

HP StorageWorks 4400 Enterprise Virtual Array installation guide

The EVA4400 is customer self installable. However, you may purchase installation service by an HP-authorized service provider if preferred. For more information, contact HP technical support in North America at 1-800-474-6836. Outside North America, call HP technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website: <http://www.hp.com/support>.

To assist you in installing the EVA4400, videos of the procedures have been produced. Go to the Services Media Library website: <http://www.hp.com/go/sml> and navigate to your product to view these videos.



* 5 1 4 0 1 7 - 0 0 1 *

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About this guide

This guide describes how to install the HP StorageWorks 4400 Enterprise Virtual Array.

Intended audience

This guide is intended for users with knowledge of:

- Storage area networks
- Basic operating system commands and utilities

Prerequisites

Prerequisites for using this product include:

- A Fibre Channel switch installed in your environment
- An equipment cabinet suitable for 2U sized enclosures
- A management server running Windows for HP Command View EVA software (server-based management)
- A management module running HP Command View EVA software (array-based management)
- A CD-ROM drive attached to either the management server or the server attached to the management module

Related documentation

You can find the documents referenced in this guide on the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Disk Storage Systems** or **Storage Software** and then select your product.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Blue text: Table 1	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Website addresses
Bold text	<ul style="list-style-type: none">• Keys that are pressed• Text typed into a GUI element, such as a box• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<i>Monospace, italic</i> text	<ul style="list-style-type: none">• Code variables• Command variables
Monospace, bold text	Emphasized monospace text

 **WARNING!**

Indicates that failure to follow directions could result in bodily harm or death.

 **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:**

Provides clarifying information or specific instructions.

 **NOTE:**

Provides additional information.

 **TIP:**

Provides helpful hints and shortcuts.

Rack stability

Rack stability protects personnel and equipment.

⚠ WARNING!

To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
 - Ensure that the full weight of the rack rests on the leveling jacks.
 - Install stabilizing feet on the rack.
 - In multiple-rack installations, fasten racks together securely.
 - Extend only one rack component at a time. Racks can become unstable if more than one component is extended.
-

HP technical support

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Customer self repair

HP customer self repair (CSR) programs allow you to repair your StorageWorks product. If a CSR part needs replacing, HP ships the part directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your HP-authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or see the CSR website:

<http://www.hp.com/go/selfrepair>

Location of WWN and serial number

For service and support purposes, the location of the controller serial number, controller product number, and WWN (after removing the controller front bezel) is shown in the circled area in [Figure 1](#).

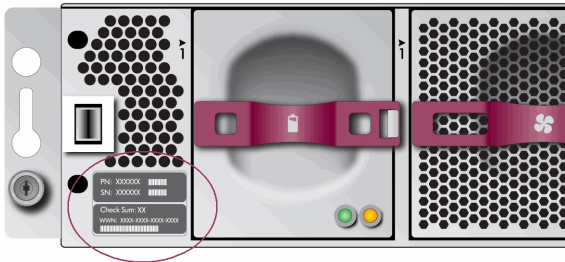
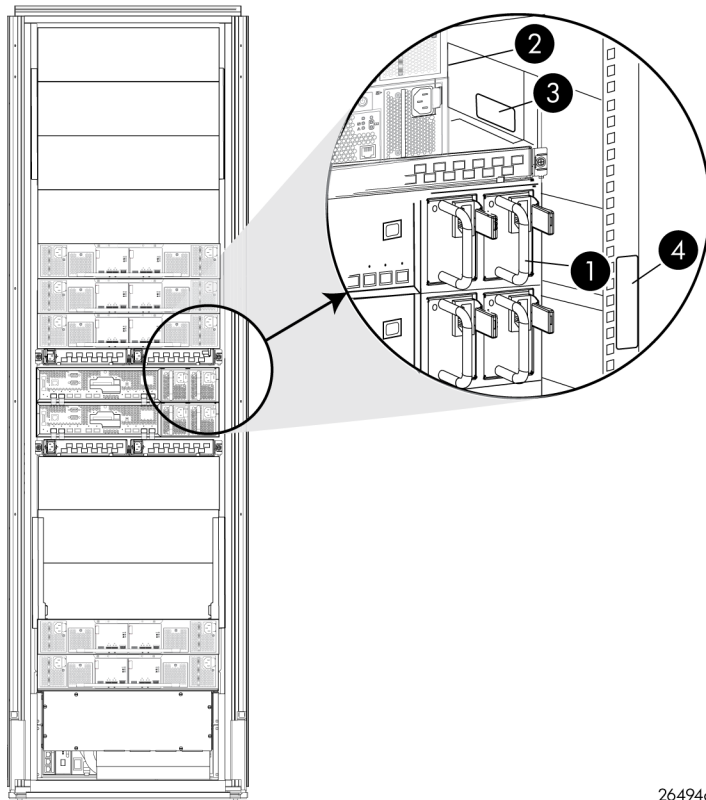


Figure 1 Location of WWN and serial number

 **NOTE:**

For products ordered as bundled products that contain multiple products, the product number and serial number needed for service and support is shown in the circled area in [Figure 2](#), callouts 3 and 4.



26494a

Figure 2 Location of WWN and serial number for bundled products

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/wwalerts>

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- <http://www.hp.com/support/manuals>
- <http://www.hp.com/support/downloads>

Documentation feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to storedocsFeedback@hp.com. All submissions become the property of HP.

Installation checklist

[Figure 3](#) and [Figure 4](#) illustrate the steps necessary to install the EVA hardware and HP Command View EVA software. Each step is described in a subsequent chapter of this manual.

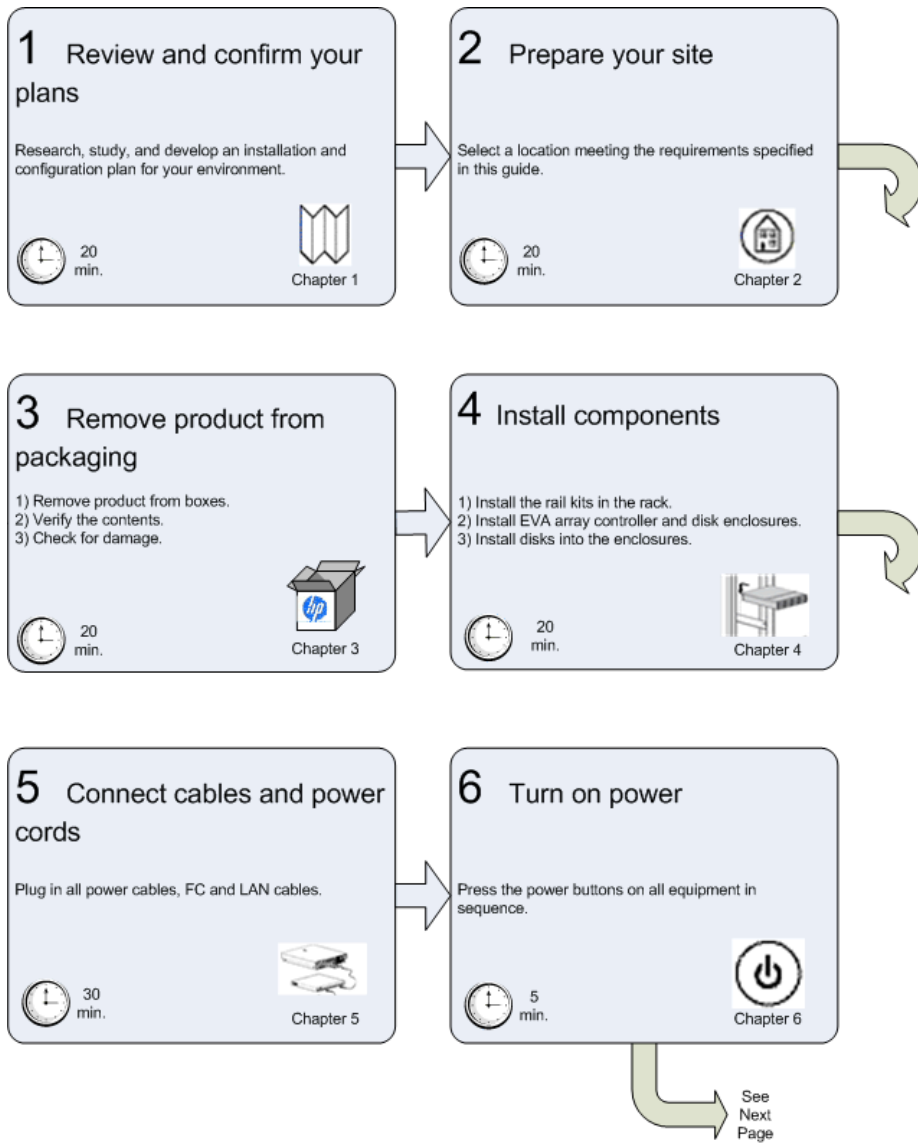


Figure 3 Installation checklist

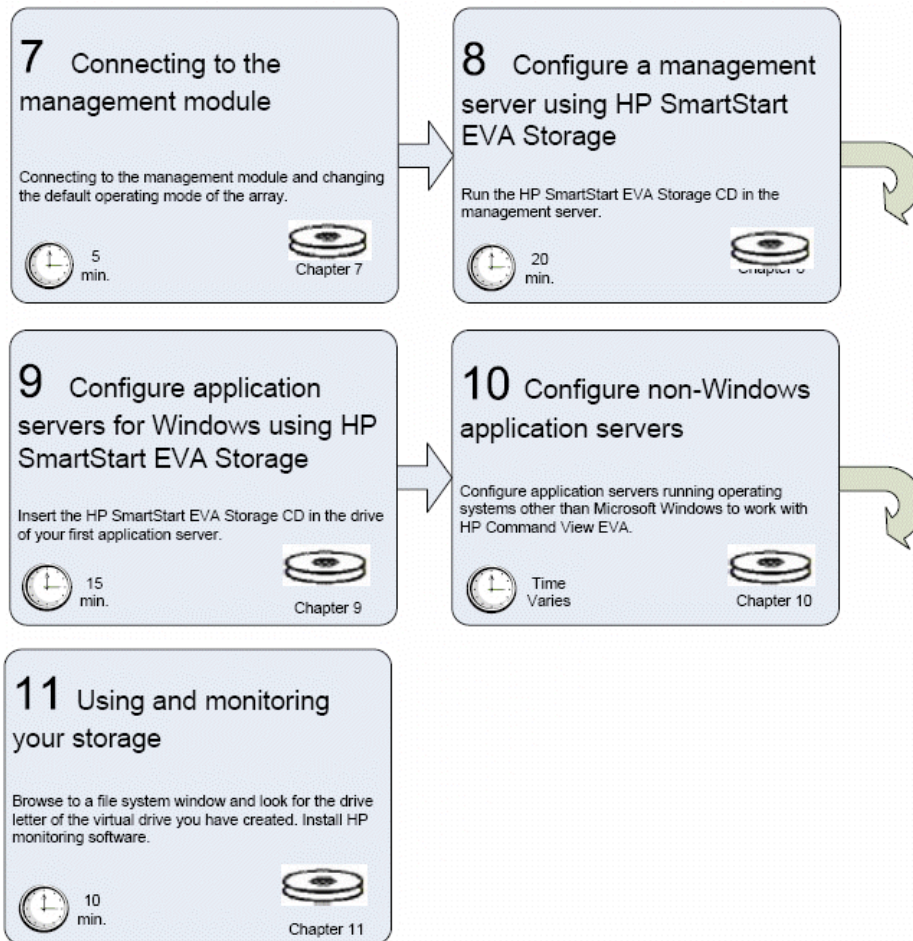


Figure 4 Installation checklist, cont'd

1 Review and confirm your plans



Overview

HP Command View EVA can be implemented in two ways:

- **Server-based management** - HP Command View EVA is installed on a management server connected to the EVA, providing management of multiple HP EVA storage systems. All components of the software suite (HP Command View EVA, HP Command View EVAPerf, HP Storage System Scripting Utility, SMI-S EVA) are installed. Server-based management is applicable to all EVA models.
- **Array-based management** - Beginning with HP Command View EVA 8.1, the EVA4400 is shipped with HP Command View EVA **pre-installed** on the management module within the controller enclosure. Only one component of the software suite (HP Command View EVA) is installed. Array-based management is applicable to the EVA4400 only.

Before installing the EVA, HP recommends that you:

- Develop an installation and configuration plan for your environment.
- Review all videos and documentation.
- Determine if the EVA will be fabric-attached (connected to Fibre Channel switch) or direct-attached (connected to Fibre Channel adapter in server). The EVA4400 is factory configured for fabric-attached. To change to direct-attached mode, see [Chapter 7](#).

NOTE:

Models of the EVA4400 with an embedded switch (also known as the HSV300-S controller) are configured in fabric-attach mode and must remain fabric-attached.

Plan your storage configuration

Proper planning of the system storage and its subsequent performance is critical to a successful deployment of the EVA. Improper planning or implementation can result in wasted storage space, degraded performance, or inability to expand the system to meet growing storage needs. Considerations include:

- System and performance expectations

- Striping methods
- RAID levels
- Hard drive sizes and types
- Spare drives
- Array sizing (capacity)



NOTE:

For the minimum supported configuration, and other configuration information, see the QuickSpecs document at: <http://www.hp.com/go/eva4400>

System and performance expectations

To help determine the best way to configure your storage, rank the following three storage characteristics in order of importance:

- Fault tolerance (high availability)
- I/O performance
- Storage efficiency

With your priorities established, you can determine which striping method and RAID level to use.

As highlighted in the following section, some configuration methods offer greater fault tolerance, while other configuration methods offer better I/O performance or storage efficiency.

RAID levels

Vraid is the HP term for implementation of RAID (**R**edundant **A**rray of **I**ndependent **D**isks) storage. Vraid is also referred to as *redundancy* in HP management software. Virtual disks with HP Vraid use three key RAID methods: data striping, data mirroring, and parity error checking. Unlike traditional RAID, all HP Vraid levels distribute data across *all* available physical disks.

Data striping improves speed by performing virtual disk I/O with an entire group of physical disks at the same time. Mirroring provides data redundancy by storing data and a copy of the data. Parity also provides data redundancy by storing data and the calculated parity for each stripe of data. If a subset of the data on a physical disk becomes corrupt or the entire physical disk fails, the data can be automatically recovered from redundancy so that data loss does not occur.

The EVA has four Vraid types: Vraid0, Vraid1, Vraid5, and Vraid6. Each Vraid type provides unique I/O speed and has a different level of data redundancy, which directly effects the amount of physical space used. Once a virtual disk is created, its Vraid type cannot be changed.

See Table 2 for a comparison of the different RAID levels.

Table 2 RAID Level Comparison

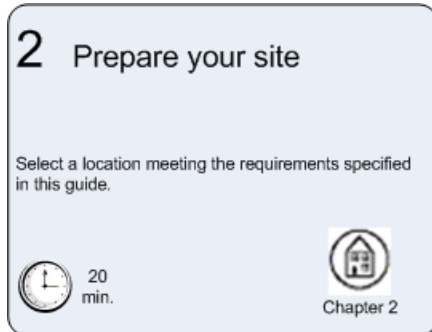
	Summary	Best practices	Data redundancy	RAID method
Vraid0	Vraid0 is optimized for I/O speed and efficient use of physical disk capacity, but provides no data redundancy.	IMPORTANT: HP does not recommend using Vraid0 for virtual disks when high availability is required. Consider Vraid0 only for noncritical storage. Vraid0 virtual disks provide the best performance for applications that use random I/O.	none	striping
Vraid1	Vraid1 is optimized for data redundancy and I/O speed, but uses the most physical disk space. IMPORTANT: Vraid1 uses about 100% more physical disk space than Vraid0.	In general, Vraid1 virtual disks provide better performance characteristics over a wider range of application workloads than Vraid5.	high	striping and mirroring
Vraid5	Vraid5 provides a balance of data redundancy, I/O speed and efficient use of physical disk space. Vraid5 uses about 20% more physical disk space than Vraid0.	Vraid5 virtual disks provide as good or better performance than Vraid1 for applications that use sequential writes. Vraid5 has much lower random write performance in comparison to Vraid1, but has much higher capacity efficiency.	medium	striping and parity
Vraid6	Vraid6 is similar to Vraid5, but provides a higher level of redundancy by storing two parity blocks per stripe instead of one. Vraid6 uses 33% more physical disk space than Vraid0.	Performance characteristics of Vraid6 for random and sequential write workloads will be slightly slower than Vraid5. Vraid6 provides the highest level of redundancy protection of all the Vraid types.	very high	striping and double parity

 **NOTE:**

For best practice information, see the *HP StorageWorks 4400 Enterprise Virtual Array configuration best practices white paper* available at:

http://h18006.www1.hp.com/storage/arraywhitepapers.html?jumpid=reg_R1002_USEN

2 Prepare your site



Overview

Preparing your site means providing:

- Physical rack space for the equipment
- AC power for the EVA
- Proper ventilation and temperature conditions
- LAN or Fibre Channel cables to attach the EVA hardware to your network.

