



Field Replacement Guide

For models: 1U-s, 2U, 2U-s, 3U, 3U-s, 3U-n, 3U-ns, NS, CS, ES, and WS

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Preface

ETI\SPHiNX is a fully integrated, disk-based data protection solution that allows host servers to backup to and restore data from a virtual tape drive or virtual tape library (VTL). For every host connection to ETI\SPHiNX, the host system “sees” a tape drive or virtual tape library. Data can be migrated to physical tape for archival storage or disaster recovery, if long-term backup copies are required.

About this guide

The *SPHiNX-CX Field Replacement Guide* is designed to help you replace your entire SPHiNX appliance, or one of several internal components, without loss of data.

The following chapters are included:

- "Replacing a SPHiNX Chassis" — Describes how to replace an entire chassis.
- "Replacing SPHiNX Parts" — Explains how to replace specific parts in the appliance.

Audience

SPHiNX is designed for use by a storage area network (SAN) administrator or IT professional who typically works with large data centers and is responsible for ensuring that data backups occur in the organization. This document is designed for personnel who install or maintain SPHiNX. The audience should be familiar with configuring backup applications, Ethernet and Fibre Channel networks, email servers, and tape libraries.

The instructions in this guide were written under the assumption that you have both the *SPHiNX-CX Quick Start Guide* and the *SPHiNX-CX Configuration Guide* in hand.

Typographical conventions

This guide uses the following typographical conventions:

Convention	Description
Bold	Used for file names, field names, URLs, interface elements that are clicked/selected, and information that must be used literally.
<i>Bold Italic</i>	Represents variables within file names, command syntax, URLs, or other literal text.
<i>Italics</i>	Used for emphasis, book titles, and variables.
Monospace	Used for text that is displayed on-screen, command names and arguments (syntax), code, and command-line text.

Convention	Description
<i>Monospace Italic</i>	Represents variables within command syntax, code, or command-line text.
Blue Text	Used for cross-references.

Related documentation

The SPHiNX documentation library (available at <https://register.etinet.com>) includes the following:

- *Quick Start Guide* provides instructions for installing the hardware and configuring SPHiNX on the network.
- *Configuration Guide* is designed to help you configure SPHiNX after initial deployment. Turn to the *Configuration Guide* to learn how to back up SPHiNX and create a system restore image, which are essential prerequisites to replacing your SPHiNX appliance.
- *Help Set* provides detailed instructions for working with the web interface.
- *Release Notes* provides information about system requirements, known issues, and other information about the current release.

Support

For technical assistance, email your inquiries to support@etinet.com. You may also visit the ETI-NET website at <http://etinet.com/> for additional contact and support information.

For the fastest possible resolution, have the following information available:

- SPHiNX hardware platform
- Serial number of your equipment
- Hardware configuration
- Software configuration, including your version and the date created, from the System Status page on the SPHiNX web interface
- A detailed description of the problem you are having with the equipment

You may also consider gathering the output of the **getVTS_dbginfo** utility, which is provided on the SPHiNX server, or you can generate a troubleshooting package from the web interface. The utility and troubleshooting package collects log files and system information.

For important safety guidelines regarding replacing the SPHiNX chassis or other components, please see the *Quick Start Guide*.

Replacing a SPHiNX Chassis

This chapter describes how to replace an entire chassis and avoid the severe loss of critical enterprise data. Follow these instructions carefully while working closely with your support representative.

To learn how to replace a single part, see "Replacing SPHiNX Parts" on page 14.

Preparing for replacement

Before removing, replacing, and configuring the SPHiNX appliance, consider the following:

Gathering tools, supplies, and work space for replacement

You need the following items to complete these replacement instructions:

- #2 Phillips screwdriver
- One of the following to access the command line interface and set up SPHiNX:
 - Terminal or a computer running a terminal emulation program
 - Keyboard and monitor, plus a VGA cable to connect the monitor to SPHiNX
- Data and power cables that were connected to the failed appliance
- Work space that is big enough for two SPHiNX appliances, side-by-side

Note The SPHiNX appliance is heavy and bulky, making it difficult for one person to remove, align the rack rails, and install in a server rack. Find someone to help you when you are ready to physically remove and install the SPHiNX appliances.

