISK       3QP1FXW600009940VERQ
```

Note: If the "response truncated" message displays at the beginning of the output, you can Telnet to the FibreBridge and enter the same command to view the output.

9. In the output, verify that the bridge is connected to all the disks and disk shelves in the stack it is supposed to be connected to.

If the output is...	Then...
Correct	Repeat step 9 for the remaining FibreBridges.
Incorrect	1. Check for loose SAS cables or correct the SAS cabling by repeating step 8. 2. Repeat step 9.

10. Cable each FibreBridge to the controllers or FC switches, depending on the MetroCluster configuration:

If you have a...	Then...
Stretch MetroCluster configuration	1. Cable FC port 1 of each FibreBridge A to an 8 Gb or 4 Gb FC port on the controller at Site 1. 2. Cable FC port 2 of each FibreBridge A to the FC port of the same speed on the controller at Site 2. 3. Repeat substeps 1 and 2 for FibreBridge B. **Note:** For resilience, connect FibreBridges to different ASIC/chip sets. For example, if you are using onboard ports, cable each FibreBridge to a different port set, such as 0a and 0c or 0b and 0d. If you are using HBAs, connect each FibreBridge to a different HBA.
Fabric-attached MetroCluster configuration	1. Cable FC port 1 of FibreBridge A to FC switch 1 at Site 1. 2. Cable FC port 1 of FibreBridge B to FC switch 2 at Site 1. 3. Repeat substeps 1 and 2 for Site 2. Figure 2 indicates attaching the second pair of FibreBridges (A and B) to FC switches (3 and 4) for site 2. **Note:** You can connect the FibreBridge to any available port on the FC switch. Whichever port you choose, use the same port consistently on each FC switch. This is for ease of manageability. For example, if you choose FC switch port 3, use only that port on each FC switch. **Note:** The FC port 2 on the FibreBridge remains unused.

11. Assign disk ownership by following the Assigning disk pools instructions in the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.

> **Note:** If you are splitting a single stack of disk shelves between two controllers, you must disable disk autoassignment before assigning disk ownership. Else, when you assign a single disk drive, the remaining disk drives might be automatically assigned to the same controller and pool.
>
> To disable disk autoassignment, run the command at the console of both controllers:
> ```
> options disk.auto_assign off
> ```

> **Note:** Do not add disk drives to aggregates or volumes until the disk drive and disk shelf firmware are updated.

12. Update the disk drive firmware to the most current version by entering the following command at the system console:
```
disk_fw_update
```
You must run this command on both controllers. If needed, refer to the procedure you copied when you downloaded the firmware as part of the preparation for this task.

13. Update the disk shelf firmware to the latest version by using the procedure you copied when you downloaded the firmware as part of the preparation for this task.

    You can run the commands in the procedure from the system console of either controller.

14. If applicable, repeat this procedure for the remote site.

Hot-swapping a FibreBridge

When a FibreBridge fails, you can hot-swap the FibreBridge without disrupting the storage system, if the system is cabled correctly for Multipath HA.

For this procedure, it is recommended that you use these FibreBridge management interfaces: the ATTO ExpressNAV GUI and ATTO QuickNAV utility.

You can use the ATTO ExpressNAV GUI to configure, manage and update firmware on a FibreBridge. You can use the ATTO QuickNAV utility to set the initial IP address of the FibreBridge management ports.

You can use other interface options instead. For example, you can use a serial port or Telnet to configure and manage a FibreBridge, and to configure the Ethernet management 1 port. You can also use FTP to update the FibreBridge firmware. If you choose any of these interface options, you must follow the requirements listed under "Other FibreBridge management interface options" on page 23.

Preparing for the hot-swap

Before you hot-swap a FibreBridge as part of the new MetroCluster system, ensure that you follow these requirements:

1. Verify that your system is cabled for Multipath HA by entering the following command at the console of both controllers:

   sysconfig

   Note: The system might take up to a minute to complete verification and display the output.

   For example, the following output states that the system is cabled for Multipath HA:

   ```
   NetApp Release R8.1xN_110610_0200 7-Mode: Fri Jun 10 02:50:01 PDT 2011
   System ID: 1573753523 (stqa-3270-2); partner ID: 1573753694 (stqa-3270-1)
   System Serial Number: 700000387985 (stqa-3270-2); partner Serial Number: 700000387997
   (stqa-3270-1)
   System Rev: B0
   System Storage Configuration: Multi-Path HA
   System ACP Connectivity: NA
   ```

2. Verify that the output shows that the system is cabled for Multipath HA.

If the system configuration is...	Then...