To ensure continuous, safe, and reliable operation of your equipment, place your system in an approved environment.

Consider using the HP Enterprise Configurator (eCO) to help plan and configure racks and rack-mountable devices. The eCO is available on the HP website: <http://h30099.www3.hp.com/configurator>.

Provide adequate structural support for the floor

Calculate the total weight of your equipment and verify that your site can support the weight.

Provide adequate clearance space and ventilation

Be sure to provide adequate clearance around the front and back of the racks. Provide at least 25 inches (63.5 cm) in the front of the rack to allow the doors to open fully and provide at least 30 inches (76.2 cm) in the rear of the rack to allow for servicing and airflow.

If there are unused spaces in your rack, attach blanking panels across those empty spaces to force the airflow through the components instead of through the open spaces.

Provide adequate and redundant sources of power

Make sure that you have two high-line power feeds installed near your computer. These two power sources usually come from the same external power grid, but occasionally may originate from different grids or even entirely different sources.

For protection against a power-source failure, obtain and include two uninterruptible power supplies in your installation.



For power consumption specifications, see the QuickSpecs document at:

<http://www.hp.com/go/eva4400>

3 Remove product from packaging

3 Remove product from packaging

- 1) Remove product from boxes.
- 2) Verify the contents.
- 3) Check for damage.

 20 min.
Chapter 3


Overview


1. Remove product from boxes.
2. Verify that contents match your expectations and site requirements.
 - EVA4400 controller enclosure should contain:
 - One 2U controller enclosure with two HSV300 or HSV300-S controller modules, two power supply modules, two fan modules, and two battery modules installed.
 - Rack mounting hardware
 - Two 2.0 meter FC copper cables
 - Two power cords
 - Installation documentation
 - XCS controller software recovery CD
 - Each FC disk shelf will contain:
 - One 2U M6412 disk enclosure, two power supply modules, two fan modules, and two battery modules.
 - Rack mounting hardware kit
 - Two 0.41 meter FC copper cables
 - Two power cords
3. Inspect for damage.

4 Install components

4 Install components

- 1) Install the rail kits in the rack.
- 2) Install EVA array controller and disk enclosures.
- 3) Install disks into the enclosures.

 20 min.

 Chapter 4

NOTE:

If you have ordered the factory integrated product, skip this section and go to [Chapter 6](#).

Rack installation best practices

In addition to industry-standard recommendations, consider the following:

- Locate the heaviest items, such as uninterruptable power supplies (UPS) and additional disk enclosures near the bottom of the rack.
- To make cabling easy, install the disk enclosures below the controller enclosure in the rack.
- Install similar components next to each other in the rack. Because enclosures, switches, and servers are of differing depths, if you have more than one of a device, mount those devices adjacent to one another to accommodate working behind the rack.

WARNING!

To reduce the risk of personal injury or damage to the equipment, be sure that:

- At least two people lift the storage system during removal or installation, if the weight, exceeds 22.7 kg (50 lb). If the system is being loaded into the rack above chest level, a third person **MUST** assist with aligning the system with the rails while the other two people support the weight of the system.
 - The leveling jacks on the rack are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - The stabilizing feet are attached to the rack if it is a single-rack installation.
 - The racks are coupled together in multiple-rack installations.
 - Only one component in a rack is extended at a time. A rack may become unstable if more than one component is extended.
 - To prevent damage and to ease insertion of the device into the rack, support the weight of the device and keep it level when sliding it into the rack.
-

See [Figure 5](#) before installing the EVA components in the rack.

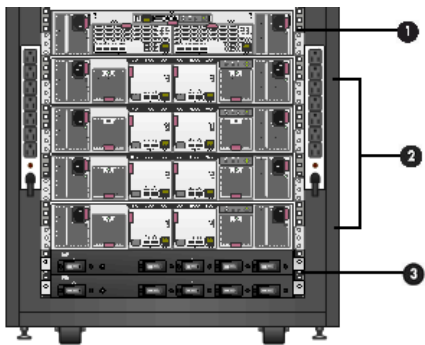


Figure 5 Typical EVA installed in rack (preferred layout)

1. Controller enclosure
2. Disk enclosures
3. PDU (at rear of enclosure)

Attach the brackets for a longer chassis

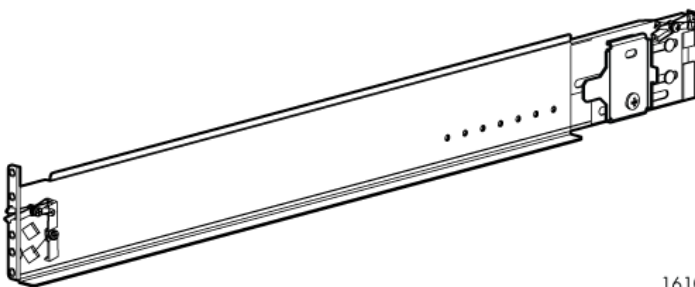
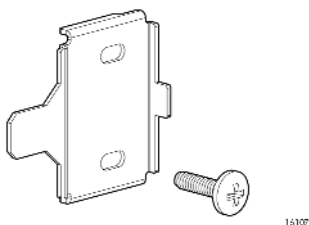
If you are installing a longer chassis into your cabinet, such as for the controller enclosure, you must remove the supplied shipping retaining bracket and install the smaller brackets supplied in the accessory kit.



NOTE:

A No. 2 Phillips head screwdriver is required for this procedure.

1. Remove the existing thumbscrew and shipping retaining bracket from the rear of the rail.
2. Insert a screw through the bottom hole of the new bracket and loosely secure the bracket to the rear of the rail.



3. Repeat steps 1 and 2 for the remaining rail.

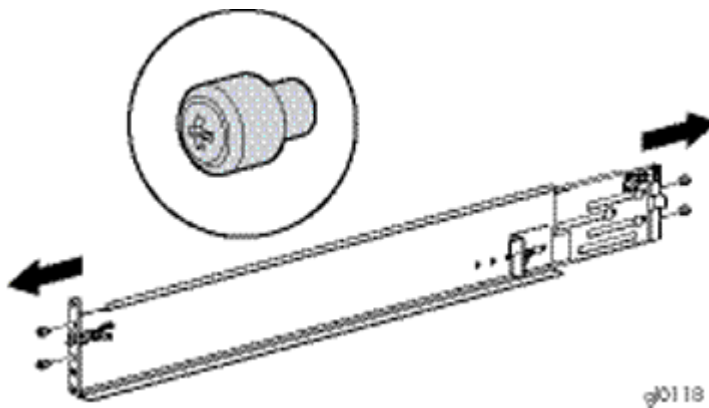
Converting the rails

The cabinet rail kit supplied with the drive enclosure comes configured for square-hole cabinets. If you need to convert the rails for a round-hole cabinet, perform the following steps:

ⓘ IMPORTANT:

Do not remove the pins from the ends of the rails unless you are converting the rails for use in round-hole cabinets. These load-bearing pins are designed to fit through the holes without being removed.

1. Locate the bag of eight round-hole pins that is included in the cabinet rail kit.
2. Use a No. 2 Phillips screwdriver to remove the standard pins from the front and back of the left and right rails (four on each rail).



3. Attach the round-hole pins into the eight holes on the rails where the standard pins were removed.

Attach the rails

📖 NOTE:

The designation of left and right rail is made when looking at the front of the rack. The rails are marked by an R (right) and L (left) stamped on the metal.

Consider the following when installing the rails:

- Installing the rails does not require any tools for assembly.
- HP recommends you install all the rail kits before installing any other components.
- Ensure the rail is level before installing any other components.

⚠ WARNING!

Before you begin, make sure that the cabinet is sufficiently stable. If provided, lower the cabinet leveler feet and make sure any required stabilizers are installed. If provided, extend the anti-tip device. Failure to extend the anti-tip device could result in personal injury or damage if the cabinet tips over.

1. On the rear of the rail, squeeze the scissor latch (1, [Figure 6](#)) together to insert the rail and pins through the cabinet holes (2, [Figure 6](#)) until the latch engages.

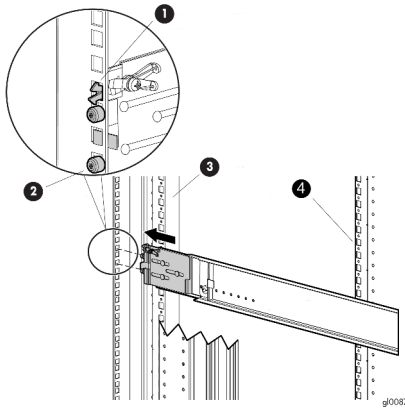


Figure 6 Attaching the rail

2. On the front of the rail, pull the locking latch and then squeeze the scissor latch to insert the rail and pins through the cabinet upright holes until the latch engages.
3. As shown in [Figure 7](#), loosen the locking nut (1) on the shipping retaining bracket (2) and slide the bracket to the farthest position on the rear of the rail. This moves the bracket out of the way to allow you to install the chassis in the rails.



NOTE:

[Figure 7](#) shows a drive enclosure rail and bracket. If you are installing a longer chassis into your cabinet, such as for a controller enclosure, see [Attach the brackets for a longer chassis](#) for additional information.

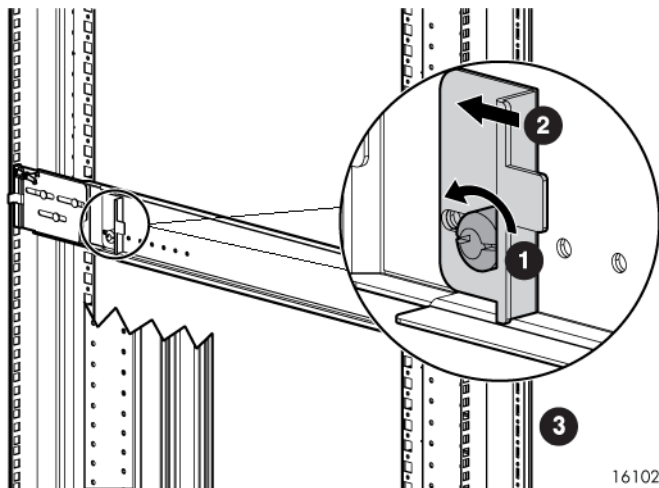


Figure 7 Locking nut and retaining bracket

4. After attaching the rail, grab and move the rail gently to be sure it is firmly engaged in the cabinet and that all latches are engaged in the cabinet holes.
5. Repeat the above steps for the other rail.

Install the enclosures

This section describes how to install disk enclosures, but controller enclosures are installed in the same way.

1. Remove the bezels installed over the thumbscrews on the front of the enclosure (Figure 8).

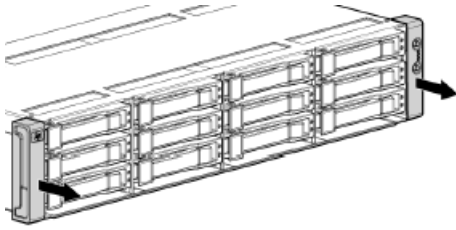


Figure 8 Removing bezels from enclosure

2. Align the enclosure with the rails and slide it into the rack (Figure 9).

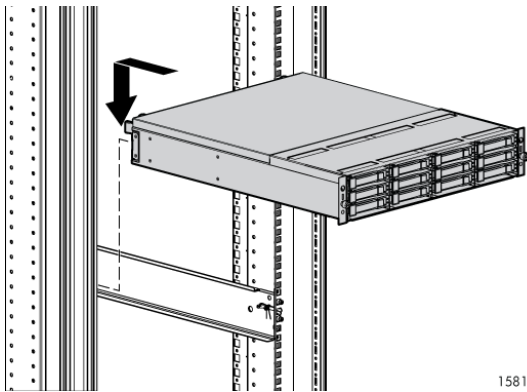


Figure 9 Installing an enclosure — view from front of rack

3. Continue sliding the enclosure into the rack until the front edge is flush with the front of the rack. (1, Figure 10)
4. Secure front of the enclosure to the front of the rack using the provided thumbscrews on the front of the device (2, Figure 10) and replace the front bezels.

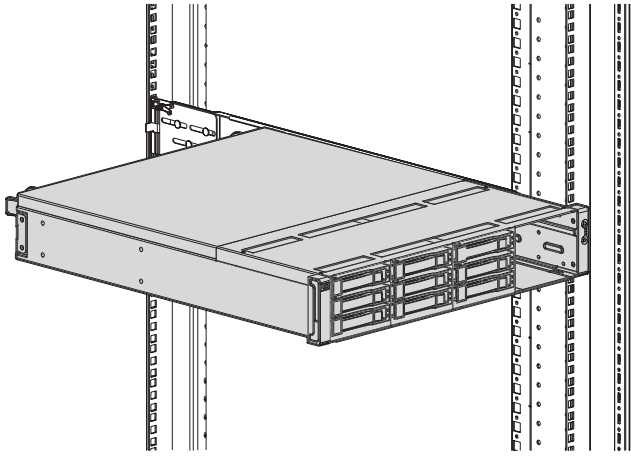


Figure 10 Securing the rear of the enclosure in the rack — view from front of rack

5. Securing the rear of the enclosure in the rack:
 - a. Loosen the thumbscrew on the shipping retaining bracket (1, [Figure 11](#)) and slide the bracket forward (2, [Figure 11](#)) until the tab engages the slot in the chassis. Tighten the thumbscrew on the bracket.

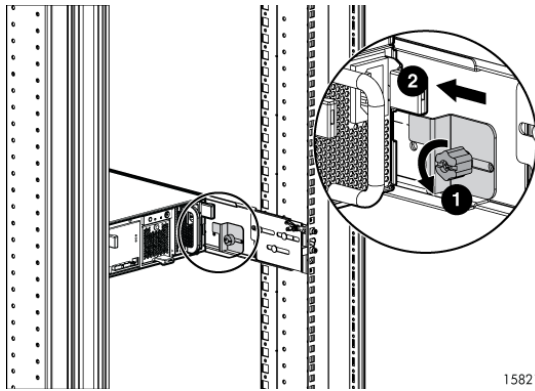


Figure 11 Securing the rear of the enclosure (view from rear of rack)

Drive bay sequence

After the disk enclosures are secured in the rack, install the hard drives into the drive bays. Drives must be installed in the proper bay sequence in the enclosures for optimum HP Command View EVA performance and data integrity.

Example 1: If you have four enclosures, and eight drives, you should install four drives into bay 1 of each enclosure and four drives into bay 2 of each enclosure. Do not install all the drives into enclosure 1 and leave the other enclosures empty.

△ CAUTION:

Install hard drives in the enclosures only after securing the enclosures in the rack:

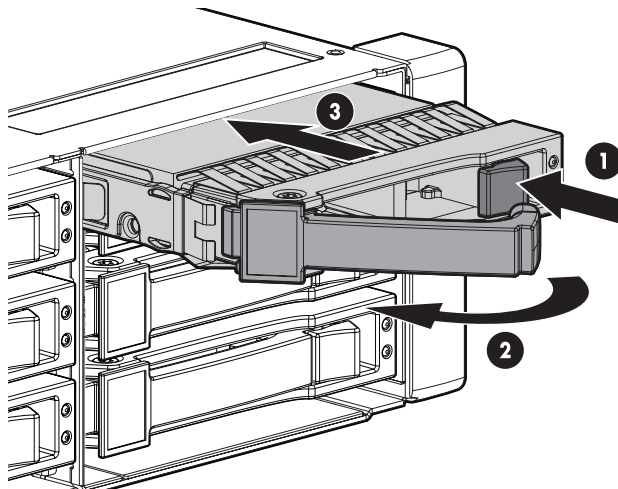
1. An enclosure populated with hard drives is too heavy to lift safely.
 2. Movement of an enclosure during installation might damage the internal storage media of installed hard drives.
-

Installing drives

△ **CAUTION:**

Follow industry-standard practices when handling hard drives. Internal storage media can be damaged when drives are shaken, dropped, or roughly placed on a work surface. When installing a hard drive, make sure it is fully seated in the drive bay. To remove a hard drive, press the release button and pull the drive only slightly out of the enclosure. Then, to allow time for the internal disk to stop rotating, wait approximately 10 seconds before completely removing the drive from the enclosure.

1. As shown in [Figure 12](#), unlatch the drive (1), swing out the handle (2), and slide the drive into the enclosure (3).
2. Latch the handle when the drive is fully seated in the enclosure.