Backing up

Before you begin to replace a SPHiNX chassis, be sure to

- Save the SPHiNX system restore image to a location off the appliance
- If Data Encryption is enabled, back up the key database
- Back up the IBM Tivoli Storage Manager catalog by configuring a backup host (**Configuration > System > Manage Backup Hosts** on the web interface); refer to the help for details

See the *Configuration Guide* to learn how to create a system restore image, create a backup of the key database, and update the system software.

Noting your existing port configuration

A World Wide Port Name (WWPN) is hard-coded for each HBA port. When you replace a chassis, you will reuse all HBAs, so the port numbers should not change. However, after you connect and reconfigure the replacement chassis, it is a good idea to confirm that the WWPNs remained unchanged. Use the notes you make here in "Confirming your ports are configured" on page 10.

To note the current WWPNs

1. Click the **Log In** button at the top of the SPHiNX web interface and enter credentials of an account that has the View/Manage Configuration access right.
2. Click **Configurations > Virtual Devices** on the navigation pane.
3. Make a note of the serial numbers and the WWPNs that appear under VIRTUAL TAPE DRIVES and VIRTUAL TAPE LIBRARIES.

VIRTUAL TAPE DRIVES								
VTD	Port	Target	Lun	Initiator	Serial Num	Tape Type	WWPN	Actions
ROBLIB_1	3a	0	1	7	0973078791	ULT3580-TD4	0x21000024ff206b46	
ROBLIB_2	3a	0	2	7	0973079047	ULT3580-TD4	0x21000024ff206b46	

VIRTUAL TAPE LIBRARIES								
VTL	Port	Target	Lun	Initiator	Serial Num	Library Type	WWPN	Actions
ROBLIB	3a	0	0	7	78787878	TS3500_ROBLIB	0x21000024ff206b46	

Creating a system restore image

When you create a system restore image, the following information is backed up:

- All configuration databases
- root and bill home directories
- Some contents of the **/etc** and **/usr/local/tape/etc** directories

A system restore image does not include virtual tape data.

Note These steps are part of a larger procedure for backing up a system. Refer to the “Managing the Server” chapter of the *Configuration Guide* for complete information.

To create a system restore image

1. Make sure SPHiNX is not in use and that no virtual tapes are mounted.
2. Click **Support > System Updates** on the navigation pane.
3. Click **Create System Restore Image**. The Creating System Restore Image page is displayed.
4. When prompted, choose to save the .tgz file.

It is recommended that you save a copy of the system restore image (.tgz file) to a remote system, for safekeeping.

Powering down the appliance

Shutting down SPHiNX disables all functions and the web interface.

To shut down

1. Power down the SCSI converter using the power switch on the rear panel, if necessary.
2. Execute the halt command by clicking **Administrations > System Tasks** on the navigation pane of the web interface and then click **Halt the System**.

Allow the SPHiNX several minutes to completely shut down before proceeding. The SPHiNX appliance console will indicate "System Halted."

3. Press the power button on the front panel of the SPHiNX server module. The button light changes from green to yellow.
4. Detach the front bezel (faceplate).

Now, you are ready to disconnect the appliance and remove it from the server rack.