Multipath HA	Go to step 3.
Mixed path or single-path HA	You must correct the SAS and FC cabling, because not all disk drives are accessible through the new bridge. **Note:** If you must correct cabling on a system, you can hot-cable only if one path to the disk drives is maintained. When bridges are not cabled as Multipath HA, restarting a bridge might cause loss of access to the disk drives and result in a multi-disk panic.

3. Go to the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website the N series support website (accessed and navigated as described in "Websites" on page 26) and download the:

a. *ATTO FibreBridge 6500N Installation and Operation Manual*

b. ATTO QuickNAV utility (to the computer you will use for setup). You need to download the utility only if you did not do so while installing the FibreBridge.

c. FibreBridge 6500N firmware file. You will update the firmware on each FibreBridge later, when instructed in Hot-adding the stack of shelves. Make a copy of the FibreBridge 6500N Firmware and release notes for reference later.

4. Complete the following substeps to use the FibreBridge management interfaces: the ATTO ExpressNAV GUI and ATTO QuickNAV utility:

a. Determine a username and password (for accessing the FibreBridge). It is recommended that you change the default username and password.

b. Disable VPN clients on the computer you are using for setup. Active VPN clients cause the QuickNAV scan for FibreBridges to fail.

Note: Use the IP address, subnet mask, and gateway information for the Ethernet management 1 port from the failed FibreBridge for the new FibreBridge.

Hot-swapping the FibreBridge

Follow these instructions to hot-swap a FibreBridge:

1. Ensure that the power source is connected to a protective earth ground and complies with local electrical codes. Improper grounding may result in an electrical shock or damage to the unit.

2. Power off the failed FibreBridge and disconnect it from the power source.

3. Disconnect the cables connected to the failed FibreBridge. Note the port to which each cable was connected.

4. Remove the failed FibreBridge from the rack.

5. Install the new FibreBridge into the rack.

6. Reconnect the power cord and Ethernet cable.

   Note: Do not reconnect the SAS or FC cables at this time.

7. Connect the FibreBridge to a power source and turn it on. The FibreBridge Ready LED might take up to 30 seconds to illuminate, indicating that the FibreBridge has completed its power-on self test sequence.

8. Set up and configure the FibreBridge by completing the following substeps:

a. Configure the Ethernet management 1 port for the FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 2.0.

b. Configure the FibreBridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 3.0. Note the user name and password that you designate.

9. Update the firmware on the FibreBridge to the latest version by following the instructions at the ATTO FibreBridge 6500N Firmware - Installation and upgrade instructions link. See the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26).

10. Reconnect the SAS and FC cables to the same ports on the new FibreBridge.

11. Verify that the FibreBridge can see all disk drives and disk shelves it is connected to:

If you use the...	Then...
ATTO ExpressNAV GUI	1. Enter the IP address of the FibreBridge in a web browser. The ATTO FibreBridge 6500N home page opens. 2. On the home page, click the **enter here** link and enter the user name and password that you designated when you configured the FibreBridge. The ATTO FibreBridge 6500N status page opens. 3. In the left menu, click **Advanced**. 4. Enter the following command and click Submit: `sastargets`
Serial port connection	Enter the following command: `sastargets`

The devices (disks and disk shelves) to which the FibreBridge is connected displays in the output. The lines in the output are sequentially numbered so you can quickly count the devices. For example, the following output shows that 10 disks are connected.

```
Tgt VendorID ProductID        Type      SerialNumber
  0 NETAPP    X410_S15K6288A15 DISK      3QP1CLE300009940UHJV
  1 NETAPP    X410_S15K6288A15 DISK      3QP1ELF600009940V1BV
  2 NETAPP    X410_S15K6288A15 DISK      3QP1G3EW00009940U2M0
  3 NETAPP    X410_S15K6288A15 DISK      3QP1EWMP00009940U1X5
  4 NETAPP    X410_S15K6288A15 DISK      3QP1FZLE00009940G8YU
  5 NETAPP    X410_S15K6288A15 DISK      3QP1FZLF00009940TZKZ
  6 NETAPP    X410_S15K6288A15 DISK      3QP1CEB400009939MGXL
  7 NETAPP    X410_S15K6288A15 DISK      3QP1G7A900009939FNTT
  8 NETAPP    X410_S15K6288A15 DISK      3QP1FY0T00009940G8PA
  9 NETAPP    X410_S15K6288A15 DISK      3QP1FXW600009940VERQ
```

Note: If the "response truncated" message displays at the beginning of the output, you can Telnet to the FibreBridge and enter the same command to view the output.