15808

Figure 12 Installing drives into the enclosures

Continue until you have installed all drives into the enclosure ([Figure 13](#)).

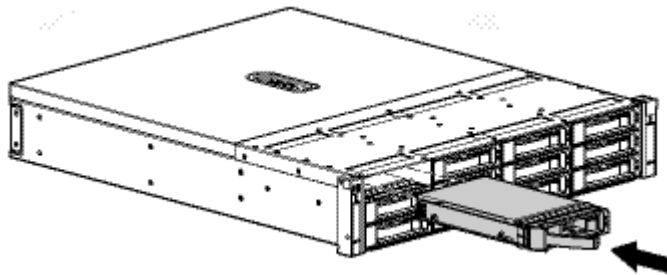


Figure 13 Sliding drives into the enclosure

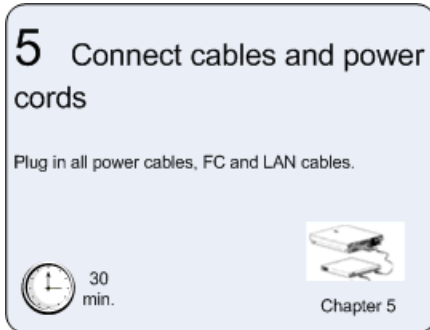
Installing SFPs

The HSV300-S controller uses Small Form Factor Pluggable (SFPs) transceiver modules on the FC ports. Four SFPs are factory installed in the HSV300-S, but you will need to install additional SFPs if you plan to use more than four switch ports. If you purchased extra SFPs, install them now.

 **NOTE:**

The HSV300-S requires 4 Gb or higher SFPs.

5 Connect cables and power cords



Overview

To connect cables and power cords:



NOTE:

If you have ordered the factory integrated product, skip this section and go to [Chapter 6](#).

1. Read the cabling best practices.
2. Attach Fibre Channel and/or LAN cables to controller, drives, and servers.
3. Label all cables using the supplied cable labeling kit.
4. Plug in all power cables.

Cabling best practices

- Use the shortest possible cable between devices. Shorter cables are easier to manage and route along the back of the rack. In addition, shorter cables reduce the possibility of signal degradation that may occur over longer distances.
- Gather the cables in the rear of the EVA to ensure that the cabling in the back of the rack system does not interfere with system operation or maintenance. Bind the cables loosely with cable ties and route the excess cables out of the way, along the side of the rack. When the cables are tied together and routed down the side of the rack, system components and indicators are easily visible and accessible.
- Attach a label near both ends of each cable to identify the device connected to that cable. Include the device, device name, port, or other information that you think will be helpful.
- Use colored markers to color code both ends of each cable, to help you visually identify a particular cable without having to read or locate the label.
- In multipath configurations, you may want to loosely bind the matching pair of cables connecting devices.

Connecting the Fibre Channel cables

To connect the EVA to the SAN, use standard Fibre Channel cables and observe cautions and good routing practices.

△ CAUTION:

Use appropriate precautions when handling Fibre Channel cables:

- Touching the end of a Fibre Channel cable will either damage the cable or cause performance problems, including intermittent difficulties accessing the storage.
 - Whenever a Fibre Channel cable is not connected, replace the protective covers on the ends of the cable.
 - Make certain that the Fibre Channel cables are installed and supported so that no excess weight is placed on the connectors. This prevents damage to the connector and cable. Excess cable should be loosely coiled and tied out of the way, being careful not to coil the cable in a tight loop. The minimum bend radius is 25 mm for 50, 62.5, and 9 micron fiber optic cable.
-

Connecting device port Fibre Channel cables to the EVA (rear view)

See [Figure 22](#) and [Figure 23](#) in Appendix A.

Connecting Fibre Channel cables to the EVA (front end)

See [Figure 24](#) and [Figure 26](#) in Appendix A for front end connections with server-based management. See [Figure 25](#) and [Figure 27](#) in Appendix A for front end connections with array-based management.

Connecting cables to an HSV300-S controller enclosure (front end)

See [Figure 28](#) for server-based management or [Figure 29](#) for array-based management in Appendix A.

Labeling cables using labeling kit

Label each end of each cable using the materials in the supplied labeling kit.

Connecting the power cords

To protect your system from power-failure-related downtime, each EVA ships standard with a redundant power supply. Depending how you connect the power supplies to your power source, you can eliminate downtime caused by power-related failures.

When connecting the power cables, use the power cables shipped with the EVA. After power is supplied to the EVA, the power supply automatically senses the input voltage and the power supply LED illuminates as solid amber.

Table 3 Power cable connections

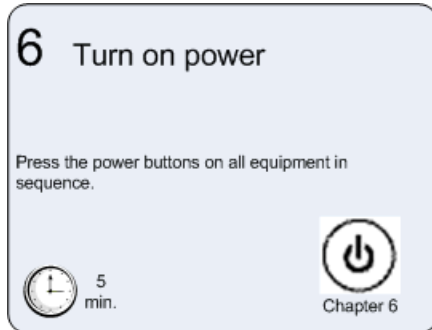
Connection Method	Level of Protection
EVA power supplies connected to: one power source	Protects you from downtime when one of the EVA power supplies fails. The remaining power supply/fan module can operate the EVA until you install a replacement module.
EVA power supplies connected to: two separate power sources	Protects you from downtime when one of the EVA power supplies fails. Protects you from data loss when one of your power sources fails, due to a pulled cable or tripped breaker. The remaining power source can power the EVA until the failed power source is restored or relocated. Depending on the cause and duration of the power outage, you can use this time to properly shut down your storage sub-system.
EVA power supplies connected to: two UPS two separate power sources	Protects you from downtime when one of the EVA power supplies fails. Protects you from data loss when one or both of your power sources fails, due to a pulled cable, tripped breaker, or local power outage. The remaining power source or the UPS will power the EVA until power is restored to the source. Depending on the cause and duration of the power outage, you can use this time to properly shut down your storage sub-system.

⚠ WARNING!

To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- To remove power to the equipment, unplug the power cord from the power supply.
- Route the power cord so that it is not likely to be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord is attached to the EVA.

6 Turn on power



Overview

This chapter describes how to power up the devices in your environment.

Power on the devices

After the EVA and its disk enclosures are installed and connected to the SAN, power up all of the devices in the SAN and verify that they are operating properly.

1. Apply power to the power distribution unit (PDU) in the rack:
 - If the controller enclosure was shipped with the power button in the “on” position, the controller enclosure and connected disk enclosures will automatically power on. Otherwise, press the power/standby button on the front panel of the controller enclosure.
 - When the controller enclosure is powered on, the LED for the power/standby buttons changes from amber to solid green.
 - Wait for a solid green LED on each disk enclosure to ensure each enclosure has successfully powered on.
2. Apply power to each external Fibre Channel switch.
3. Wait (up to five minutes) for the EVA to complete its startup routine and for the Fibre Channel switches to boot.
4. Apply power to the servers in the SAN with access to the EVA, start the operating system, and log on as administrator.

△ CAUTION:

When you power on the server, the monitor may display a “New Hardware Found” message and prompt to install an HBA driver. Cancel out of this window to prevent the installation of an unsupported HBA driver.

5. Verify that each component in the SAN is operating properly.

Verify the operating status of the EVA

To verify the operating status of the EVA, view the LEDs on the EVA.

View the LEDs on the EVA

Each module of the EVA is equipped with an LED display (Figure 14). The green LED on the panel should be lit when the unit is operating properly. Check the LEDs located on the enclosure first before checking the LEDs on individual replaceable units in the EVA.

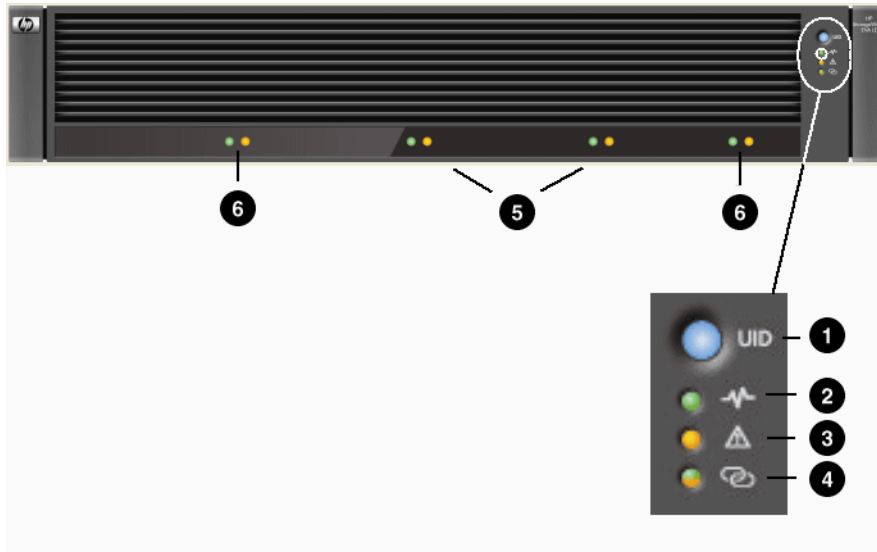


Figure 14 EVA4400 front panel LEDs

Table 4 EVA4400 status lights during startup

Number	LED Function	Startup Condition
1	UID (Unit ID)	Blinking blue
2	Enclosure external health	Blinking green
3	Enclosure fault warning	Blinking amber
4	Link to host	Solid amber
5 (2 LEDs)	Fan condition	Solid amber
6 (2 LEDs)	Battery condition	Solid amber

Table 5 EVA4400 status lights during operation

Number	LED Function	Startup Condition	Fault Condition
1	UID (Unit ID)	Off — blinking if turned on remotely	N/A
2	Enclosure external health	Green	

Number	LED Function	Startup Condition	Fault Condition
3	Enclosure fault warning	Green	Blinking amber
4	Link to host	Green	Amber — indicates link lost
5 (2 LEDs)	Fan condition	Green	Blinking green — indicates charging or defective FRU
6 (2 LEDs)	Battery condition	Green	Blinking amber — indicates defective FRU

If the LED patterns described in [Table 4](#) and [Table 5](#) are not illuminated:

- Check your cable connections between the device and the EVA.
- Check the availability of your power source.
- Review the installation procedures.
- Remove and reinsert the module.

Verify the operating status of the disk enclosures

To verify that the disk enclosures and hard drives are operating properly, view the enclosure and hard drive LEDs and compare them with the patterns described in the documentation for these devices. If the LEDs indicate a fault, see the *HP StorageWorks 4400 Enterprise Virtual Array user guide*.

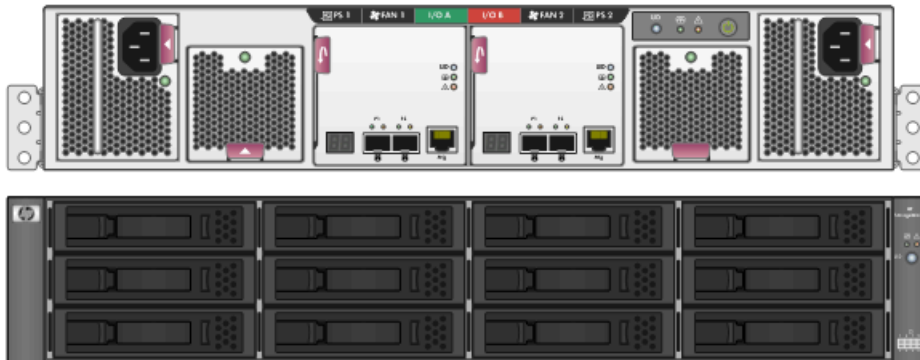


Figure 15 Rear and front view of the disk enclosure

Verify the operating status of the Fibre Channel switches and adapters

Verifying Fibre Channel switches

To verify that your switches are operating properly, view the switch LEDs and compare them with the patterns described in the documentation for these devices.

If the LEDs indicate a fault, see the documentation that came with the switch for help.

Optional Step: If you will be using Fibre Channel to attach the EVA to your existing servers, you must install Fibre Channel adapters in those servers and test the Fibre Channel adapters - prior to installing HP Command View EVA.

Ensure you have the correct quantity and length of Fibre Channel cables available to attach your servers to the EVA.

Installing Fibre Channel drivers

If you are using Windows, the HP SmartStart EVA Storage software automatically loads the required Fibre Channel drivers. This occurs during this installation process when you run HP SmartStart EVA Storage.

For other operating systems, load the drivers as directed in [Chapter 10](#).

Configuring the embedded switch

The embedded switch in an HSV300-S controller has a default IP addresses that may not be visible in your network. Any configuration changes must be made to both embedded switches in an HSV300-S controller enclosure. This process involves connecting a cable from the Ethernet port of each switch to a laptop computer and supplying switch addresses that are valid for your network.

NOTE:

For complete switch configuration and management instructions, see the *HP StorageWorks Fabric OS 6.1.x administrator guide* at: <http://www.hp.com/support/manuals>. Under Storage, click **Disk Storage Systems** and then click **HP StorageWorks 4400 Enterprise Virtual Array** under EVA Disk Arrays.

To configure an embedded switch in an HSV300-S controller:

1. Obtain a laptop and an Ethernet cable (straight-through or crossover type), and change the IP address of the laptop to have an address in the same IP range as the embedded switch (for example **10.77.77.79**, with a subnet mask of: **255.255.255.0**).

NOTE:

The embedded switch has an MDI-X port that supports straight-through or crossover Ethernet cables. Use a Cat 5e or greater cable.

If needed, you can directly connect to the switch using the console port (2, [Figure 16](#)) and the provided console cable (manufacturing part number 259992-001). You may need a USB adapter for this cable if your laptop does not have a serial port.

2. Connect the Ethernet port (2, [Figure 16](#)) of the embedded switch to the laptop.

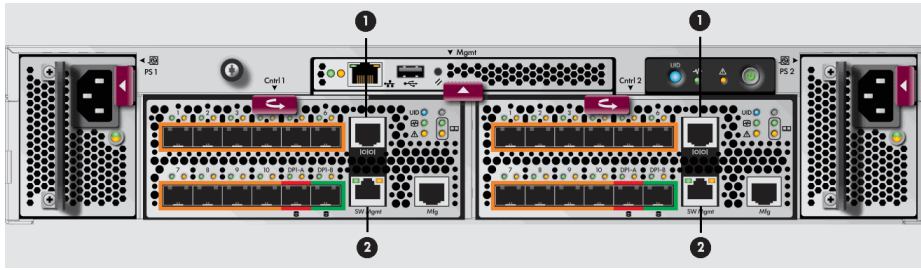


Figure 16 HSV300-S rear view

1. Console port
 2. Ethernet port
3. Browse to **http://10.77.77.77** for the Controller 1 switch.



NOTE:

Fibre Channel switches are referred to as *left slot switch* and *right slot switch* in Brocade Web Tools.

The switch management GUI (Brocade Web Tools) appears (Figure 17).

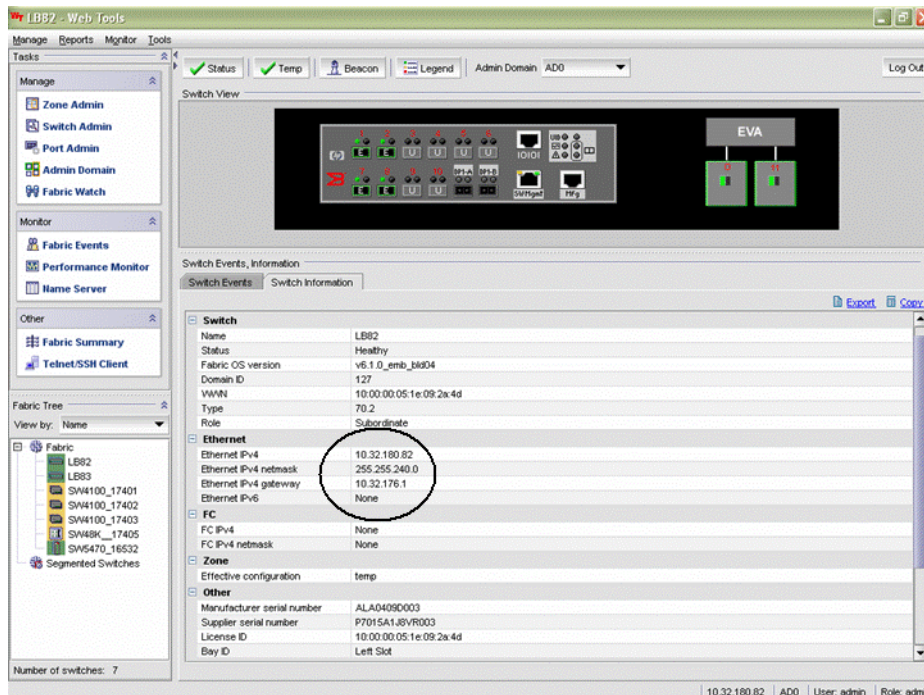


Figure 17 Switch Management GUI

4. Change the IP address and other settings of the switch as appropriate for your network. You may also rename the switch or perform other configuration activities at this time.
5. Remove the Ethernet cable from the first switch and connect the cable to the Ethernet port (2, Figure 16) of the other embedded switch. Browse to **http://10.77.77.78** for the Controller 2 switch and repeat step 4.