Installing the new appliance

To install the new appliance, you will

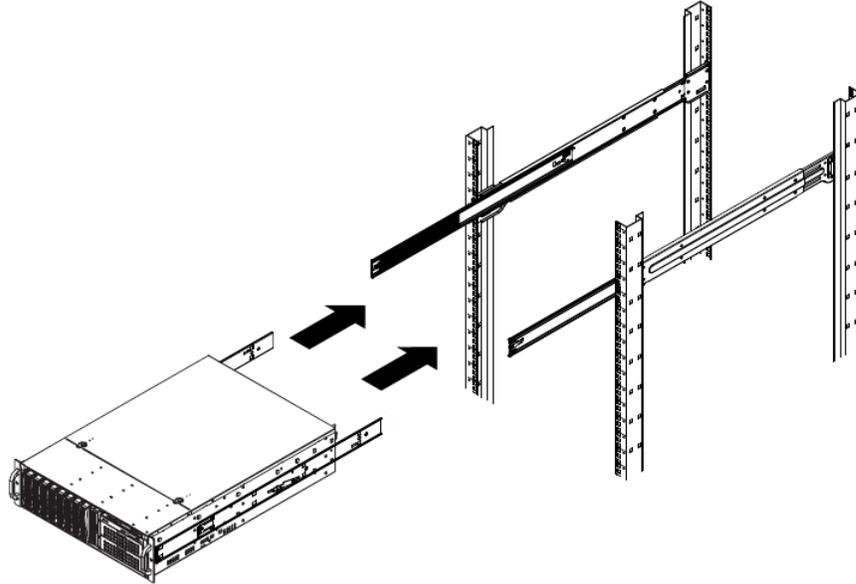
- Install SPHiNX in the rack
- Cable the appliance
- Power on the appliance
- Install the bezel (faceplate)

Installing the appliance in the rack

To install the new SPHiNX appliance

1. With the help of an assistant, line up the rear of the chassis rails with the front of the rack rails.
2. Slide the chassis rails into the rack rails, keeping the pressure even on both sides. You may have to depress the locking tabs when inserting. When the appliance is pushed completely into the rack, the

locking tabs “click”.



Reconnecting the appliance

After you reinstall the appliance in the rack, you can plug in all its cables. The following illustrations can serve as a guide.

Back of the 1U-s appliance

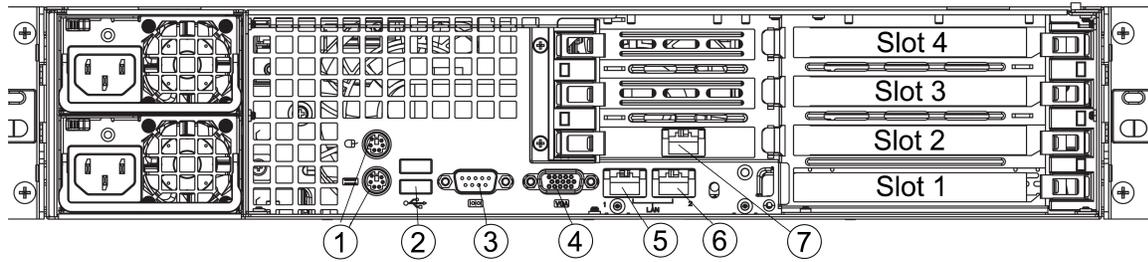
- | | | |
|--------------|----------------|---------------------------|
| 1. PS/2 port | 4. Serial port | 6. Ethernet port 1 (eth0) |
| 2. PS/2 port | 5. SVGA port | 7. Ethernet port 2 (eth1) |
| 3. USB ports | | |

For slots 1 and 2, the following cards may be installed. The ports in slots 1 and 2 are numbered from right to left.

- | | | | |
|---------------------------------------|---|----------------------------|-------------------------|
| • Dual-port 4Gb Fibre Channel card(s) | • <i>In slot 2 only</i> Dual-port SCSI card | • Single-port SCSI card(s) | • Dual-port SAS card(s) |
|---------------------------------------|---|----------------------------|-------------------------|

Note The 1-port SCSI card cannot be connected to a host server. It is provided for external device support only.

Back of the 2U and 2U-s appliance



- | | | |
|----------------|---------------------------|---------------------------|
| 1. PS/2 ports | 4. SVGA port | 6. Ethernet port 2 (eth1) |
| 2. USB ports | 5. Ethernet port 1 (eth0) | 7. IPMI port |
| 3. Serial port | | |

The RAID controller card is installed in slot 1. For slots 2, 3, and 4, the following cards may be installed. The ports on each card are numbered from right to left.