12. In the output, verify that the bridge is connected to all the disks and disk shelves in the stack it is supposed to be connected to.

If the output is...	Then...
Correct	Repeat step 11 for the remaining FibreBridges.
Incorrect	1. Check for loose SAS cables or correct the SAS cabling by repeating step 10. 2. Repeat step 11.

13. Verify that both controllers have access through the new FibreBridge to the disk shelves (that the system is cabled for Multipath HA), by entering the following command at the system console of both controllers:

`sysconfig`

Note: It might take up to a minute for the system to complete the verification and display the results.

For example, the following output states that the system is cabled for Multipath HA:

```
Data ONTAP Release R8.1 RC1 7-Mode: Fri Sept 30 02:50:01 PDT 2011
System ID: 1573753523 (stqa-3270-2); partner ID: 1573753694 (stqa-3270-1)
System Serial Number: 700000387985 (stqa-3270-2);
Partner Serial Number: 700000387997 (stqa-3270-1)
System Rev: B0
System Storage Configuration: Multi-Path HA
System ACP Connectivity: NA
```

If the system configuration is...	Then...
Multipath HA	The procedure is completed.
Mixed-path or Single-path HA	You must correct the SAS and FC cabling because not all disk drives are accessible through the new FibreBridge. **Attention:** If you must correct cabling on a system, you can hot-cable only if one path to the disk drives is maintained. When FibreBridges are not cabled as Multipath HA, restarting a FibreBridge might cause loss of access to the disk drives and result in a multi-disk panic.

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

Hot-adding a SAS disk shelf to a stack of SAS disk shelves

You can hot-add one or more SAS disk shelves to a stack of SAS disk shelves.

Preparing for the hot-add

Before you hot-add a disk shelf, ensure that you follow these requirements:

1. Download the following documents from the N series support website (accessed and navigated as described in "Websites" on page 26):
   - MetroCluster Compatibility Matrix
   - *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*
   - *Hardware and Service Guide* for your disk shelf model

2. Go to the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26) and download the latest disk and disk shelf firmware. Make a copy of the disk and disk shelf firmware instructions for reference later.

3. Check the MetroCluster Compatibility Matrix to verify that the disk shelf you are hot-adding is supported.

Hot-adding the shelf

Follow these instructions to hot-add a disk shelf:

- This procedure is for hot-adding a disk shelf to the logical last disk shelf in a stack.

   The logical last disk shelf in a stack is connected from IOM B to FibreBridge B.

- This is a nondisruptive procedure.

- You should hot-add an equal number of disk shelves at each site.

- If you are hot-adding more than one disk shelf, you must hot-add one disk shelf at a time.

Attention: Hot-adding a disk shelf requires you to update the disk drive firmware on the hot-added disk shelf by running the following command:

```
disk_fw_update
```

Running this command can be disruptive if an earlier version of the firmware is installed on existing disk drives in the system.

To hot-add a disk shelf:

1. Ensure that the power source is connected to a protective earth ground and complies with local electrical codes. Improper grounding may result in an electrical shock or damage to the unit.
2. Install and cable the disk shelf by completing the following substeps:
   a. Install the disk shelf, power it on, and set the shelf ID. For instructions, see the *Hardware and Service Guide* for your disk shelf model.

      Note: You must power-cycle the disk shelf to make the ID's active. Shelf IDs must be unique for each SAS disk shelf within the entire storage system.
   b. Disconnect the SAS cable from the IOM B circle port of the last shelf in the stack and reconnect it to the same port in the new shelf. The other end of this cable should remain connected to FibreBridge B.
   c. Daisy-chain the new disk shelf by cabling the new shelf IOM square ports (of IOM A and IOM B) to the last shelf IOM circle ports (of IOM A and IOM B).

   For an example of a cabled stack of disk shelves, you can refer to any of the illustrations in this document.
3. Verify disk shelf connectivity by entering the following command at the system console of either controller:

   ```
   sysconfig -v
   ```

   The output shows the following:

   Each FibreBridge on a separate line and, for fabric-attached MetroCluster configurations, under each FC port to which it is visible; for stretch MetroCluster configurations, directly connected.