 **NOTE:**

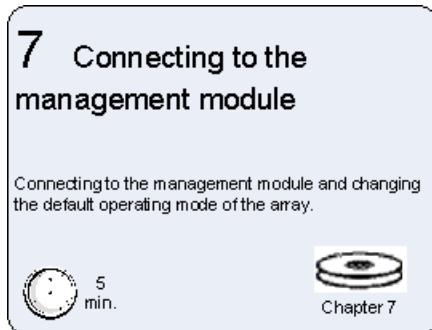
Two switches cannot have the same domain ID in the same fabric.

Verify the operating status of the servers

Although the EVA is not yet visible to the server, verify that the server is operating properly. A simple test is to verify that your operating system loaded and then open a software application or your browser.

If your server is not operating properly, see the documentation that came with the server for help.

7 Connecting to the management module



Complete the procedures in this chapter if any of the following situations apply. Otherwise skip this chapter.

- **WOCP Access:** You want to use the web-based operator control panel (WOCP). You can use the WOCP to view array state and status information and edit basic configuration settings. See the WOCP user guide for more information.
- **Array operating mode change (via WOCP):** You have a direct connect configuration. If you have a direct connect configuration, you must change the default operating mode, as described in this chapter.
- **Array-based management (via HP Command View EVA):** You are using a management server to run HP Command View EVA. With the release of HP Command View EVA 8.1, you have the option to run HP Command View EVA from the management module (array-based management), which eliminates the requirement for a management server.

The management module has an MDI-X port that supports straight-through or crossover Ethernet cables. Use a Cat 5e or greater cable to connect the management module from its Ethernet jack (1, [Figure 18](#)) to the management server.

Connecting to the management module

You can connect to the management module through a public or a private network.

If you use a laptop to connect to the management module, configure the laptop to have an address in the same IP range as the management module (for example **192.168.0.2**, with a subnet mask of: **255.255.0.0**).

Connecting through a public network

1. Initialize the EVA4400 storage system, using HP SmartStart EVA Storage or HP Command View EVA.
2. If currently connected, disconnect the public network LAN cable from the back of the management module in the controller enclosure.
3. Press and hold the recessed Reset button (2, [Figure 18](#)) for 4–5 seconds. This sets an IP address of 192.168.0.1. The amber indicator on the top right corner of the Ethernet jack (1, [Figure 18](#)) will flash momentarily when the reset operation is completed.

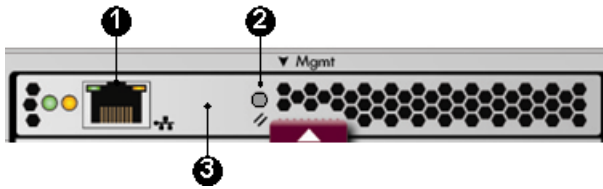


Figure 18 management module

4. Temporarily connect a LAN cable from a private network to the management module. A laptop computer works well for this.
5. From a computer on the private network, browse to **https://192.168.0.1:2373** and log in as an administrator. The user name is `admin`. No password is required. The WOCP GUI appears.

IMPORTANT:

Previously the WOCP used port 2372 but now uses 2373.

6. Select **Administrator Options > Configure Network Options**.
7. Enter an IP address and other network settings that apply.

NOTE:

If you configure the management module in the 10.0.0.x network, do not use 10.0.0.1, 10.0.0.2, or 10.0.0.3 as the IP address for the management module or any device connected to the management module. These addresses are used by the management module.

8. Click **Save Changes**. The IP address changes immediately, causing you to lose connectivity to the WOCP. You cannot save changes if the EVA4400 storage system has not been initialized.
9. Remove the LAN cable to the private network and reconnect the cable to the public network. The new IP address is stored and remains in effect, even when the storage system is shut down or restarted. However, the IP address will be lost if the storage system is uninitialized and the WOCP reset.
10. From a computer on the public network, browse to **https://newly configured ip address:2373** and log in as an administrator. The user name is `admin`. No password is required. The WOCP GUI appears.

NOTE:

If the password for either the administrator or user account is changed, it should be recorded since it cannot be cleared without performing a complete reset of the WOCP.

Connecting through a private network

Use this procedure when the management module will not be connected through a public network or the array has not yet been initialized.

1. Press and hold the recessed Reset button for 4–5 seconds (2 [Figure 18](#)). This sets an IP address of 192.168.0.1. The amber indicator on the top right corner of the Ethernet jack (1, [Figure 18](#)) will flash momentarily when the reset operation is completed.

2. Browse to **https://192.168.0.1:2373** and log in as an administrator. The user name is `admin`. No password is required. The WOCP GUI appears.
3. If network setting changes are required, select **Administrator Options > Configure Network Options**.
4. Enter an IP address and other network settings that apply.

 **NOTE:**

If you configure the management module in the 10.0.0.x network, do not use 10.0.0.1, 10.0.0.2, or 10.0.0.3 as the IP address for the management module or any device connected to the management module. These addresses are used by the management module.

5. Click **Save Changes**. The IP address changes immediately, causing you to lose connectivity to the WOCP. You cannot save changes if the EVA4400 storage system has not been initialized. The new IP address is stored and remains in effect, even when the storage system is shut down or restarted. However, the IP address will be lost if the storage system is uninitialized and the WOCP reset.
6. From a computer on the private network, browse to **https://newly configured ip address:2373** and log in as an administrator. The user name is `admin`. No password is required. The WOCP GUI appears.

Accessing HP Command View EVA on the management module

To access HP Command View EVA on the management module complete the following:

1. Click **Launch Command View EVA**.
2. Click **Use management module server**. The logon window appears.
3. Enter the security credentials for accessing HP Command View EVA.

Changing the default operating mode

By default, the EVA4400 is shipped to operate in a Fibre Channel switch environment and is configured in *fabric* mode. If you choose to connect the EVA4400 directly to a server, you must change the default operating mode of the EVA4400 to *direct* mode. If you do not change this mode, the EVA4400 will be unable to communicate with your server. Use the web-based operator control panel (WOCP) to change the default operating mode.

 **NOTE:**

You must have administrator privilege to change the settings in the WOCP. Change your browser settings for the WOCP window as described in the *HP StorageWorks Command View EVA installation guide*.

To change the default operating mode:

1. Connect to the management module using one of the methods described in [Connecting through a public network](#) or [Connecting through a private network](#).
2. Log into the WOCP as an administrator. The default username is `admin` and the password field is blank. For security reasons, change the password after you log in.
3. Select **Administrator Options** → **Configure controller host ports**.

The WOCP displays (Figure 19).

StorageWorks Enterprise Virtual Array

System Status
System: ✔ Good
Controller 1: ✔ Good
Controller 2: ✔ Good

Management Options

User Options
View system information
Configure User login options
View network information
Launch Command View EVA

Administrator Options
View detailed system information
Configure Administrator login options
Configure network options
Power down or restart system
Update management module firmware
Uninitialize system
Configure controller host ports
Configure controller device ports

Service Options
View message logs
View last controller fault

Controller 1 Host Port Properties

Controller 1 | Controller 2

Fibre Channel Switch
Operational state: Not installed

Port FP1
Operational state: ✔ Good
Connection state: ✔ Logged into fabric
World Wide Name: 5000-1FE1-5007-5558
Address: 10-1C-00
Speed: 1 Gb/s
Topology: Fabric

Port FP2
Operational state: ✔ Good
Connection state: ✔ Logged into fabric
World Wide Name: 5000-1FE1-5007-5559
Address: 10-19-00
Speed: 2 Gb/s
Topology: Direct

Figure 19 WOCP Configure controller host ports page

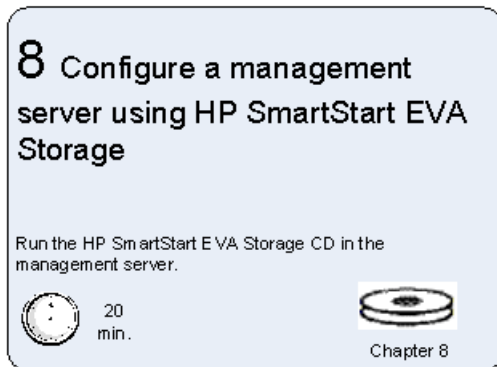
4. In the **Topology** box, select **Direct** from the dropdown menu.
5. Click **Save Changes**.
6. Change the default operating mode for the other controller.
7. Close the WOCP and remove the Ethernet cable from the server.

Accessing the WOCP through HP Command View EVA

1. Select the EVA4400 storage system to access.
2. Select **Hardware > Controller Enclosure > Management Module**.
3. Click **Launch WOCP**.

Rarely, the Launch WOCP button may not appear due to invalid array state or if the management module IP address is unknown to HP Command View EVA.

8 Configuring management servers using HP SmartStart EVA Storage



NOTE:

This chapter only applies if you are connecting the EVA4400 to a management server for server-based management. If you plan to install HP Command View EVA on the controller enclosure management module (for array-based management), skip this chapter and go to Chapter 9. To complete array configuration for array-based management, see “Completing the array configuration” in the *HP StorageWorks Command View EVA user guide*.

Overview

1. Insert the HP SmartStart EVA Storage CD in the drive of the management server. The HP SmartStart EVA Storage tool runs automatically.
2. Read the conceptual information and browse online help.
3. Click **Configure as Management Server** on the display.
4. Follow the prompts to configure this system as your management server.

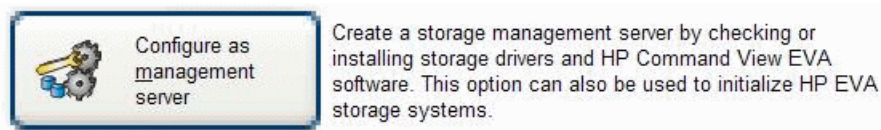




Figure 20 Configure as management server choice

9 Configuring application servers for Windows using HP SmartStart EVA Storage

9 Configure application servers for Windows using HP SmartStart EVA Storage

Insert the HP SmartStart EVA Storage CD in the drive of your first application server.

 15 min.  Chapter 9

Overview

1. Insert the HP SmartStart EVA Storage CD in the drive of an application server. This may be the same server as your management server.
The HP SmartStart EVA Storage tool runs automatically.
2. Click and choose to configure either for the first time or to use additional storage.
3. Repeat this configuration process for each server in your HP Command View EVA configuration.



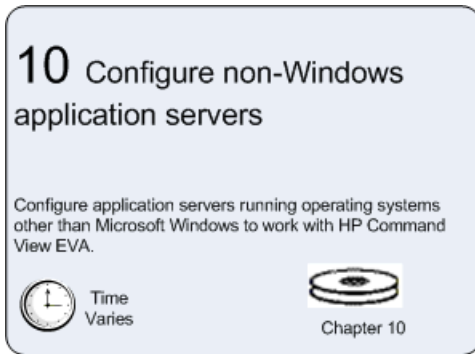
	Configure as application server & create storage.	Create a registered application server by checking or installing storage access software, then create and mount the server's first storage volumes.
	Add storage to an application server.	Create additional storage volumes and mount them on a registered application server.

Figure 21 Configure storage initially or add storage later

10 Configuring non-Windows application servers



Overview

After installing and configuring the EVA4400, you can connect hosts to the array. This chapter provides OS-specific connectivity information for the following supported operating systems:

- [HP-UX](#), page 54
- [IBM AIX](#), page 56
- [Linux](#), page 57
- [Novell NetWare](#), page 61
- [OpenVMS](#), page 62
- [Sun Solaris](#), page 66
- [VMware](#), page 74

Clustering

Clustering is connecting two or more computers together so that they behave like a single computer. Clustering is used for parallel processing, load balancing, and fault tolerance.

See the *HP StorageWorks Enterprise Virtual Array compatibility reference* for the clustering software supported on each operating system. Clustering is not supported on Linux, Novell NetWare, or VMware.

NOTE:

For OpenVMS, you must make the Console LUN ID and OS unit IDs unique throughout the entire SAN, not just the controller subsystem.

Multipathing

Multipathing software provides a multiple-path environment for your operating system. See the following website for more information:

<http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html>

See the *HP StorageWorks Enterprise Virtual Array compatibility reference* for the multipathing software supported on each operating system.

Installing Fibre Channel adapters

For all operating systems, supported Fibre Channel adapters (FCAs) must be installed in the host server in order to communicate with the EVA.

NOTE:

Traditionally, the adapter that connects the host server to the fabric is called a host bus adapter (HBA). The server HBA used with the EVA4400 is called a Fibre Channel adapter (FCA). You might also see the adapter called a Fibre Channel host bus adapter (Fibre Channel HBA) in other related documents.

Follow the hardware installation rules and conventions for your server type. The FCA is shipped with its own documentation for installation. See that documentation for complete instructions. You need the following items to begin:

- FCA boards and the manufacturer's installation instructions
- Server hardware manual for instructions on installing adapters
- Tools to service your server

The FCA board plugs into a compatible I/O slot (PCI, PCI-X, PCI-E) in the host system. For instructions on plugging in boards, see the hardware manual.

You can download the latest FCA firmware from the following website: <http://www.hp.com/support/downloads>. Enter HBA in the **Search Products** box and then select your product. See the *HP StorageWorks Enterprise Virtual Array compatibility reference* for supported FCAs by operating system.

Testing connections to the EVA

After installing the FCAs, you can create and test connections between the host server and the EVA. For all operating systems, you must:

- Add hosts
- Create and present virtual disks
- Verify virtual disks from the hosts

The following sections provide information that applies to all operating systems. For OS-specific details, see the applicable operating system section.

Adding hosts

To add hosts using HP Command View EVA:

1. Retrieve the world-wide names (WWN) for each FCA on your host.
You need this information to select the host FCAs in HP Command View EVA.
2. Use HP Command View EVA to add the host and each FCA installed in the host system.

 **NOTE:**

To add hosts using HP Command View EVA, you must add each FCA installed in the host. Use **Add Host** to add the first adapter. To add subsequent adapters, use **Add Port**. Ensure that you add a port for each active FCA.

3. Select the applicable operating system for the host mode.

Table 6 Operating system and host mode selection

Operating System	Host mode selection
HP-UX	HP-UX
IBM AIX	IBM AIX
Linux	Linux
Mac OS X	Linux
NetWare	Unknown
OpenVMS	OVMS
Sun Solaris	Sun Solaris
VMware	VMware

4. Check the Host folder in the Navigation pane of HP Command View EVA to verify the host FCAs are added.

 **NOTE:**

More information about HP Command View EVA is available at the following website: <http://www.hp.com/support/manuals>. Click **Storage Software** under Storage, and then select **HP StorageWorks Command View EVA software** under Storage Device Management Software.

Creating and presenting virtual disks

To create and present virtual disks to the host server:

1. From HP Command View EVA, create a virtual disk on the EVA4400.
2. Specify values for the following parameters:
 - Virtual disk name
 - Vraid level
 - Size
3. Present the virtual disk to the host you added.

4. If applicable (AIX, NetWare, OpenVMS) select a LUN number if you chose a specific LUN on the Virtual Disk Properties window.

Verifying virtual disk access from the host

To verify that the host can access the newly presented virtual disks, restart the host or scan the bus.

If you are unable to access the virtual disk:

- Verify all cabling to the switch, EVA, and host.
- Verify all firmware levels. For more information, see the Enterprise Virtual Array QuickSpecs and associated release notes.
- Ensure that you are running a supported version of the host operating system. For more information, see the *HP StorageWorks Enterprise Virtual Array compatibility reference*.
- Ensure that the correct host is selected as the operating system for the virtual disk in HP Command View EVA.
- Ensure that the host WWN number is set correctly (to the host you selected)
- Verify the FCA switch settings
- Verify that the virtual disk is presented to the host
- Verify zoning

Configuring virtual disks from the host

After you create the virtual disks on the EVA4400 and rescan or restart the host, follow the host-specific conventions for configuring these new disk resources. For instructions, see the documentation included with your server.