- Dual-port 4Gb Fibre Channel card(s)



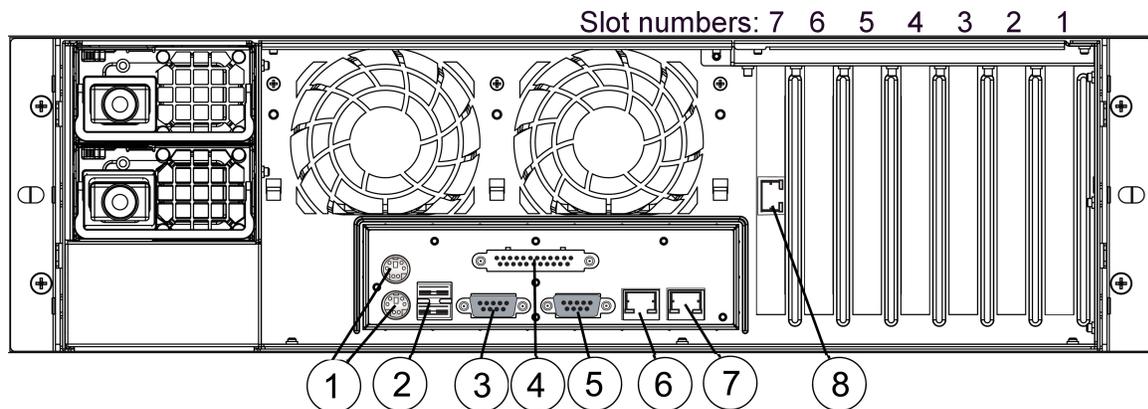
- Dual-port SCSI card(s)



- Dual-port SAS card(s)



Back of the 3U and 3U-n appliance



- | | | |
|----------------|---------------------------|---------------------------|
| 1. PS/2 ports | 4. SVGA port | 7. Ethernet port 2 (eth1) |
| 2. USB ports | 5. Serial port | 8. IPMI port |
| 3. Serial port | 6. Ethernet port 1 (eth0) | |

For slots 1-4 and 6, the following cards may be installed. The ports on each card are numbered from top to bottom (a and b on 2-port cards, a-d on 4-port cards).

- Dual-port Fibre Channel card(s)



- Quad-port Fibre Channel card(s)



- Dual-port SCSI card(s)



- Dual-port SAS card(s)



may be installed in
- slot 1
- slot 2
- slot 3
- slot 4
- slot 6

may be installed in
- slot 6

may be installed in
- slot 1
- slot 2
- slot 3

may be installed in
- slot 1
- slot 4

The ports on each card are numbered from top to bottom (a and b on 2-port cards and a-d on 4-port cards).

Back of the 3U-s and 3U-ns appliance

- | | | |
|---------------|----------------|---------------------------|
| 1. PS/2 ports | 4. Serial port | 6. Ethernet port 1 (eth0) |
| 2. USB ports | 5. SVGA port | 7. Ethernet port 2 (eth1) |
| 3. IPMI port | | |

For slots 1-5, the following cards may be installed. The ports on each card are numbered from top to bottom (a and b on 2-port cards, a-d on 4-port cards).

- | | | | |
|-----------------------------------|-----------------------------------|----------------------------|-------------------------|
| • Dual-port Fibre Channel card(s) | • Quad-port Fibre Channel card(s) | • Single-port SCSI card(s) | • Dual-port SAS card(s) |
|-----------------------------------|-----------------------------------|----------------------------|-------------------------|

Back of the CS, ES, and NS appliance

- | | | |
|----------------|--|-------------|
| 1. SSDs | 4. USB ports | 6. VGA port |
| 2. Serial port | 5. Ethernet ports
(left: eth0, right: eth1) | |
| 3. IPMI port | | |

For slots 3-7, the following cards may be installed. The ports on each card are numbered from top to bottom (a and b on 2-port cards, a-d on 4-port cards).

- | | | | |
|------------------------------------|------------------------------------|-------------------------|----------------------|
| • Dual-port 8Gb Fibre Channel card | • Quad-port 8Gb Fibre Channel card | • Single-port SCSI card | • Dual-port SAS card |
|------------------------------------|------------------------------------|-------------------------|----------------------|

Slot 1 contains the RAID controller card, and slot 2 contains a dual-port SAS3 JBOD expansion card.

Back of the WS appliance

1. COM1 port
2. IPMI port
3. USB ports
4. Ethernet ports
(top: eth0, bottom: eth1)

5. VGA port

For slots 5-7, the following cards may be installed. The ports on each card are numbered from top to bottom (a and b on 2-port cards, a-d on 4-port cards).