   For example, output for a fabric-attached MetroCluster configuration would look like:

   ```
   FC-to-SAS Bridge:
   Brocade300-1:9.126L0 : ATTO FibreBridge6500N 1.11 FB6500N100189
   Brocade300-2:1.126L0 : ATTO FibreBridge6500N 1.11 FB6500N100162
   ```

   For example, output for a stretch MetroCluster configuration would look like:

   ```
   FC-to-SAS Bridge:
   125L0 : ATTO FibreBridge6500N 1.10 FB6500N100053
   125L0 : ATTO FibreBridge6500N 1.10 FB6500N100048
   ```

   Each disk shelf on a separate line under each FC port to which it is visible (for fabric-attached or stretch MetroCluster configurations).

   ```
   Shelf 0: IOM6 Firmware rev. IOM6 A: 0111 IOM6 B: 0111
   Shelf 1: IOM6 Firmware rev. IOM6 A: 0111 IOM6 B: 0111
   ```

   Each disk drive on a separate line under each FC port to which it is visible (for fabric-attached or stretch MetroCluster configurations).

   For example, output for a fabric-attached MetroCluster configuration would look like:

   ```
   Brocade300-1:9.126L1 : NETAPP X421_HCOBD450A10 NA01 418.0GB (879097968 520B/sect)
   Brocade300-1:9.126L2 : NETAPP X421_HCOBD450A10 NA01 418.0GB (879097968 520B/sect)
   ```

   For example, output for a stretch MetroCluster configuration would look like:

```
125L1 : NETAPP X421_HCOBD450A10 NA01 40.0GB (82262416 520B/sect)
125L2 : NETAPP X421_HCOBD450A10 NA01 40.0GB (82262416 520B/sect)
```

4. Assign disk ownership by following the Assigning disk pools instructions in the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*.

   Note: If you are splitting a single stack of disk shelves between two controllers, you must disable disk autoassignment before assigning disk ownership. Else, when you assign a single disk drive, the remaining disk drives might be automatically assigned to the same controller and pool.

   To disable disk autoassignment, run the following command at the console of both controllers:

   ```
   options disk.auto_assign off
   ```

   Note: Do not add disk drives to aggregates or volumes until the disk drive and disk shelf firmware are updated.

5. Update the disk drive firmware to the latest version by entering the following command at the system console:

   ```
   disk_fw_update
   ```

   You must run this command on both controllers. If needed, refer to the procedure you copied when you downloaded the firmware as part of the preparation for this task.

6. Update the disk shelf firmware to the latest version by using the procedure you copied when you downloaded the firmware as part of the preparation for this task. You can run the commands in the procedure from the system console of either controller.

7. If you are hot-adding more than one disk shelf, repeat Steps 1 through 6 for each disk shelf.

Converting an HA pair or stretch MetroCluster system with SAS disk shelves to a fabric-attached MetroCluster system

You can convert an HA pair or stretch MetroCluster system that has SAS disk shelves to a fabric-attached MetroCluster system.

For this procedure, it is recommended that you use these FibreBridge management interfaces: the ATTO ExpressNAV GUI and ATTO QuickNAV utility.

You can use the ATTO ExpressNAV GUI to configure, manage and update firmware on a FibreBridge. You can use the ATTO QuickNAV utility to set the initial IP address of the FibreBridge management ports.

You can use other interface options instead. For example, you can use a serial port or Telnet to configure and manage a FibreBridge, and to configure the Ethernet management 1 port. You can also use FTP to update the FibreBridge firmware. If you choose any of these interface options, you must follow the requirements listed under "Other FibreBridge management interface options" on page 23.

Preparing for the conversion

Before converting an HA pair or stretch MetroCluster system to a fabric-attached MetroCluster system:
* The system platforms should be supported. The *IBM System Storage N series Introduction and Planning Guide* has the latest information about supported platforms.
* Data ONTAP 8.1 or later should be installed on the system.
* An ATTO-supported web browser should be installed so that you can use the ATTO ExpressNAV GUI. Recommended browsers are Internet Explorer 8 or Mozilla Firefox 3. The *ATTO FibreBridge 6500N Installation and Operation Manual* contains a list of supported web browsers.

To convert an HA pair or stretch MetroCluster system to a fabric-attached MetroCluster system:

1. Download the following documents from the N series support website (accessed and navigated as described in "Websites" on page 26):
   - *MetroCluster Compatibility Matrix*
   - *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide*
   - *Brocade Switch Configuration Guide for Fabric-attached MetroClusters*
   - *Hardware and Service Guide* for your disk shelf model
   - *ATTO FibreBridge 6500N Installation and Operation Manual*

2. Go to the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26) and download the:
   a. ATTO QuickNAV utility (to the computer you will use for setup)
   b. FibreBridge 6500N firmware file. You will update the firmware on each FibreBridge later, when instructed in Hot-adding the stack of shelves. Make a copy of the FibreBridge 6500N Firmware and release notes for reference later.