HP-UX

Scanning the bus

To scan the FCA bus and display information about the EVA4400 devices:

1. Enter `# ioscan -fnCdisk` to start the rescan.
All new virtual disks become visible to the host.
2. Assign device special files to the new virtual disks with `insf`.
`# insf -e`



NOTE:

Uppercase “E” reassigns device special files to all devices. Lowercase “e” assigns device special files only to the new devices—in this case, the virtual disks.

The following is a sample output from an `ioscan` command:

```
# ioscan -fnCdisk

# ioscan -fnCdisk
Class      I  H/W Patch          Driver      S/W      H/W Type      Description
```

State						
=====						
ba	3	0/6	lba	CLAIMED	BUS_NEXUS	Local PCI Bus Adapter (782)
fc	2	0/6/0/0	td	CLAIMED	INTERFACE	HP Tachyon XL@ 2 FC Mass Stor Adap /dev/td2
fc	0	0/6/0/0.39	fc	CLAIMED	INTERFACE	FCP Domain
ext_bus	4	0/6/00.39.13.0.0	fcpararray	CLAIMED	INTERFACE	FCP Array Interface
target	5	0/6/0/0.39.13.0.0.0	tgt	CLAIMED	DEVICE	
ctl	4	0/6/0/0.39.13.0.0.0.0	sctl	CLAIMED	DEVICE	HP HSV300 /dev/rscsi/c4t0d0
disk	22	0/6/0/0.39.13.0.0.0.1	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c4t0d1 /dev/rdisk/c4t0d
ext_bus	5	0/6/0/0.39.13.255.0	fcpdev	CLAIMED	INTERFACE	FCP Device Interface
target	8	0/6/0/0.39.13.255.0.0	tgt	CLAIMED	DEVICE	
ctl	20	0/6/0/0.39.13.255.0.0.0	sctl	CLAIMED	DEVICE	HP HSV300 /dev/rscsi/c5t0d0
ext_bus	10	0/6/0/0.39.28.0.0	fcpararray	CLAIMED	INTERFACE	FCP Array Interface
target	9	0/6/0/0.39.28.0.0.0	tgt	CLAIMED	DEVICE	
ctl	40	0/6/0/0.39.28.0.0.0.0	sctl	CLAIMED	DEVICE	HP HSV300 /dev/rscsi/c10t0d0
disk	46	0/6/0/0.39.28.0.0.0.2	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d2 /dev/rdisk/c10t0d2
disk	47	0/6/0/0.39.28.0.0.0.3	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d3 /dev/rdisk/c10t0d3
disk	48	0/6/0/0.39.28.0.0.0.4	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d4 /dev/rdisk/c10t0d4
disk	49	0/6/0/0.39.28.0.0.0.5	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d5 /dev/rdisk/c10t0d5
disk	50	0/6/0/0.39.28.0.0.0.6	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d /dev/rdisk/c10t0d6
disk	51	0/6/0/0.39.28.0.0.0.7	sdisk	CLAIMED	DEVICE	HP HSV300 /dev/dsk/c10t0d7 /dev/rdisk/c10t0d7

Creating volume groups on a virtual disk using vgcreate

You can create a volume group on a virtual disk by issuing a `vgcreate` command. This builds the virtual group block data, allowing HP-UX to access the virtual disk. See the `pvcreate`, `vgcreate`, and `lvcreate` man pages for more information about creating disks and file systems. Use the following procedure to create a volume group on a virtual disk:

NOTE:

Italicized text is for example only.

1. To create the physical volume on a virtual disk, enter a command similar to the following:


```
# pvcreate -f /dev/rdisk/ c32t0d1
```
2. To create the volume group directory for a virtual disk, enter a command similar to the following:


```
# mkdir /dev/ vg01
```
3. To create the volume group node for a virtual disk, enter a command similar to the following:


```
# mknod /dev/vg01/group c 64 0x010000
```

The designation *64* is the major number that equates to the 64-bit mode. The *0x01* is the minor number in hex, which must be unique for each volume group.
4. To create the volume group for a virtual disk, enter a command similar to the following:


```
# vgcreate -f /dev/ vg01 /dev/dsk/ c32t0d1
```

5. To create the logical volume for a virtual disk, enter a command similar to the following:

```
# lvcreate -L1000 /dev/ vg01/lvol1
```

In this example, a 1-Gb logical volume (lvol1) is created.

6. Create a file system for the new logical volume by creating a file system directory name and inserting a mount tap entry into `/etc/fstab`.
7. Run `mkfs` on the new logical volume. The new file system is ready to mount.

IBM AIX

Accessing IBM AIX utilities

You can access IBM AIX utilities such as the Object Data Manager (ODM), on the following website:

<http://www.hp.com/support/downloads>

In the Search products box, enter **MPIO**, and then click **AIX MPIO PCMA for HP Arrays**. Select **IBM AIX**, and then select your software storage product.

Adding hosts

To determine the active FCAs on the IBM AIX host, enter:

```
# lsdev -Cc adapter |grep fcs
```

Output similar to the following appears:

```
fcs0      Available 1H-08      FC Adapter
fcs1      Available 1V-08      FC Adapter
# lscfg -vl
fcs0 fcs0                U0.1-P1-I5/Q1  FC Adapter
  Part Number.....80P4543
  EC Level.....A
  Serial Number.....1F4280A419
  Manufacturer.....001F
  Feature Code/Marketing ID...280B
  FRU Number.....      80P4544
  Device Specific.(ZM).....3
  Network Address.....10000000C940F529
  ROS Level and ID.....02881914
  Device Specific.(Z0).....1001206D
  Device Specific.(Z1).....00000000
  Device Specific.(Z2).....00000000
  Device Specific.(Z3).....03000909
  Device Specific.(Z4).....FF801315
  Device Specific.(Z5).....02881914
  Device Specific.(Z6).....06831914
  Device Specific.(Z7).....07831914
  Device Specific.(Z8).....20000000C940F529
  Device Specific.(Z9).....TS1.90A4
  Device Specific.(ZA).....T1D1.90A4
  Device Specific.(ZB).....T2D1.90A4
  Device Specific.(YL).....U0.1-P1-I5/Q1b.
```


Creating and presenting virtual disks

When creating and presenting virtual disks to an IBM AIX host, be sure to:

- Set the OS unit ID to **0**.
- Set Preferred path/mode to **No Preference**.

Select a LUN number if you chose a specific LUN on the Virtual Disk Properties window.

Verifying virtual disks from the host

To scan the IBM AIX bus, enter: `cfgmgr -v`

The `-v` switch (verbose output) requests a full output.

To list all EVA devices, enter:

Output similar to the following is displayed:

```
hdisk1 Available 1V-08-01      HP HSV300 Enterprise Virtual Array
hdisk2 Available 1V-08-01      HP HSV300 Enterprise Virtual Array
hdisk3 Available 1V-08-01      HP HSV300 Enterprise Virtual Array
```

Linux

Driver failover mode

If you use the `INSTALL` command without command options, the driver's failover mode depends on whether a QLogic driver is already loaded in memory (listed in the output of the `lsmod` command). Possible driver failover mode scenarios include:

- If an `hp_qla2x00src` driver RPM is already installed, then the new driver RPM uses the failover of the previous driver package.
- If there is no QLogic driver module (`qla2xxx` module) loaded, the driver defaults to failover mode. This is also true if an inbox driver is loaded that does not list output in the `/proc/scsi/qla2xxx` directory.
- If there is a driver loaded in memory that lists the driver version in `/proc/scsi/qla2xxx` but no driver RPM has been installed, then the driver RPM loads the driver in the failover mode that the driver in memory currently uses.

Installing a Qlogic driver



NOTE:

The HP Emulex driver kit performs in a similar manner; use `./INSTALL -h` to list all supported arguments.

1. Download the appropriate driver kit for your distribution. The driver kit file is in the format `hp_qla2x00-yyyy-mm-dd.tar.gz`.
2. Copy the driver kit to the target system.
3. Uncompress and untar the driver kit using the following command: `# tar zxvf hp_qla2x00-yyyy-mm-dd.tar.gz`

4. Change directory to the `hp_qla2x00-yyyy-mm-dd` directory.

5. Execute the `INSTALL` command.

The `INSTALL` command syntax varies depending on your configuration. If a previous driver kit is installed, you can invoke the `INSTALL` command without any arguments:

To use the currently loaded configuration:

```
# ./INSTALL
```

To force the installation to failover mode, use the `-f` flag:

```
# ./INSTALL -f
```

To force the installation to single-path mode, use the `-s` flag:

```
# ./INSTALL -s
```

To list all supported arguments, use the `-h` flag:

```
# ./INSTALL -h
```

The `INSTALL` script installs the appropriate driver RPM for your configuration, as well as the appropriate `fibreutils` RPM. Once the `INSTALL` script is finished, you will either have to reload the QLogic driver modules (`qla2xxx`, `qla2300`, `qla2400`, `qla2xxx_conf`) or reboot your server.

The commands to reload the driver are:

```
# /opt/hp/src/hp_qla2x00src/unload.sh
```

```
# modprobe qla2xxx_conf
```

```
# modprobe qla2xxx
```

```
# modprobe qla2300
```

```
# modprobe qla2400
```

The command to reboot the server is:

```
# reboot
```

△ **CAUTION:**

If the boot device is attached to the SAN, you must reboot the host.

To verify which RPM versions are installed, use the `rpm` command with the `-q` option. For example:

```
# rpm -q hp_qla2x00src
```

```
# rpm -q fibreutils
```

Upgrading Linux components

If you have any installed components from a previous solution kit or driver kit such as the `qla2x00` RPM, invoke the `INSTALL` script with no arguments, as shown in the following example:

```
# ./INSTALL
```

To manually upgrade the components, select one of the following kernel distributions:

- For 2.4 kernel based distributions, use version 7.xx.
- For 2.6 kernel based distributions, use version 8.xx.

Depending on the kernel version you are running, upgrade the driver RPM manually as follows:

- For the `hp_qla2x00src` RPM:

```
# rpm -Uvh hp_qla2x00src- version-revision .linux.rpm
```

- For `fibertools` RPM, you have two options:

- To upgrade the driver:
rpm -Uvh fibreutils- *version-revision* .linux. *architecture* .rpm
- To remove the existing driver, and install a new driver:
rpm -e fibreutils
rpm -ivh fibreutils- *version-revision* .linux. *architecture* .rpm

Upgrading qla2x00 RPMs

If you have a qla2x00 RPM from HP installed on your system, use the INSTALL script to upgrade from qla2x00 RPMs. The INSTALL script removes the old qla2x00 RPM and installs the new hp_qla2x00src while keeping the driver settings from the previous installation. The script takes no arguments. Use the following command to run the INSTALL script:

```
# ./INSTALL
```

NOTE:

If you are going to use the failover functionality of the QLA driver, uninstall Secure Path and reboot before you attempt to upgrade the driver. Failing to do so can cause a kernel panic.

Third-party storage detection

The preinstallation portion of the RPM contains code to check for non-HP storage. The reason for doing this is so that the RPM does not overwrite any settings that another vendor may be using. You can skip the detection by setting the environmental variable HPQLA2X00FORCE to *y* by issuing the following commands:

```
# HPQLA2X00FORCE=y
# export HPQLA2X00FORCE
```

You can also use the `-F` option of the INSTALL script by entering the following command:

```
# ./INSTALL -F
```

Compiling the driver for multiple kernels

If your system has multiple kernels installed on it, you can compile the driver for all the installed kernels by setting the INSTALLALLKERNELS environmental variable to *y* and exporting it by issuing the following commands:

```
# INSTALLALLKERNELS=y
# export INSTALLALLKERNELS
```

You can also use the `-a` option of the INSTALL script as follows:

```
# ./INSTALL -a
```

Uninstalling the Linux components

To uninstall the components, use the INSTALL script with the `-u` option as shown in the following example:

```
# ./INSTALL -u
```

To manually uninstall all components, or to uninstall just one of the components, use one or all of the following commands:

```
# rpm -e fibreutils
# rpm -e hp_q1a2x00
# rpm -e hp_q1a2x00src
```

Using the source RPM

In some cases, you may have to build a binary `hp_q1a2x00` RPM from the source RPM and use that manual binary build in place of the scripted `hp_q1a2x00src` RPM. You need to do this if your production servers do not have the kernel sources and `gcc` installed.

If you need to build a binary RPM to install, you will need a development machine with the same kernel as your targeted production servers. You can install the binary RPM-produced RPM methods on your production servers.

NOTE:

The binary RPM that you build works only for the kernel and configuration that you build on (and possibly some errata kernels). Ensure that you use the 7.xx version of the `hp_q1a2x00` source RPM for 2.4 kernel-based distributions and the 8.xx version of the `hp_q1a2x00` source RPM for 2.6 kernel-based distributions.

Use the following procedure to create the binary RPM from the source RPM:

1. Select one of the following options:
 - Enter the `# ./INSTALL -S` command.

NOTE:

If you execute the `# ./INSTALL -S` command, you do not have to complete step 2 through step 4.

- Install the source RPM by issuing the `# rpm -ivh hp_q1a2x00-version-revision.src.rpm` command
2. Select one of the following directories:
 - For Red Hat distributions, use the `/usr/src/redhat/SPECS` directory.
 - For SUSE distributions, use the `/usr/src/packages/SPECS` directory.
 3. Build the RPM by using the `# rpmbuild -bb hp_q1a2x00.spec` command.

NOTE:

In some of the older Linux distributions, the RPM command contains the RPM build functionality.

At the end of the command output, the following message appears:

```
"Wrote: ...rpm".
```

This line identifies the location of the binary RPM.

4. Copy the binary RPM to the production servers and install it using the following command:

```
# rpm -ivh hp_qla2x00- version-revision.architecture .rpm
```

Verifying virtual disks from the host

To ensure that the LUN is recognized after a virtual disk is presented to the host, do one of two things:

- Reboot the host
- Enter the `/opt/hp/hp_fibreutils/hp_rescan -a` command

To verify that the host can access the virtual disks, enter the `# more /proc/scsi/scsi` command.

The output lists all SCSI devices detected by the server. An EVA4400 LUN entry looks similar to the following:

```
Host: scsi3 Channel: 00 ID: 00 Lun: 01
Vendor: HP      Model: HSV300      Rev:
Type: Direct-Access          ANSI SCSI revision: 02
```

Novell NetWare

Driver files and parameters

The software kit that is included with the FCA contains the latest version of the FCA software files as of the time of shipment. Software files are updated periodically and can be downloaded from the following website: <http://h20000.www2.hp.com/bizsupport/>.

You can load the `QL2x00.HAM` driver with optional switches to modify driver functionality. Command examples for both single path and multiple path are:

- Single Path:
`Load QL2x00.HAM Slot=2/Luns/allpaths/Portnames/startunit`
- Multiple Path:
`Load QL2x00.Ham Slot=2/luns/allpaths/portnames`

Installing Novell NetWare drivers

NOTE:

The `QL2x00 HAM` driver may not be compatible with NetWare versions earlier than 6.x.

To install the NetWare driver in a previously installed Netware 6.x system:

1. Enter the following command from the console screen:
`LOAD HDETECT`
2. Select **Continue** from the **Options** menu, and then press **Enter**.
3. Select **Modify** from the **Options** menu, and then press **Enter**.
4. Press **Enter** to **Select** and **View** with the drivers highlighted.
5. Select **Modify** in the **Additional Driver Options** menu and press **Enter**.
6. Press **Insert** or **INS** on your keyboard to add a new driver.

7. Press **Insert** or **INS** on your keyboard to add an unlisted driver.
8. Do one of the following:
 - If you have the HAM driver and DDI file on a floppy disk, press **Enter**.
 - If you have the HAM driver and DDI file on another media such as a CD-ROM directory or a drive, press **F3**, and then specify the path to the files. A file specification can be similar to the following:
C:\nwserver\
9. Select **Modify**, and then press **Enter** when the QL2x00 properties are displayed.
10. Select **Return to Driver Summary**, and then press **Enter** when the Additional Drivers screen is displayed.
11. Select **Continue** from the **Options** menu, and then press **Enter** to load the driver.
12. Select **Continue** from the **Protocol Options** menu to exit.

 **NOTE:**

If you have a Proliant server, ensure that CPQSHD.CDM is later than 2.0. Multipath I/O is not supported on SP6 with CPQSHD.CDM.

Using the CFG.NLM utility

You can use the CFG.NLM utility to determine WWN numbers. To use the CFG.NLM utility:

1. Copy the CFG.NLM utility from the C:\nwserver\drivers\unsupdrv to the system directory of the server.
2. From the console, enter the `cfg/I` command.
3. Go to the Logger screen and copy the WWN numbers that are displayed.
4. Ensure that the host FCAs have been added by inspecting the Host folder in the Navigation pane of HP Command View EVA.