- Dual-port 8Gb Fibre Channel card
- Quad-port 8Gb Fibre Channel card
- Single-port SCSI card
- Dual-port SAS card

Slots 1-4 are not supported and cannot be used.

To reconnect the appliance

1. Use the cables you disconnected from the old SPHiNX appliance and plug them into the new one, in exactly the same arrangement you had before.

Note If you need to make any changes, see the *SPHiNX-CX Quick Start Guide*.

2. Connect the power cord(s) you pulled from the old appliance into the power port(s) on the new appliance.

Note If you have a physical tape device or disk array, be sure it is running and connected to SPHiNX before you turn on the new appliance. If SPHiNX is running when you power on a physical tape device, reboot SPHiNX so it will recognize the tape device.

Powering on the appliance

Press the power button located on the front panel of the SPHiNX appliance.

Allow SPHiNX to completely boot before proceeding. The console will display a login prompt when it is ready to proceed.

Installing the chassis bezel (faceplate)

Remove the bezel to the front of the old SPHiNX chassis and install it on the new one by inserting the bezel into the left side of the chassis and then into the right. Use the holes as guides and verify that both sides are seated firmly.

Reconfiguring the network interfaces

After replacing a chassis, the system's network settings are not configured correctly. For example, if eth0 and eth1 existed before replacing the drive, eth2 and eth3 are present after (and eth0 and eth1 are not present). A script is provided that enables you to reconfigure the network interfaces.

To reconfigure the network interfaces

1. From the command line, log in to the system as the **root** user.
2. Run the `/usr/local/tape/bin/clear_net_rules` script.
3. Reboot the system.

Confirming your ports are configured

The following procedure explains how to confirm that the ports (WWPNs) on the SPHiNX and the host server (s) have not changed.

To confirm that your ports have not changed

1. After you reboot SPHiNX (see the previous section), log in to the SPHiNX web interface using an account that has the View/Manage Configuration access right. Click the **Log In** button at the top of the page and enter a username and password.
2. Click **Configuration > Virtual Devices** on the navigation pane.
3. Look under VIRTUAL TAPE DRIVES and VIRTUAL TAPE LIBRARIES. The WWPNs for each virtual tape drive and virtual tape library should be identical to those you noted in step 3 of "Noting your existing port configuration" on page 3.

The screenshot displays two sections of the SPHiNX web interface. The top section, titled "VIRTUAL TAPE DRIVES", contains a table with columns: VTD, Port, Target, Lun, Initiator, Serial Num, Tape Type, WWPN, and Actions. It lists two entries: ROBLIB_1 and ROBLIB_2. Below the table is a button labeled "Add Virtual Tape Drive >". The bottom section, titled "VIRTUAL TAPE LIBRARIES", contains a table with columns: VTL, Port, Target, Lun, Initiator, Serial Num, Library Type, WWPN, and Actions. It lists one entry: ROBLIB.

VTD	Port	Target	Lun	Initiator	Serial Num	Tape Type	WWPN	Actions
ROBLIB_1	3a	0	1	7	0973078791	ULT3580-TD4	0x2100001b329dddc7	
ROBLIB_2	3a	0	2	7	0973079047	ULT3580-TD4	0x2100001b329dddc7	

Add Virtual Tape Drive >

VTL	Port	Target	Lun	Initiator	Serial Num	Library Type	WWPN	Actions
ROBLIB	3a	0	0	7	78787878	TS3500_ROBLIB	0x2100001b329dddc7	

4. In a terminal window, check your host servers to make sure that they discovered the old WWPNs.
5. If you have switches on your network and you have zones configured, your zone configuration should not have changed, either.

Verifying that the new appliance is properly configured

After SPHiNX reboots, you can check its status to ensure that it is configured properly.

To verify the new appliance's configuration

1. Log in as the admin user, if you have not done so already.
2. Click **System Status** on the navigation pane. The System Status page is displayed.
3. Confirm your vault configuration. In addition, your services should be running and your server host connections should be active.