3. Check the MetroCluster Compatibility Matrix to ensure that the system meets configuration requirements for the FibreBridge.

4. Check the *IBM System Storage N series Data ONTAP 8.1 7-Mode High-Availability Configuration Guide* to ensure that the system meets the MetroCluster requirements as defined in the MetroCluster installation.

5. Gather the hardware and information needed to use the recommended FibreBridge management interfaces—the ATTO ExpressNAV GUI and the ATTO QuickNAV utility—by completing the following substeps:
   a. Get a standard Ethernet cable to connect the FibreBridge Ethernet management 1 port to the network.
   b. Determine a user name and password for accessing the FibreBridge. It is recommended that you change the default user name and password.
   c. Obtain an IP address, subnet mask, and gateway information for the Ethernet management 1 port on each FibreBridge.
   d. Disable VPN clients on the computer that you use for setup. Active VPN clients cause the QuickNAV-scan for FibreBridges to fail.

6. Get the 4ea 6MM screws and 4ea nut clips shipped with the FibreBridge to secure the FibreBridges to the front of the rack. The openings in the FibreBridge "L" brackets are compliant with rack standard ETA-310-X for 19-inch (482.6 mm) racks.

7. Update the following firmware for each system as described in the *Data ONTAP 7-Mode Upgrade Guide*:
   a. Data ONTAP. The same version of Data ONTAP must be installed on both controllers.
   b. Storage system
   c. Disk shelf
   d. Disk drive

8. If you have a chassis with two controllers, complete the following substeps so that there is only one controller in each chassis:
   a. Move one controller to a new chassis to form the partner node of the MetroCluster system.
   b. Install an FC-VI interconnect card on both systems.

For details about the conversion process, see the *TR-3517, MetroCluster Upgrade Planning Guide*.

Converting the system

Before you start converting your HA pair or stretch MetroCluster system:

- If you have a standard HA pair, you should make it a mirrored HA pair (in Step 17), for which you need to add disk shelves, disable disk autoassignment, assign the new disk drives to pool 1, and then reboot each controller.
- Multipath HA is the only supported configuration for MetroCluster systems using FibreBridges. Both controllers must have access through the bridges to the disk shelves in each stack.
- A stack of SAS disk shelves can contain shelves of SATA disk drives and shelves of SAS disk drives. However, SATA and SAS disk drives cannot be mixed in the same disk shelf.
- You should use an equal number of disk shelves at each site.
- You should have two bridges for each stack of disk shelves at each site.
- Each FC switch must have one FC port to connect to one FibreBridge.
- The system connectivity requirements, such as maximum distances for disk shelves, FC switches, and backup tape devices using 50 micron multimode fiber optic cables, also apply to FibreBridges. The *N series Introduction and Planning Guide* has detailed information about system connectivity requirements.

To convert your HA pair or stretch MetroCluster system:

1. Note the shelf IDs of the disk shelves connected to the system. You use this information later during disk autoassignment.
2. Move the NVRAM adapter and FC-VI adapter to their respective slots in the system, as shown in the N series Introduction and Planning Guide.
3. Determine the switch and general configuration by completing the Planning the fabric-attached MetroCluster installation worksheet in the *IBM System Storage N series Data ONTAP 7-Mode High-Availability Configuration Guide*.
4. If needed, update the firmware on each FC switch based on the version of Data ONTAP installed on your system. The MetroCluster Compatibility Matrix contains a list of supported FC switch firmware.
5. Set up and configure the FC switches, and verify your FC switch licenses, as described in the Brocade Switch Configuration Guide for Fabric-attached MetroClusters.

   Note: The configuration and firmware requirements for Brocade switches in a MetroCluster environment are different from the requirements for switches used in SAN environments. Refer to MetroCluster documentation when installing and configuring your FC switches.

   Note: If you are using FC switches that were previously used for another purpose, you must restore the FC switches to factory defaults
6. If you are converting a stretch MetroCluster system, go to Step 11. Else, install the bridges by completing the following substeps, and then continuing to step 7:
   a. Attach the 4ea nut clips to the front of the Rack at the EIA position you wish to install the FibreBridge.
   b. Secure the "L" brackets on the front of each bridge to the front of the rack with four screws.
   c. Place each bridge on the equipment rack.
   d. Connect each bridge to a power source and turn it on.