Verifying virtual disks from the host

To scan the bus for the virtual disk and then display information about the EVA4400 devices:

Scan for new devices

```
Scan all LUNs
List storage adapters
```

OpenVMS

Updating the AlphaServer console code, Integrity Server console code, and Fibre Channel FCA firmware

The firmware update procedure varies for the different server types. To update firmware, follow the procedure described in the Installation instructions that accompany the firmware images.

Verifying Fibre Channel adapter software installation

A supported FCA should already be installed in the host server. The procedure to verify that console recognizes the installed FCA varies for the different server types. Follow the procedure described in the Installation instructions that accompany the firmware images.

Console LUN ID and OS unit ID

HP Command View EVA software contains a box for the Console LUN ID on the `Initialized Storage System Properties` window.

It is important that you set the Console LUN ID to a number other than zero. If the Console LUN ID is not set or is set to zero, the OpenVMS host will not recognize the controller pair. The Console LUN ID for a controller pair must be unique within the SAN. [Table 7](#) shows an example of the Console LUN ID.

You can set the OS unit ID on the Virtual Disk Properties window. The default setting is 0, which disables the ID field. To enable the ID field, you must specify a value between 1 and 32767, ensuring that the number you enter is unique within the SAN. An OS Unit ID greater than 9999 is not capable of being MSCP served.

△ CAUTION:

It is possible to enter a duplicate Console LUN ID or OS unit ID number. You must ensure that you enter a Console LUN ID and OS Unit ID that is not already in use. A duplicate Console LUN ID or OS Unit ID can allow the OpenVMS host to corrupt data through confusion about LUN identity. It can also prevent the host from recognizing the controllers.

Table 7 Comparing console LUN to OS unit ID

ID type	System Display
Console LUN ID set to 100	\$1\$GGA100:
OS unit ID set to 50	\$1\$DGA50:

Adding OpenVMS hosts

To obtain WWNs on AlphaServers, do one of the following:

- Enter the `show device fg/full OVMS` command.
- Use the `WWIDMGR -SHOW PORT` command at the SRM console.

To obtain WWNs on Integrity servers, do one of the following:

1. Enter the `show device fg/full OVMS` command.
2. Use the following procedure from the server console:
 1. From the EFI boot Manager, select **EFI Shell**.
 2. In the EFI Shell, enter `"Shell> drivers"`.

A list of EFI drivers loaded in the system is displayed.

3. In the listing, find the line for the FCA for which you want to get the WWN information.

For a Qlogic HBA, look for HP 4 Gb Fibre Channel Driver or HP 2 Gb Fibre Channel Driver as the driver name. For example:

```

          T   D
D          Y C I
R          P F A
V  VERSION  E G G #D #C DRIVER NAME                               IMAGE NAME
== ===== = = = == == =====
22 00000105 B X X  1  1 HP 4 Gb Fibre Channel Driver          PciROM:0F:01:01:002

```

4. Note the driver handle in the first column (0x22 in the example).
5. Using the driver handle, enter the `drvdfgdriver_handle` command to find the Device Handle (Ctrl). For example:

```

Shell> drvcfg 22
Configurable Components
Drv[22] Ctrl[25] Lang[eng]

```

6. Using the driver and device handle, enter the `drvdfg -sdriver_handle device_handle` command to invoke the EFI Driver configuration utility. For example:

```

Shell> drvcfg -s 22 25

```

7. From the Fibre Channel Driver Configuration Utility list, select item 8 (Info) to find the WWN for that particular port.

Output similar to the following appears.

```

Adapter Path:  Acpi (PNP0002,0300) /Pci (01|01)
Adapter WWPN:   50060B00003B478A
Adapter WWNN:  50060B00003B478B
Adapter S/N:   3B478A

```

Scanning the bus

Enter the following command to scan the bus for the OpenVMS virtual disk:

```
$ MC SYSMAN IO AUTO/LOG
```

A listing of LUNs detected by the scan process is displayed. Verify that the new LUNs appear.

NOTE:

The EVA4400 console LUN can be seen without any virtual disks presented. The console LUN appears as \$1\$GGAX (where *x* represents the console LUN ID on the controller).

After the system scans the fabric for devices, you can verify the devices with the `SHOW DEVICE` command:

```
$ SHOW DEVICE NAME-OF-VIRTUAL-DISK /FULL
```

For example, to display device information on a virtual disk named \$1\$DGA50, enter `$ SHOW DEVICE 1DGA50:/FULL`.

The following output is displayed:

```

Disk $1$DGA50: (BRCK18), device type HSV210, is online, file-oriented device,
shareable, device has multiple I/O paths, served to cluster via MSCP Server,

```


error logging is enabled.

```
Error count                2      Operations completed          4107
Owner process              " "    Owner UIC                    [SYSTEM]
Owner process ID          00000000  Dev Prot                    S:RWPL,O:RWPL,G:R,W
Reference count           0      Default buffer size          512
Current preferred CPU Id  0      Fastpath                     1
WWID 01000010:6005-08B4-0010-70C7-0001-2000-2E3E-0000
Host name                  "BRCK18"  Host type, avail AlphaServer DS10 466 MHz, yes
Alternate host name       "VMS24"   Alt. type, avail HP rx3600 (1.59GHz/9.0MB), yes
Allocation class          1

I/O paths to device       9
Path PGA0.5000-1FE1-0027-0A38 (BRCK18), primary path.
Error count               0      Operations completed          145
Path PGA0.5000-1FE1-0027-0A3A (BRCK18).
Error count               0      Operations completed          338
Path PGA0.5000-1FE1-0027-0A3E (BRCK18).
Error count               0      Operations completed          276
Path PGA0.5000-1FE1-0027-0A3C (BRCK18).
Error count               0      Operations completed          282
Path PGB0.5000-1FE1-0027-0A39 (BRCK18).
Error count               0      Operations completed          683
Path PGB0.5000-1FE1-0027-0A3B (BRCK18).
Error count               0      Operations completed          704
Path PGB0.5000-1FE1-0027-0A3D (BRCK18).
Error count               0      Operations completed          853
Path PGB0.5000-1FE1-0027-0A3F (BRCK18), current path.
Error count               2      Operations completed          826
Path MSCP (VMS24).
Error count               0      Operations completed          0
```

You can also use the `SHOW DEVICE DG` command to display a list of all Fibre Channel disks presented to the OpenVMS host.

 **NOTE:**

Restarting the host system shows any newly presented virtual disks because a hardware scan is performed as part of the startup.

If you are unable to access the virtual disk, check the following:

- Check the switch zoning database.
- Use HP Command View EVA to verify the host presentations.
- Check the SRM console firmware on AlphaServers.
- Ensure that the correct host is selected for this virtual disk and that a unique OS Unit ID is used in HP Command View EVA.

Configuring virtual disks from the OpenVMS host

To set up disk resources under OpenVMS, initialize and mount the virtual disk resource as follows:

1. Enter the following command to initialize the virtual disk:

```
$ INITIALIZE name-of-virtual-disk volume-label
```

2. Enter the following command to mount the disk:

```
MOUNT/SYSTEM name-of-virtual-disk volume-label
```

 **NOTE:**

The `/SYSTEM` switch is used for a single stand-alone system, or in clusters if you want to mount the disk only to select nodes. You can use `/CLUSTER` for OpenVMS clusters. However, if you encounter problems in a large cluster environment, HP recommends that you enter a `MOUNT/SYSTEM` command on each cluster node.

3. View the virtual disk's information with the `SHOW DEVICE` command. For example, enter the following command sequence to configure a virtual disk named `data1` in a stand-alone environment:

```
$ INIT $1$DGA1: data1
$ MOUNT/SYSTEM $1$DGA1: data1
$ SHOW DEV $1$DGA1: /FULL
```

Setting preferred paths

You can set or change the preferred path used for a virtual disk by using the `SET DEVICE /PATH` command. For example:

```
$ SET DEVICE $1$DGA83: /PATH=PGA0.5000-1FE1-0007-9772 /SWITCH
```

This allows you to control which path each virtual disk uses.

You can use the `SHOW DEV/FULL` command to display the path identifiers.

For additional information on using OpenVMS commands, see the OpenVMS help file:

```
$ HELP TOPIC
```

For example, the following command displays help information for the `MOUNT` command:

```
$ HELP MOUNT
```

Sun Solaris

Loading the operating system and software

Follow the manufacturer's instructions for loading the operating system (OS) and software onto the host. Load all OS patches and configuration utilities supported by HP and the FCA manufacturer.

Configuring FCAs with the Sun SAN driver stack

Sun-branded FCAs are supported only with the Sun SAN driver stack. The Sun SAN driver stack is also compatible with current Emulex FCAs and QLogic FCAs. Support information is available on the Sun website:

http://www.sun.com/io_technologies/index.html

To determine which non-Sun branded FCAs HP supports with the Sun SAN driver stack, see the latest MPxIO application notes or contact your HP representative.

Update instructions depend on the version of your OS:

- For Solaris 8/9, install the latest Sun StorEdge SAN software with associated patches. To automate the installation, use the Sun-supplied install script available at:
<http://www.sun.com/download/>
 1. Under Systems Administration, select **Storage Management**.
 2. Under Browse Products, select **StorageTek SAN 4.4**.
 3. Reboot the host after the required software/patches have been installed. No further activity is required after adding any new LUNs once the array ports have been configured with the `cfgadm -c` command for Solaris 8/9.

Examples for two FCAs:

```
cfgadm -c configure c3
```

```
cfgadm -c configure c4
```

- For Solaris 10, use the Sun Update Manager to install the latest patches (see <http://www.sun.com/service/sunupdate/>). Reboot the host once the required software/patches have been installed. No further activity is required after adding any new LUNs, as the controller and LUN recognition is automatic for Solaris 10.

Configuring Emulex FCAs with the lpfc driver

To determine which Emulex FCAs and which driver version HP supports with the lpfc driver, see the latest *HP StorageWorks 4400 Enterprise Virtual Array release notes* or contact your HP representative. To configure Emulex FCAs with the lpfc driver:

- Ensure that you have the latest supported version of the lpfc driver (see <http://www.emulex.com>).
- Edit the following parameters in the `/kernel/drv/lpfc.conf` driver configuration file to set up the FCAs for a SAN infrastructure:

```
topology=2;
```

```
scan-down=0;
```

```
nodev-tmo=60;
```

```
linkdown-tmo=60;
```

- If using a single FCA and no multipathing, edit the following parameter to reduce the risk of data loss in case of a controller reboot:

```
nodev-tmo=120;
```

- If using Veritas Volume Manager (VxVM) DMP for multipathing (single or multiple FCAs), edit the following parameter to ensure proper VxVM behavior:

```
no-device-delay=0;
```

- In a fabric topology, you use persistent bindings to bind a SCSI target ID to the world wide port name (WWPN) of an array port. This ensures that the SCSI target IDs remain the same when the system reboots. You set persistent bindings by editing the configuration file or by using the `lputil` utility.

NOTE:

HP recommends that you assign target IDs in sequence, and that the EVA has the same target ID on each host in the SAN.

The following example for an EVA4400 illustrates the binding of targets 20 and 21 (lpfc instance 2) to WWPNs 50001fe100270938 and 50001fe100270939, and the binding of targets 30 and 31 (lpfc instance 0) to WWPNs 50001fe10027093a and 50001fe10027093b:

```
fcplib-wwpn="50001fe100270938:lpfc2t20",
           "50001fe100270939:lpfc2t21",
           "50001fe10027093a:lpfc0t30",
           "50001fe10027093b:lpfc0t31";
```

 **NOTE:**

Replace the WWPNs in the example with the WWPNs of your array ports. For an EVA8000, you can add up to eight targets.

For each LUN that will be accessed, add an entry to the `/kernel/drv/sd.conf` file. For example, if you want to access LUNs 1 and 2 through all four paths, add the following entries to the end of the file:

```
name="sd" parent="lpfc" target=20 lun=1;
name="sd" parent="lpfc" target=21 lun=1;
name="sd" parent="lpfc" target=30 lun=1;
name="sd" parent="lpfc" target=31 lun=1;
name="sd" parent="lpfc" target=20 lun=2;
name="sd" parent="lpfc" target=21 lun=2;
name="sd" parent="lpfc" target=30 lun=2;
name="sd" parent="lpfc" target=31 lun=2;
```

- Reboot the server to implement the changes to the configuration files.
- If LUNs have been preconfigured in the `/kernel/drv/sd.conf` file, use the `devfsadm` command to perform LUN rediscovery after configuring the file.

 **NOTE:**

The `lpfc` driver is *not* supported for Sun StorEdge Traffic Manager/Sun Storage Multipathing. To configure an Emulex FCA using the Sun SAN driver stack, see “[Configuring the FCAs with the Sun SAN driver stack](#)” on page 66.

Configuring QLogic FCAs with the `qla2300` driver

See the latest *HP StorageWorks 4400 Enterprise Virtual Array release notes* or contact your HP representative to determine which QLogic FCAs and which driver version HP supports with the `qla2300` driver. To configure QLogic FCAs with the `qla2300` driver:

- Ensure that you have the latest supported version of the `qla2300` driver (see <http://www.qlogic.com>).
- Edit the following parameters in the `/kernel/drv/qla2300.conf` driver configuration file to set up the FCAs for a SAN infrastructure:

```
hba0-connection-options=1;
hba0-link-down-timeout=60;
hba0-persistent-binding-configuration=1;
```
- If using a single FCA and no multipathing, edit the following parameters to reduce the risk of data loss in case of a controller reboot:

```
hba0-login-retry-count=60;
hba0-port-down-retry-count=60;
```

```
hba0-port-down-retry-delay=2;
```

The `hba0-port-down-retry-delay` parameter is *not* supported with the 4.13.01 driver; the time between retries is fixed at approximately 2 seconds.

- In a fabric topology, you use persistent bindings to bind a SCSI target ID to the world wide port name (WWPN) of an array port. This ensures that the SCSI target IDs remain the same when the system reboots. You set persistent bindings by editing the configuration file or by using the `SANsurfer` utility.

The following example for an EVA4000/6000 illustrates the binding of targets 20 and 21 (hba instance 0) to WWPNs 50001fe100270938 and 50001fe100270939, and the binding of targets 30 and 31 (hba instance 1) to WWPNs 50001fe10027093a and 50001fe10027093b:

```
hba0-SCSI-target-id-20-fibre-channel-port-name="50001fe100270938";
hba0-SCSI-target-id-21-fibre-channel-port-name="50001fe100270939";
hba1-SCSI-target-id-30-fibre-channel-port-name="50001fe10027093a";
hba1-SCSI-target-id-31-fibre-channel-port-name="50001fe10027093b";
```

 **NOTE:**

Replace the WWPNs in the example with the WWPNs of your array ports. For an EVA8000, you can add up to eight targets.

- If the `qla2300` driver is version 4.13.01 or earlier, for each LUN that users will access add an entry to the `/kernel/drv/sd.conf` file:

```
name="sd" class="scsi" target=20 lun=1;
name="sd" class="scsi" target=21 lun=1;
name="sd" class="scsi" target=30 lun=1;
name="sd" class="scsi" target=31 lun=1;
```

If LUNs are preconfigured in the `/kernel/drv/sd.conf` file, after changing the configuration file, use the `devfsadm` command to perform LUN rediscovery.

- If the `qla2300` driver is version 4.15 or later, verify that the following or a similar entry is present in the `/kernel/drv/sd.conf` file:

```
name="sd" parent="qla2300" target=2048;
```

To perform LUN rediscovery after configuring LUNs, use the following command:

```
/opt/QLLogic_Corporation/drvutil/qla2300/qlreconfig -d qla2300 -s
```

- Reboot the server to implement the changes to the configuration files.

 **NOTE:**

The `qla2300` driver is *not* supported for Sun StorEdge Traffic Manager/Sun Storage Multipathing. To configure a QLogic FCA using the Sun SAN driver stack, see [“Configuring the FCAs with the Sun SAN driver stack”](#) on page 66.

Fabric setup and zoning

To set up the fabric and zoning:

1. Verify that the Fibre Channel cable is connected and firmly inserted at the array ports, host ports, and SAN switch.

2. Through the Telnet connection to the switch or Switch utilities, verify that the WWN of the EVA ports and FCAs are present and online.
3. Create a zone consisting of the WWNs of the EVA ports and FCAs, and then add the zone to the active switch configuration.
4. Enable, and then save, the new active switch configuration.

 **NOTE:**

There are variations in the steps required to configure the switch between different vendors. For more information, see the *HP StorageWorks SAN design reference guide*, available for downloading on the HP website: <http://www.hp.com/go/sandesign>.