System Status admin@VTS15 [Log Out](#) [Help »](#)

Appliance Product version: 8.0-22
Serial number: A10057
System Time: Tuesday, February 28, 2012 11:18AM CST

Services [Refresh](#)

Service	Active
TAPESERVER	YES

Virtual Device Status

Device Name	Type	Command	kb/sec	Virtual Media
VF1501	5257	REWIND	0	\\VAULT01\PERF_POOL1\CART
VF1502	5257	REWIND	0	\\VAULT01\PERF_POOL2\CART
VF1503	5257	REWIND	0	\\VAULT01\PERF_POOL3\CART
VF1504	5257	REWIND	0	\\VAULT01\PERF_POOL4\CART
VF1505	5257	INQUIRY	0	\\VAULT01\PERF_POOL5\CART
VF1506	5257	INQUIRY	0	\\VAULT01\PERF_POOL6\CART
VF1507	5257	INQUIRY	0	\\VAULT01\PERF_POOL7\CART
VF1508	5257	INQUIRY	0	\\VAULT01\PERF_POOL8\CART
VF1509	5257	INQUIRY	0	\\VAULT01\PERF_POOL9\CART
VF1510	5257	INQUIRY	0	\\VAULT01\PERF_POOL10\CART
VF1511	5257	INQUIRY	0	\\VAULT01\PERF_POOL11\CART
VF1512	5257	INQUIRY	0	\\VAULT01\PERF_POOL12\CART

Job Status [View Jobs »](#)

Displays running jobs, jobs that are scheduled to run in the next 4 hours and jobs that completed in the last 4 hours

Job Name	Job Type	Job Description	Time	Status
No job status available to display.				

Storage [View Storage Report »](#)

Licensed Capacity: 1TB
Used Capacity: 265.9 GB

Storage Location	Size	Available
VAULT00	76G	72G (95%)
VAULT01	1.1T	1.1T (96%)
VAULT02	917G	831G (95%)
VAULT03	917G	830G (95%)
VAULT04	1.1T	1.1T (96%)
VAULT05	917G	856G (96%)
VAULT06	917G	856G (96%)
VAULT07	1.1T	1.1T (99%)
VAULT08	917G	856G (96%)
VAULT09	917G	856G (96%)
VAULT10	1.1T	1.1T (99%)
VAULT11	917G	856G (96%)
VAULT12	917G	856G (96%)

If SPHiNX does not appear to be working properly, see the Help Set for troubleshooting information. For extensive configuration information, see the *Quick Start Guide* and the *Configuration Guide*.

Returning the old SPHiNX chassis

After you confirm that the new SPHiNX is up and running, return the old chassis to the address provided in your RMA within five working days.

To return the failed SPHiNX chassis

1. If you have not already done so, place the old chassis in the packaging that you saved.
2. Attach the return shipping label to the box. If you need to create a new label, be sure to include the RMA number that Technical Support gave you.

Replacing SPHiNX Parts

You can replace the following components:

- power supply
- data drive(s)
- horizontal host bus adapter (HBA) in the 1U and 2U appliance, or vertical HBA in the 3U appliances
- RAID controller battery

The power supply and data drives can be “hot-swapped,” which means you can replace them while the appliance is powered up and connected to your network. After you work with your Support representative to identify the problem component, you will be sent a replacement.

This chapter explains how to replace the parts and avoid the loss of critical enterprise data. Follow these instructions carefully. To replace a SPHiNX chassis, see “Replacing a SPHiNX Chassis” on page 5.

Preparing for replacement

You will need the following items to complete these replacement instructions:

- #2 Phillips screwdriver
- Packaging that came with your replacement part, which you will re-use to return the old part
- One of the following to access the command line interface and set up SPHiNX:
 - Terminal or a computer running a terminal emulation program
 - Keyboard and monitor, plus a VGA cable to connect the monitor to SPHiNX
- Ethernet and power cables that were connected to SPHiNX
- Work space that is big enough for a SPHiNX chassis

Note The SPHiNX appliances are heavy, making it very difficult for just one person to hold, unclip the rack rails, and then align and re-install. Ask someone to help you physically remove and replace the appliances in the server rack.