      Note: Ensure that each bridge is connected to a different power source. The bridge Ready LED might take up to 30 seconds to illuminate, indicating that the bridge has completed its power-on self test sequence. For information about power requirements and LEDs, see the *ATTO FibreBridge 6500N Installation and Operation Manual*.
7. Connect the Ethernet management 1 port on each bridge to the network using an Ethernet cable.

   Note: You can use the Ethernet management 1 port to quickly download the bridge firmware (using ATTO ExpressNAV or FTP management interfaces) and to retrieve core files and extract logs.
8. Set up and configure each bridge by completing the following substeps:

a. Configure the Ethernet management 1 port for each bridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 2.0.

   Note: When you run QuickNAV and ExpressNAV to configure an Ethernet management port, only the Ethernet management port that is connected by the Ethernet cable is configured. For example, if you want to configure the Ethernet management 2 port, you would need to connect the Ethernet cable to port 2 and run QuickNAV and ExpressNAV.

b. Configure each bridge by following the procedure in the *ATTO FibreBridge 6500N Installation and Operation Manual*, section 3.0. Note the user name and password that you designate.

9. Update the firmware on each FibreBridge to the latest version by following the instructions at the ATTO FibreBridge 6500N Firmware - Installation and upgrade instructions link. See the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on N series support website (accessed and navigated as described in "Websites" on page 26).

10. Cable the disk shelves to the bridges by completing the following substeps:

   Note: The disk shelves in the stack remain daisy-chained.

   a. For each stack of disk shelves, cable IOM A square port of the first shelf to SAS port A on FibreBridge A.

   b. For each stack of disk shelves, cable IOM B circle port of the last shelf to SAS port A on FibreBridge B.

   Each bridge has one path to its stack of disk shelves: bridge A connects to the A-side of the stack through the first shelf, and bridge B connects to the B-side of the stack through the last shelf.

   Note: The bridge SAS port B is disabled.

   Figure 5 shows a set of FibreBridges cabled to a stack of three disk shelves.
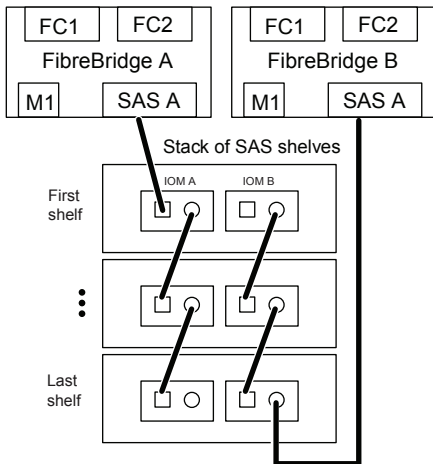

Figure 5. FibreBridges connected to a SAS stack

11. Verify that each bridge is connected to the disk drives and disk shelves.

If you are using...	Then...
ATTO ExpressNAV GUI	1. In a web browser, enter the IP address of the bridge. The ATTO FibreBridge 6500N home page opens. 2. On the home page, click the **enter here** link to enter your user name and the password that you designated when you configured the bridge. The ATTO FibreBridge 6500N status page opens. 3. In the left-pane menu, click Advanced. 4. Enter the following command and click Submit: `sastargets`
Serial port connection	Enter the following command: `sastargets`

The output shows the devices (disks and disk shelves) that the bridge is connected to.

```
Tgt VendorID ProductID Type SerialNumber
0 NETAPP X410_S15K6288A15 DISK 3QP1CLE300009940UHJV
1 NETAPP X410_S15K6288A15 DISK 3QP1ELF600009940V1BV
2 NETAPP X410_S15K6288A15 DISK 3QP1G3EW00009940U2M0
3 NETAPP X410_S15K6288A15 DISK 3QP1EWMP00009940U1X5
4 NETAPP X410_S15K6288A15 DISK 3QP1FZLE00009940G8YU
5 NETAPP X410_S15K6288A15 DISK 3QP1FZLF00009940TZKZ
6 NETAPP X410_S15K6288A15 DISK 3QP1CEB400009939MGXL
7 NETAPP X410_S15K6288A15 DISK 3QP1G7A900009939FNTT
8 NETAPP X410_S15K6288A15 DISK 3QP1FY0T00009940G8PA
```

Note: If the "response truncated" message displays at the beginning of the output, you can Telnet to the bridge and enter the same command to see the output.