Sun StorEdge Traffic Manager (MPxIO)/Sun Storage Multipathing

Sun StorEdge Traffic Manager (MPxIO)/Sun Storage Multipathing can be used for FCAs configured with the Sun SAN driver and depends upon the operating system version, architecture (SPARC/x86), and patch level installed. For configuration details, see the *HP StorageWorks MPxIO application notes*, available on the HP support website: <http://www.hp.com/support/manuals>.

In the `Search products` box, enter `MPxIO`, and then click the search symbol. Next, select the application notes from the search results listing.

Configuring with Veritas Volume Manager

The Dynamic Multipathing (DMP) feature of Veritas Volume Manager (VxVM) can be used for all FCAs and all drivers. EVA disk arrays are certified for VxVM support. When you install FCAs, ensure that the driver parameters are set correctly. Failure to do so can result in a loss of path failover in DMP. For information about setting FCA parameters, see “[Configuring the FCAs with the Sun SAN driver stack](#)” on page 66 and the FCA manufacturer’s instructions.

The DMP feature requires an Array Support Library (ASL) and an Array Policy Module (APM). The ASL/APM enables Asymmetric Logical Unit Access (ALUA). LUNs are accessed through the primary controller. After enablement, use the `vxdisk list <device>` command to determine the primary and secondary paths. For VxVM 4.1 (MP1 or later), you must download the ASL/APM from the Symantec/Veritas support site for installation on the host. This download and installation is *not* required for VxVM 5.0.

To download and install the ASL/APM from the Symantec/Veritas support website:

1. Go to <http://support.veritas.com>.
2. Enter **Storage Foundation for UNIX/Linux** in the `Product Lookup` box.
3. Enter **EVA** in the `Ask a question or enter keyword` box, and then click the search symbol. To further narrow down the search, change the platform to Solaris and search again.
4. Read `TechNotes` and follow the instructions to download and install the ASL/APM.
5. Run `vxctl enable` to notify VxVM of the changes.
6. Verify the configuration of VxVM as shown in [Example 1](#) (the output may be slightly different depending on your VxVM version and the array configuration).

Example 1. Verifying the VxVM configuration

```
# vxddladm listsupport all | grep HP
libvxhpalua.so      HP, COMPAQ
libvxxp1281024.so  HP
libvxxp12k.so      HP

# vxddladm listsupport libname=libvxhpalua.so
ATTR_NAME          ATTR_VALUE
=====
LIBNAME            libvxhpalua.so
VID                HP, COMPAQ
PID               HSV101, HSV111 (C)COMPAQ, HSV111
                  HSV200, HSV210
ARRAY_TYPE        A/A-A-HP
ARRAY_NAME        EVA3000, EVA5000, EVA4K6K
                  EVA8000

# vxdladm listapm all | grep HP
dmphpalua          dmphpalua          1          A/A-A-HP          Active
# vxdladm listapm dmphpalua
Filename:          dmphpalua
APM name:          dmphpalua
APM version:       1
Feature:           VxVM
VxVM version:     40
Array Types Supported: A/A-A-HP
Depending Array Types: A/A-A
State:             Active

# vxdladm listenclosure all
ENCLR_NAME        ENCLR_TYPE        ENCLR_SNO        STATUS        ARRAY_TYPE
=====
Disk              Disk              DISKS            CONNECTED     Disk
EVA8000           EVA8000           50001FE1002709E0  CONNECTED     A/A-A-HP
```

By default, the EVA iopolicy is set to Round-Robin. For VxVM 4.1 MP1, only one path is used for the I/Os with this policy. Therefore, HP recommends that you change the iopolicy to Adaptive in order to use all paths to the LUN on the primary controller. [Example 2](#) shows the commands you can use to check and change the iopolicy.

Example 2. Setting the iopolicy

```
# vxdladm getattr arrayname EVA8000 iopolicy
ENCLR_NAME        DEFAULT          CURRENT
=====
EVA8000           Round-Robin     Round-Robin

# vxdladm setattr arrayname EVA8000 iopolicy=adaptive

# vxdladm getattr arrayname EVA8000 iopolicy
ENCLR_NAME        DEFAULT          CURRENT
=====
EVA8000           Round-Robin     Adaptive
```

Configuring virtual disks from the host

The procedure you use to configure the LUN path to the array depends on the FCA driver. For more information, see [Installing Fibre Channel adapters](#).

To identify the WWLUN ID assigned to the virtual disk and/or the LUN assigned by the storage administrator:

- Sun SAN driver, with MPxIO enabled:
 - You can use the `luxadm probe` command to display the array/node WWN and associated array for the devices.
 - The WWLUN ID is part of the device file name. For example:

```
/dev/rdisk/c5t600508B4001030E40000500000B20000d0s2
```

- If you use `luxadm display`, the LUN is displayed after the device address. For example:

```
50001fe1002709e9,5
```

- Sun SAN driver, without MPxIO:
 - The EVA WWPN is part of the file name (which helps you to identify the controller). For example:

```
/dev/rdisk/c3t50001FE1002709E8d5s2
```

```
/dev/rdisk/c3t50001FE1002709ECd5s2
```

```
/dev/rdisk/c4t50001FE1002709E9d5s2
```

```
/dev/rdisk/c4t50001FE1002709EDd5s2
```

If you use `luxadm probe`, the array/node WWN and the associated device files are displayed.

- You can retrieve the WWLUN ID as part of the `format -e (scsi, inquiry)` output; however, it is cumbersome and hard to read. For example:

```
09 e8 20 04 00 00 00 00 00 00 35 30 30 30 31 46      .....50001F
45 31 30 30 32 37 30 39 45 30 35 30 30 30 31 46      E1002709E050001F
45 31 30 30 32 37 30 39 45 38 36 30 30 35 30 38      E1002709E8600508
42 34 30 30 31 30 33 30 45 34 30 30 30 30 35 30      B4001030E4000050
30 30 30 30 42 32 30 30 30 30 00 00 00 00 00 00      0000B20000
```

- The assigned LUN is part of the device file name. For example:

```
/dev/rdisk/c3t50001FE1002709E8d5s2
```

You can also retrieve the LUN with `luxadm display`. The LUN is displayed after the device address. For example:

```
50001fe1002709e9,5
```

- Emulex (lpfc)/QLogic (qla2300) drivers:
 - You can retrieve the WWPN by checking the assignment in the driver configuration file (easiest, so you know the assigned target) or by using `HBAnyware/SANSurfer`.
 - You can retrieve the WWLUN id by using `HBAnyware/SANSurfer`.

You can also retrieve the WWLUN ID as part of the `format -e (scsi, inquiry)` output; however, it is cumbersome and difficult to read. For example:

```
09 e8 20 04 00 00 00 00 00 00 35 30 30 30 31 46      .....50001F
45 31 30 30 32 37 30 39 45 30 35 30 30 30 31 46      E1002709E050001F
```


45 31 30 30 32 37 30 39 45 38 36 30 30 35 30 38	E1002709E8600508
42 34 30 30 31 30 33 30 45 34 30 30 30 30 35 30	B4001030E4000050
30 30 30 30 42 32 30 30 30 30 00 00 00 00 00 00	0000B20000

- The assigned LUN is part of the device file name. For example:
/dev/dsk/c4t20d 5 s2

Verifying virtual disks from the host

Verify that the host can access virtual disks by using the `format` command. See [Example 3](#).

Example 3. Format command

```
# format
Searching for disks...done
c2t50001FE1002709F8d1: configured with capacity of 1008.00MB
c2t50001FE1002709F8d2: configured with capacity of 1008.00MB
c2t50001FE1002709FCd1: configured with capacity of 1008.00MB
c2t50001FE1002709FCd2: configured with capacity of 1008.00MB
c3t50001FE1002709F9d1: configured with capacity of 1008.00MB
c3t50001FE1002709F9d2: configured with capacity of 1008.00MB
c3t50001FE1002709FDd1: configured with capacity of 1008.00MB
c3t50001FE1002709FDd2: configured with capacity of 1008.00MB

AVAILABLE DISK SELECTIONS:

0. c0t0d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248> /pci@1f,4000/scsi@3/sd@0,0
1. c2t50001FE1002709F8d1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssd@w50001fe1002709f8,1
2. c2t50001FE1002709F8d2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssd@w50001fe1002709f8,2
3. c2t50001FE1002709FCd1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssd@w50001fe1002709fc,1
4. c2t50001FE1002709FCd2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/QLGC,qla@4/fp@0,0/ssd@w50001fe1002709fc,2
5. c3t50001FE1002709F9d1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/lpfc@5/fp@0,0/ssd@w50001fe1002709f9,1
6. c3t50001FE1002709F9d2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/lpfc@5/fp@0,0/ssd@w50001fe1002709f9,2
7. c3t50001FE1002709FDd1 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/lpfc@5/fp@0,0/ssd@w50001fe1002709fd,1
8. c3t50001FE1002709FDd2 <HP-HSV210-5100 cyl 126 alt 2 hd 128 sec 128>
   /pci@1f,4000/lpfc@5/fp@0,0/ssd@w50001fe1002709fd,2
Specify disk (enter its number):
```

If you cannot access the virtual disks:

- Verify zoning.
- For Sun Solaris, verify that the correct WWPNs for the EVA (lpfc, qla2300 driver) have been configured and the target assignment is matched in `/kernel/drv/sd.conf` (lpfc and qla2300 4.13.01).

Labeling and partitioning the devices

Label and partition the new devices using the Sun `format` utility:

△ CAUTION:

When selecting disk devices, be careful to select the correct disk because using the label/partition commands on disks that have data can cause data loss.

1. Enter the `format` command at the root prompt to start the utility.
2. Verify that all new devices are displayed. If not, exit the format utility (enter **quit** or press **Ctrl+D**) and verify that the configuration is correct (see “Configuring virtual disks from the host” on page 72).
3. Record the character-type device file names (for example, `c1t2d0`) for all new disks. You will use this data to create the file systems or to use them with the Solaris or Veritas Volume Manager.
4. When prompted to specify the disk, enter the number of the device to be labeled.
5. When prompted to label the disk, enter `Y`.

 NOTE:

Because the virtual geometry of the presented volume varies with size, always select `autoconfigure` as the disk type.

6. if you are not using Veritas Volume Manager, use the `partition` command to create or adjust the partitions.
7. Repeat this labeling procedure for each new device. (Use the `disk` command to select another disk.)
8. When you finish labeling the disks, enter `quit` or press **Ctrl+D** to exit the format utility. For more information, see the *System Administration Guide: Devices and File Systems* for your operating system, available on the Sun website: <http://docs.sun.com>.

 NOTE:

Some format commands are not applicable to the EVA storage systems.

VMware

Installing VMware

For installation instructions, see the VMware installation guide for your server.

Upgrading VMware

If you have already installed VMware, use the following procedure to patch or upgrade the system:

1. Extract the upgrade-tarball on the system. A sample extract follows:
`esx- n.n.n -14182-upgrade.tar.gz`

2. Boot the system in Linux mode by selecting the `Linux` boot option from the boot menu selection window.
3. Extract the tar file and enter the following command:
`upgrade.pl`
4. Reboot the system using the default boot option (`esx`).

Configuring the EVA4400 in VMware host servers

To configure an EVA4400 on a VMware ESX server:

1. Use HP Command View EVA to configure one host for each ESX server.
2. Ensure that the Fibre Channel Adapters (FCAs) are populated in the world wide port name (WWPN) list. Edit the WWPN, if necessary.
3. Set the connection type to `VMware`.
4. Add a port to the host defined in Step 1. Do *not* add host entries for servers with more than one FCA.
5. Perform one of the following tasks to locate the WWPN:

- From the service console, enter the `wwpn.pl` command.

Output similar to the following is displayed:

```
[root@gnome7 root]# wwpn.pl

vmhba0: 210000e08b09402b (QLogic) 6:1:0
vmhba1: 210000e08b0ace2d (QLogic) 6:2:0

[root@gnome7 root]#
```

- Check the `/proc/scsi/qla2300/X` directory, where `X` is a bus instance number. Look for the SCSI device information section.

Output similar to the following is displayed:

```
SCSI Device Information:
scsi-qla0-adapter-node=200000e08b0b0638;
scsi-qla0-adapter-port=210000e08b0b0638;
```

Configuring the ESX server

This section provides information about configuring the ESX server.

Loading the FCA NVRAM

The FCA stores configuration information in the nonvolatile RAM (NVRAM) cache. You must download the configuration for HP StorageWorks products.

Perform one of the following to load the NVRAM:

- If you have a ProLiant blade server:
 1. Download the supported FCA BIOS update, available on <http://www.hp.com/support/downloads>, to a virtual floppy.
For instructions on creating and using a virtual floppy, see the *HP Integrated Lights-Out user guide*.
 2. Unzip the file.

3. Follow the instructions in the readme file to load the NVRAM configuration onto each FCA.
- If you have a blade server other than a ProLiant blade server:
 1. Download the supported FCA BIOS update, available on <http://www.hp.com/support/downloads>.
 2. Unzip the file.
 3. Follow the instructions in the readme file to load the NVRAM configuration onto each FCA.

Setting the multipathing policy

You can set the multipathing policy for each logical unit number (LUN) or logical drive on the storage area network (SAN) to one of the following:

- Most recently used (MRU)
- Fixed
- Preferred

ESX 2.5.x commands

The # `vmkmultipath -s vmhba0:0:1 -p mru` command sets `vmhba0:0:1` with an MRU multipathing policy for all LUNs on the SAN.

The # `vmkmultipath -s vmhba1:0:1 -p fixed` command sets `vmhba1:0:1` with a Fixed multipathing policy.

The # `vmkmultipath -s vmhba1:0:1 -r vmhba2:0:1 -e vmhba2:0:1` command sets and enables `vmhba2:0:1` with a Preferred multipathing policy.

ESX 3.x commands

The # `esxcfg-mpath --policy=mru --lun=vmhba0:0:1` command sets `vmhba0:0:1` with an MRU multipathing policy.

The # `esxcfg-mpath --policy=fixed --lun=vmhba0:0:1` command sets `vmhba1:0:1` with a Fixed multipathing policy.

The # `esxcfg-mpath --preferred --path=vmhba2:0:1 --lun=vmhba2:0:1` command sets `vmhba2:0:1` with a Preferred multipathing policy.

NOTE:

Each LUN can be accessed through both EVA storage controllers at the same time; however, each LUN path is optimized through one controller. To optimize performance, if the LUN multipathing policy is Fixed, all servers must use a path to the same controller.

You can also set the multipathing policy from the VMware Management User Interface (MUI) by clicking the **Failover Paths** tab in the Storage Management section and then selecting **Edit... link** for each LUN whose policy you want to modify.

Specifying DiskMaxLUN

The `DiskMaxLUN` setting specifies the highest-numbered LUN that can be scanned by the ESX server.

- For ESX 2.5.x, the default value is 8. If more than eight LUNs are presented, you must change the setting to an appropriate value. To set `DiskMaxLUN`, select **Options> Advanced Settings** in the MUI, and then enter the highest-numbered LUN.

- For ESX 3.0 the default value is set to the Max set value of 256. To set `DiskMaxLun` to a different value, in Virtual Infrastructure Client, select **Configuration > Advance Settings > Disk > Disk.MaxLun**, and then enter the new value.

Verifying connectivity

To verify proper configuration and connectivity to the SAN:

- For ESX 2.5.x, enter the `# vmkmultipath -q` command.
- For ESX 3.x, enter the `# esxcfg-mpath -l` command.

For each LUN, verify that the multipathing policy is set correctly and that each path is marked `on`. If any paths are marked `dead` or are not listed, check the cable connections and perform a rescan on the appropriate FCA. For example:

- For ESX 2.5.x, enter the `# cos-rescan.sh vmhba0` command.
- For ESX 3.x, enter the `# esxcfg-rescan vmhba0` command.

If paths or LUNs remain missing, see the VMware or HP StorageWorks documentation for troubleshooting information.

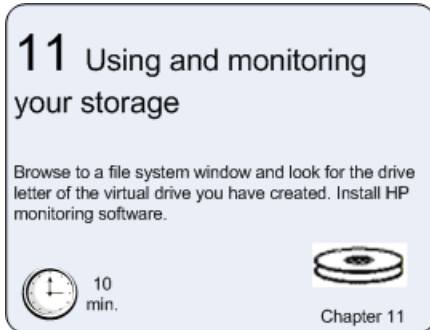
Verifying virtual disks from the host

To verify that the host can access the virtual disks, enter the `# more /proc/scsi/scsi` command.

The output lists all SCSI devices detected by the server. An EVA4400 LUN entry looks similar to the following:

```
Host: scsi3 Channel: 00 ID: 00 Lun: 01
Vendor: HP      Model: HSV300      Rev:
Type: Direct-Access                      ANSI SCSI revision: 02
```

11 Using and monitoring your storage



NOTE:

Monitoring capabilities are not currently supported by HP Command View EVA 8.1 on the management module. To ensure continued monitoring capabilities, use HP Command View EVA 8.0.2 or earlier on the management server.