Replacing a power supply

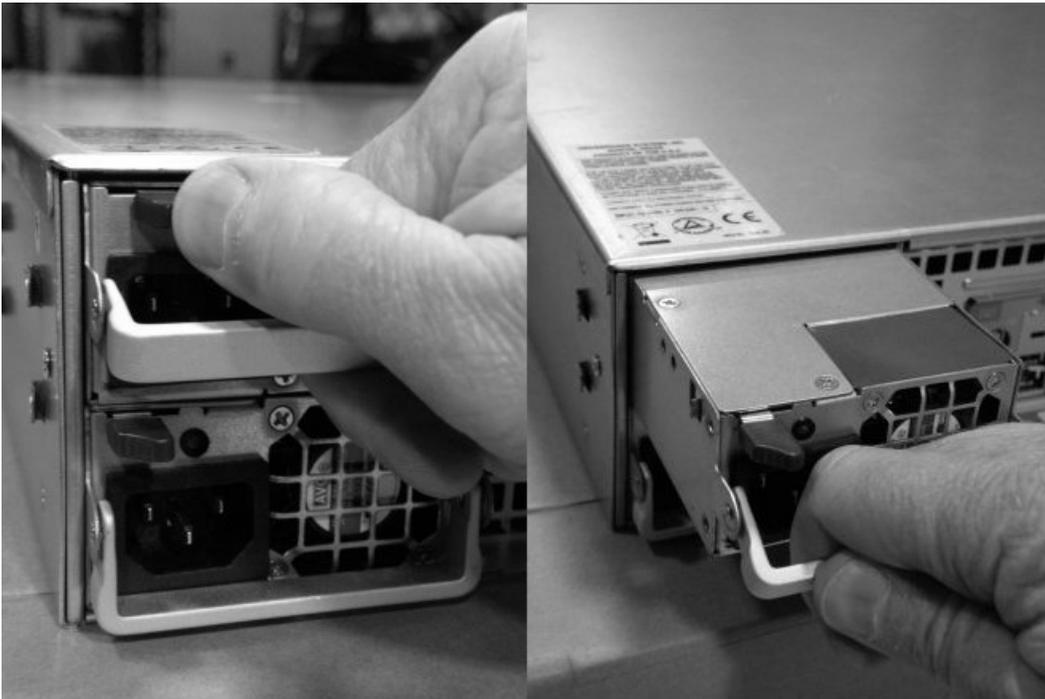
All SPHiNX appliances have redundant power supplies except the WS. Use the following procedure to replace a power supply while the appliance is operating on all other models.

To replace a power supply

1. Unbox the new power supply, making sure to keep its packaging.
2. Gain access to the rear of the SPHiNX appliance. Make sure that you have at least two feet of clearance behind the power supply.
3. Unplug the power supply you are replacing.

Note The light on the power supply you are replacing be amber or off. A green light indicates a working power supply.

4. Slide the red release tab and use the handle to pull the power supply out of the chassis.



5. Insert the new power supply firmly into the chassis until you hear a click.
Note Be sure that the new power supply clicks securely in place. (You should not be able to pull it out again without sliding the red release tab.)
6. Plug the power cord into the new power supply module. Its LED should turn green.
7. Follow your RMA instructions to return the old power supply for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing a disk drive

If a hard drive in your appliance fails, you can replace it while the appliance is operating. The replacement procedure you will use depends on your model:

- The 2U, 3U, and 3U-n appliances have 3ware RAID controllers. See "Replacing a drive in the 2U, 3U, or 3U-n" on page 16 for instructions.
- The 1U-s, 2U-s, 3U-s, and 3U-ns appliances have MegaRaid controllers. See "Replacing a drive in the 1U-s, 2U-s, 3U-s, or 3U-ns" on page 19
- The CS, ES, or WS appliance use a software RAID that relies on one or more RAIDZ1 disk sets. See Replacing a drive in the CS, ES, or WS for instructions.

CAUTION! Failure to follow the instructions could result in data loss. Contact SPHiNX Support if you need assistance.