12. Cable the bridges to the FC switches by completing the following substeps:

   a. Cable FC port 1 on bridge A to FC switch 1

   b. Cable FC port 1 on bridge B to FC switch 2

   Note: You can connect the bridge to an available port on the FC switch. Whichever port you choose, you must use the same port consistently on each FC switch. The FC port 2 remains unused on each bridge.

13. Cable the controllers to the FC switches using the information in the *IBM System Storage N series Data ONTAP 7-Mode High-Availability Configuration Guide*.

14. Assign disk ownership by following the Assigning disk pools instructions in the *IBM System Storage N series Data ONTAP 7-Mode High-Availability Configuration Guide*. You can use the disk drive information you gathered in Step 1.

   Note: If you are splitting a single stack of disk shelves between two controllers, you must disable disk autoassignment before assigning disk ownership. Else, when you assign a single disk drive, the remaining disk drives might be automatically assigned to the same controller and pool. To disable disk autoassignment, run the options `disk.auto_assign off` command at the console of both controllers.

15. Install the Data ONTAP licenses on each controller in the following order:

   a. `syncmirror_local`

   b. `cf_remote`

16. Reboot each controller.

17. Configure the controller by using the information in the *IBM System Storage N series Data ONTAP 7-Mode High-Availability Configuration Guide*.

If you are converting a...	Then...
Standard HA pair with SAS storage	Set up mirroring and configure the controller. **Note:** You need to add disk shelves, disable disk autoassignment, assign the new disk drives to pool 1, and then boot each controller.
Stretch MetroCluster system with SAS storage	Configure the controller.

18. Verify that the aggregate Snapshot copy reserve for mirroring is 5% or larger, by entering the following command at the console of each controller:

    `aggr options aggrname`

19. Configure the MetroCluster system by using the information in the *IBM System Storage N series Data ONTAP 7-Mode High-Availability Configuration Guide*.
20. Transport the partner controller, FC switches, disk shelves, and bridge to the remote site.
21. Set up the remote site system by repeating this procedure.

Other FibreBridge management interface options

If needed, you can use management interfaces other than the recommended ATTO ExpressNAV GUI and ATTO QuickNAV utility. You can use a serial port or Telnet to configure and manage a FibreBridge and to configure the FibreBridge Ethernet management 1 port, and you can use FTP to update the FibreBridge firmware. You need to fulfill the requirements for the applicable interface before you install a FibreBridge.

Note: The *ATTO FibreBridge 6500N Installation and Operation Manual* has more information about FibreBridge management interface options.

You can access this document by using the link provided on the SAS disk shelf (EXN3000 or EXN3500) publication matrix page on the N series support website (accessed and navigated as described in "Websites" on page 26).

Serial port

When using the serial port to configure and manage a FibreBridge, and configure the Ethernet management 1 port, your system must meet the following requirements:

- You must have a serial cable (which connects from the FibreBridge serial port to a serial (COM) port on the computer you are using for setup).

  The FibreBridge serial port is RJ-45 and has the same pin-out as the controllers.
- You must have a terminal emulation program such as Hyperterminal, Teraterm, or PuTTY to access the console.

  The terminal program should be capable of logging screen output to a file.
- You need to obtain an IP address, subnet mask, and gateway information for the Ethernet management 1 port on each FibreBridge.

Telnet

When using Telnet to configure and manage a FibreBridge, your system must meet the following requirements:

- You must have a serial cable (which connects from the FibreBridge serial port to a serial (COM) port on the computer you are using for setup).

  The FibreBridge serial port is RJ-45 and has the same pin-out as the controllers.

- It is recommended that you determine a non-default user name and password (for accessing the FibreBridge).
- You must have a terminal emulation program such as Hyperterminal, Teraterm, or PuTTY to access the console.

  The terminal program should be capable of logging screen output to a file.

FTP

When using FTP to update FibreBridge firmware, your system must meet the following requirements:

- You must have a standard Ethernet cable (which connects from the FibreBridge Ethernet management 1 port to your network).
- It is recommended that you determine a non-default user name and password (for accessing the FibreBridge).

FibreBridge error messages

FibreBridge error messages inform you of FibreBridge configuration errors that Data ONTAP has detected when cabling FibreBridges or when downloading disk shelf and disk drive firmware.

Attention: If you must correct cabling on a system that is serving data, you can perform hot-cable changes only if one path to the disk drives is maintained.