Using your storage

1. Start a server application.
2. Browse to a file system window and verify the drive letter of the virtual drive you have created.

Firmware recovery CD

A recovery CD containing the original XCS firmware installed on the array is shipped along with your EVA4400. The CD is only needed for recovery purposes. The latest firmware can be found on the HP software depot web page: <http://h20392.www2.hp.com/portal/swdepot/index.do>

Install HP Insight Remote Support Software

HP recommends you install HP's Insight Remote Support software, (part number RSSWMBASE) from www.software.hp.com, to complete this installation. HP Insight Remote Support helps you reduce costs, save time and ensure maximum system availability by providing remote monitoring, intelligent event diagnosis and the automatic secure submission of hardware event notifications. This technology has been optimized for environments with 1-50 servers (maximum 100) and requires only a shared Windows ProLiant hosting device. It will support HP ProLiant, BladeSystem, Integrity, HP 9000 servers and HP EVA storage devices, and will be available at no extra cost as part of your warranty, HP Care Pack Service or contractual support agreement with HP. For more information access the Insight RS quick start guide at <http://docs.hp.com/en/netsys.html#Insight%Remote%20Support>.

 **NOTE:**

If you require integration with HP Systems Insight Manager (HP SIM) or HP Operations Manager, then you should install the HP Remote Support Pack (RSP), not Insight RS. The RSP solution enhances HP SIM with intelligent event diagnosis and the automatic submission of hardware event notifications securely to HP Support, including acknowledgement and status returns.

Remote Support Pack contains event monitoring and proactive service support, including assessments and analysis for nearly all HP servers, storage, networks and SAN environments plus selected Dell and IBM Windows servers that have a support obligation with HP, including proactive service contracts. The HP contract and warranty entitlement feature of HP SIM requires this plug-in to be installed. More information can be found at www.hp.com/services/remotesupportpack.

A EVA4400 cabling diagrams

This appendix contains cabling diagrams for common EVA4400 installation environments. If you plan to configure the EVA4400 with an iSCSI device, see the *HP StorageWorks EVA iSCSI connectivity user guide*. See [Related documentation](#) for the location of this guide.

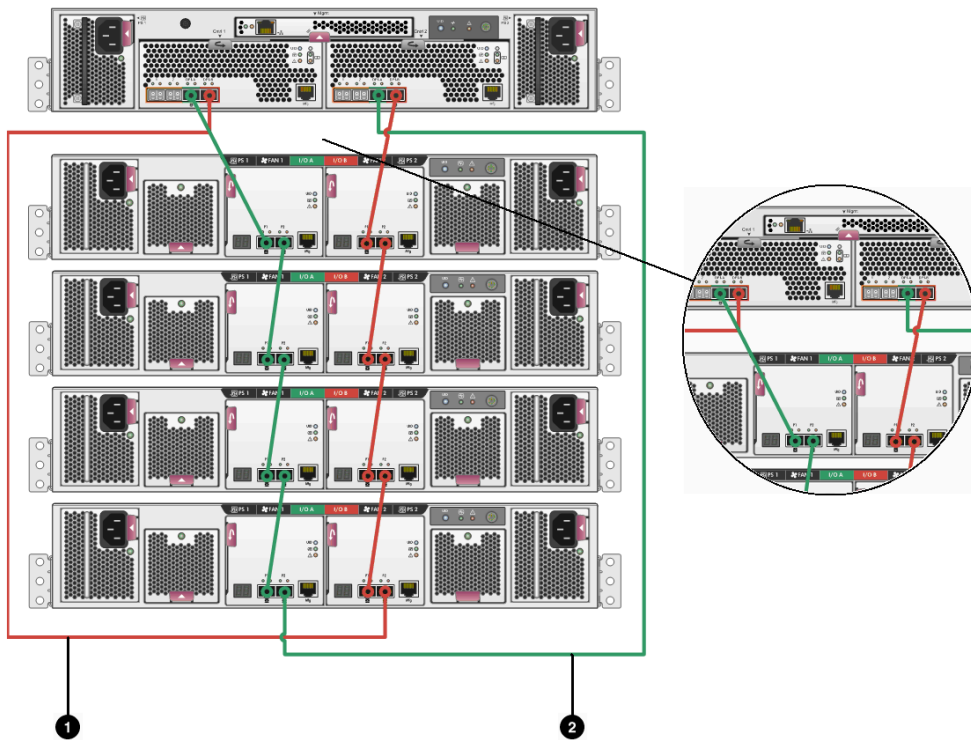
Connecting device port Fibre Channel cables to the EVA4400 (rear view)

This section shows two views of how you can connect cables to the controller. [Figure 22](#) shows the controller mounted on top of the disk shelves in the rack, and [Figure 23](#) shows the controller with disk shelves mounted above and below it.

1. For configurations with the controller *above* the disk enclosures, attach the cables to the EVA as shown in [Figure 22](#).

 **NOTE:**

All controller device port A cabling must be plugged into the A I/O modules on all enclosures.
All controller B device port cabling must be plugged into the B I/O modules on all enclosures.



1. This cable connects controller 1, device port 1B (top left — Cntrl 1, DP1B) to I/O module B, port 2 (bottom right - I/O B, P2).

2. This cable connects controller 2, device port 1A (top right — Cntrl 2, DP1A) to I/O module A, port 2 (bottom left - I/O A, P2).

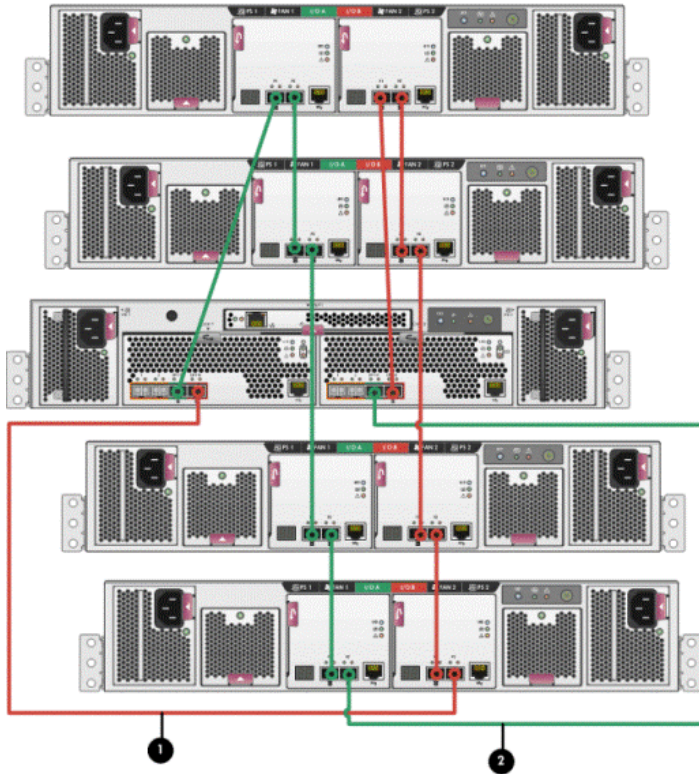
Figure 22 Fibre Channel cabling for the EVA (rear view, top-mounted controller)

2. For configurations with the controller *between* the disk enclosures, attach the cables to the EVA as shown in [Figure 23](#).



NOTE:

All controller device port A cabling must be plugged into the A I/O modules on all enclosures.
All controller B device port cabling must be plugged into the B I/O modules on all enclosures.



1. This cable connects controller 1, device port 1B (top left - Cntrl 1, DP1B) to I/O module B, port 2 (bottom right - I/O B, P2).
2. This cable connects controller 2, device port 1A (top right - Cntrl 2, DP1A) to I/O module A, port 2 (bottom left - I/O A, P2).

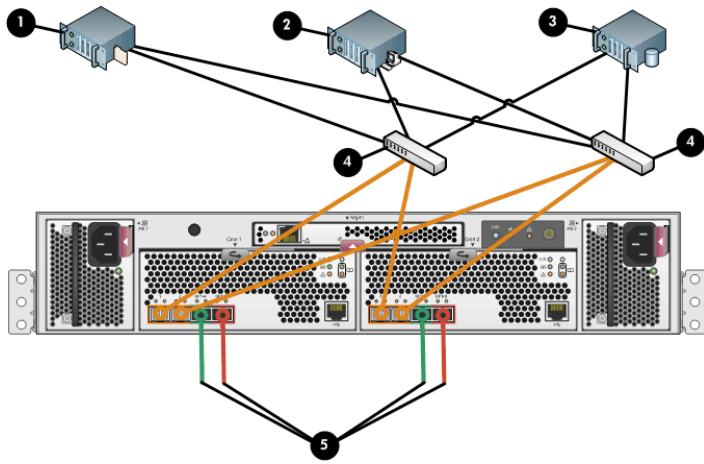
Figure 23 Fibre Channel cabling for the EVA (rear view, mid-mounted controller)

Connecting Fibre Channel cables to the EVA4400 (front end)

You can cable the front end of your EVA4400 either to external Fibre Channel switches or directly to servers. See [Figure 24](#) and [Figure 26](#) for front end connections with server-based management. See [Figure 25](#) and [Figure 27](#) for front end connections with array-based management.

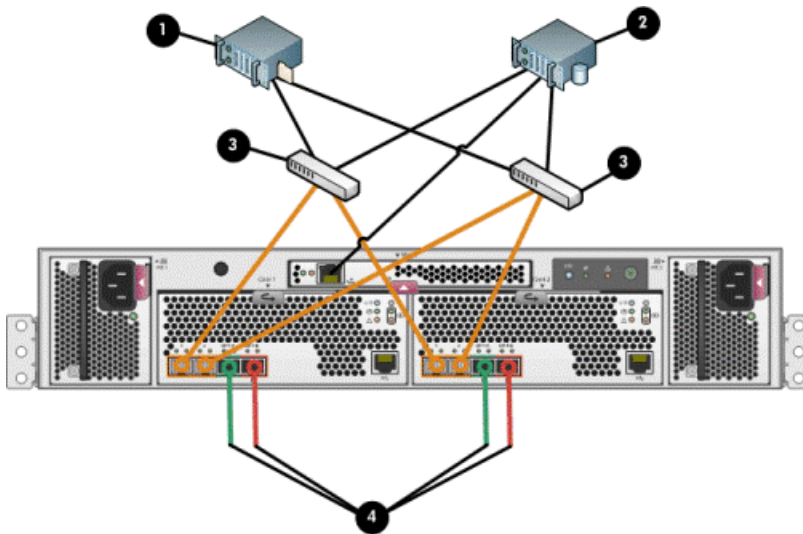
NOTE:

The cabling diagrams in [Figure 24](#) through [Figure 27](#) require fabric connect mode, which is the default as shipped.



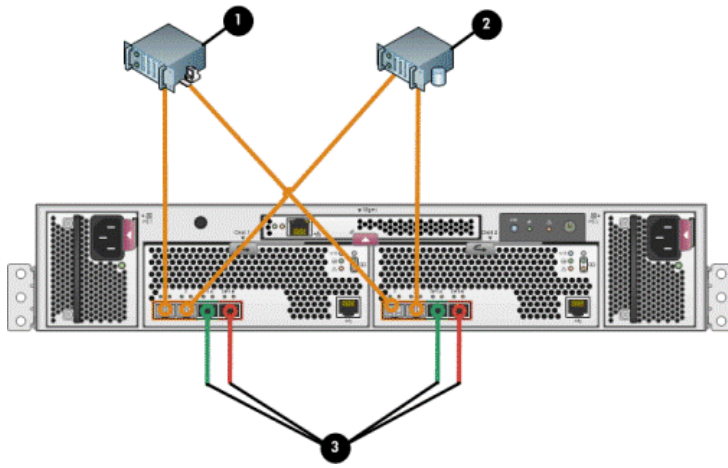
1. File server
2. Management server
3. Database server
4. Fiber channel switch
5. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

Figure 24 Cabling the controller to front end components - Fibre Channel to switch detail view with server-based management



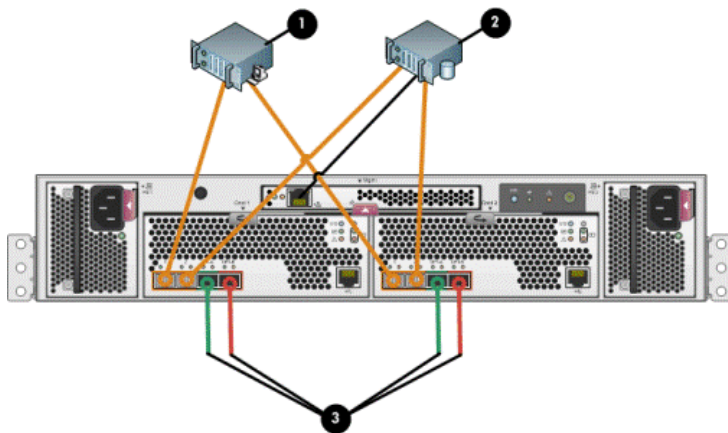
1. File server
2. Database server
3. Fiber channel switch
4. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

Figure 25 Cabling the controller to front end components - Fibre Channel to switch detail view with array-based management



1. Management server
2. Database server
3. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

Figure 26 Cabling the controller to front end components - direct Fibre Channel to servers with server-based management



1. File server
2. Database server
3. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

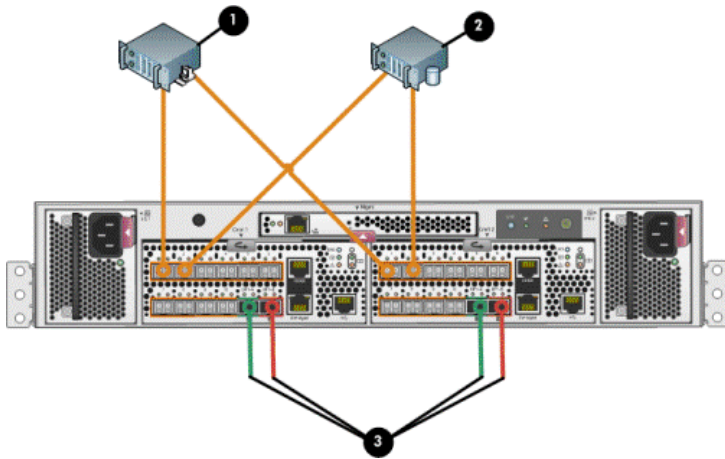
Figure 27 Cabling the controller to front end components - direct Fibre Channel to servers with array-based management

Connecting to the HSV300-S controller enclosure

The HSV 300-S controller enclosure includes a switch within each controller. [Figure 28](#) and [Figure 29](#) shows an HSV300-S controller enclosure in a direct connect cabling environment.

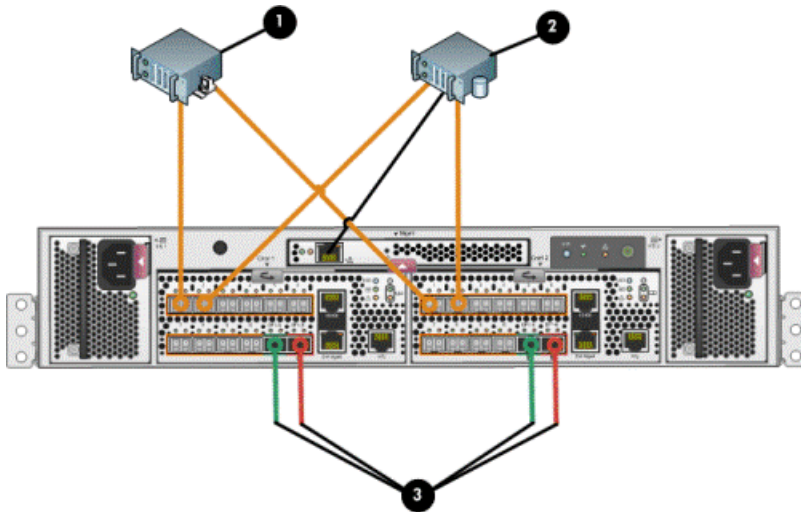
 **NOTE:**

Additional external switches can be connected to the HSV300-S controller enclosure.



1. Management server
2. Database server
3. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

Figure 28 HSV300-S controller enclosure in a direct connect configuration with server-based management



1. File server
2. Database server
3. Indicates cabling connections to disk enclosures. See [Figure 22](#) and [Figure 23](#) for cabling connections.

Figure 29 HSV300-S controller enclosure in a direct connect configuration with array-based management