config.bridge.adapter.invalid

Message
> config.bridge.adapter.invalid

Severity
> ERROR

Description
> This message displays when an FC-to-SAS bridge is attached to an unsupported FC adapter port.

Corrective action
> Attach the FC-to-SAS bridge to a QLogic 4-Gb/s or 8-Gb/s adapter. (These are the only supported adapters.)
>
> FC ports can be onboard and/or on PCIe HBAs.

SNMP trap ID
> N/A

config.bridge.extra.port

Message
> config.bridge.extra.port

Severity
> ERROR

Description
> This message displays when both FC ports of an FC-to-SAS bridge are attached to the same controller.

Corrective action
> Correct the cabling by following the defined stretch or fabric-attached MetroCluster cabling information and illustrations in this
>
> *Configuring a MetroCluster system with SAS disk shelves and FibreBridge 6500N* document.

SNMP trap ID
N/A

config.bridge.fw.mismatch

Message
config.bridge.fw.mismatch

Severity
ERROR

Description
This message displays when two or more attached FC-to-SAS bridges are running different firmware versions.

All FibreBridges should be running the same firmware version.

Corrective action
Upgrade the firmware version to the latest version on the FC-to-SAS bridges by using the instructions in the ATTO FibreBridge 6500N Firmware download page on the N series support website (accessed and navigated as described in "Websites" on page 26).

SNMP trap ID
N/A

config.bridge.SAS.miswired

Message
config.bridge.SAS.miswired

Severity
ERROR

Description
This message displays when the SAS disk shelves behind an FC-to-SAS bridge are not wired in the correct order.

Corrective action
Correct the cabling by following the defined stretch or fabric-attached MetroCluster cabling information and illustrations in this *Configuring a MetroCluster system with SAS disk shelves and FibreBridge 6500N* document.

SNMP trap ID
N/A

config.bridge.SAS2Domain

Message
config.bridge.SAS2Domain

Severity
WARNING

Description
This message displays when a disk is multipathed to one SAS domain; that is, both ports of the disk are visible from the same bridge FC port.

Corrective action
Recable the disk shelf containing the specified disk, so that the two disk ports are in different SAS domains.

You can use the cabling information and illustrations in this *Configuring a MetroCluster with SAS disk shelves and FibreBridge 6500N* document.

SNMP trap ID
>   N/A

dfu.badBridgeShelfConfig

Message
>   dfu.badBridgeShelfConfig

Severity
>   ERROR

Description
>   This message displays when the disk firmware update aborts because it cannot contact the two peer FC-to-SAS bridges.

Corrective action
>   Make sure that the storage controller is correctly cabled to the two peer FC-to-SAS bridges and that the bridges are correctly cabled to the SAS disk shelves, and then run the `disk_fw_update` command again.
>
>   You can use the cabling information and illustrations in this *Configuring a MetroCluster with SAS disk shelves and FibreBridge 6500N* document.

SNMP trap ID
>   N/A

sfu.badBridgeShelfConfig

Message
>   sfu.badBridgeShelfConfig

Severity
>   ERROR

Description
>   This message displays when the disk shelf firmware update aborts because it cannot contact the two peer FC-to-SAS bridges.

Corrective action
>   Make sure that the storage controller is correctly cabled to the two peer FC-to-SAS bridges and that the bridges are correctly cabled to the SAS disk shelves, and then run the `storage download shelf` command again.
>
>   You can use the cabling information and illustrations in this *Configuring a MetroCluster with SAS disk shelves and FibreBridge 6500N* document.

SNMP trap ID
>   N/A

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/

- 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/

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

- 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:

  publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

- Firmware and software upgrades are available for download using the **Software Packages** link from the **Download** task of the N series support website. Refer to the Important information for N series support for step-by-step instructions explaining how to access software packages as part of the complete instructions for entitlement and registration. After a customer has completed the registration process and provided the **Web Access Keys** on the **N series and related Host Software Downloads - Signup** page for the individual machines they own, all firmware, software, and host connectivity utilities entitled for these machines will be visible.

  Note: Firmware upgrades for FC/SAS bridges are only available for EXN3000 and EXN3500 storage expansion units ordered with Feature Code 2100 to support stretch and fabric-attached MetroCluster environments. These firmware upgrades will be available from the N series FC/SAS bridge firmware software package along with the ATTO QuickNAV tool that facilitates the IP assignment of the FC/SAS bridges.

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