Note To avoid compatibility issues, use the same hard disk model as the replacement unit. If that's not possible, use the next available size of replacement disk, measured by usable sectors (the number of usable sectors must be either the same size or greater than the disk's that's being replaced). For example, if a pool was created with a "500 GB" drive and you need to replace it with another "500 GB" drive, you may not be able to do so if the drives are not of the same make, model, and firmware revision. When using more than one disk it is possible to have different number of usable sectors, depending on the disks' models.

Before beginning

- Back up your data and your configuration:
 - Save the SPHiNX system restore image to a location off of the appliance.
 - If Data Encryption is enabled, back up the key database.
 - Back up the IBM Tivoli Storage Manager catalog by configuring a backup host (**Configuration > System > Manage Backup Hosts** on the web interface); refer to the help for details

See the *Configuration Guide* to learn how to perform these procedures.

- Be sure that you remove *only* the failed drive. Removing more than one drive from the chassis while it is running will cause loss of all data. See the Help Set for backup instructions.

Replacing a drive in the 2U, 3U, or 3U-n

To replace a failed disk drive

1. Determine which drive has failed:
 - a. In a web browser, log in as an administrator to 3ware 3DM2 for the RAID controller in your SPHiNX 2U, 3U, or 3U-n. For example, enter
https://vts16:888/
where *vts16* is the name of your appliance.
After you log in, the Summary page is displayed.
 - b. At the top of the page under Information, click **Drive Information**. The Drive Information page is displayed.

- c. To find the bad drive, look in the Status column for an error, such as "Read Failure".

Port	Model	Capacity	Serial #	Firmware	Unit	Status	Identify
0	ST380815AS	74.53 GB	6QZ3DK6X	3.AAD	0	OK	<input type="checkbox"/>
1	ST380815AS	74.53 GB	6QZ3DMQ8	3.AAD	0	OK	<input type="checkbox"/>
2	ST3750525AS	696.64 GB	5VP7W39N	JC45	1	OK	<input type="checkbox"/>
3	ST3750525AS	696.64 GB	5VP7WVBV	JC45	1	OK	<input type="checkbox"/>
4	ST3750525AS	696.64 GB	5VP7XP8T	JC45	1	OK	<input type="checkbox"/>
5	ST3750525AS	696.64 GB	5VP7WVBT	JC45	1	Read Failure	<input type="checkbox"/>
6	ST3750640AS	696.64 GB	5QD09873	3.AAE	2	OK	<input type="checkbox"/>
7	ST3750640AS	696.64 GB	5QD0D0WL	3.AAE	2	OK	<input type="checkbox"/>
8	NOT PRESENT	--	--	--	--	--	<input type="checkbox"/>
9	NOT PRESENT	--	--	--	--	--	<input type="checkbox"/>

- d. Write down the serial number of the failed drive (for example: 5VP7WVBT).
2. Power down the SPHiNX appliance and locate the failed drive by looking at the serial number printed on the drive's label.
 - a. Press the release tab for each drive and then swing each drive handle forward.



- b. Once you locate the failed drive, pull it out of the chassis.
 - c. Reinsert all other drives back into the chassis.

CAUTION! Reinstalling a **failed** drive in a RAID array will cause the loss of all data. Call your Support representative if you are unsure about identifying the bad drive.
3. Unbox the new data drive, making sure to keep its packaging.

Note The replacement drive comes mounted in a drive tray, so all you need to do is pull the failed drive out and replace it.
 4. Push the new hard drive into the open chassis slot and close the tray handle.
 5. Power on the SPHiNX appliance.
 6. In the 3ware 3DM2 user interface, return to the Drive Information page. Note that the **Status** changed to OK.

3ware 3DM[®]2 VTS21.commstor.crossroads.com (Linux 2.6.18-128.7.1.el5) Administrator logged in Logout

Summary	Information	Management	Monitor	3DM 2 Settings	Help
Refresh	Drive Information		Select Controller	Controller ID 0 (9650SE-16ML) ▼	

Drive Information (Controller ID 0)							
Port	Model	Capacity	Serial #	Firmware	Unit	Status	Identify
0	ST380815AS	74.53 GB	6QZ3DK6X	3.AAD	0	OK	<input type="checkbox"/>
1	ST380815AS	74.53 GB	6QZ3DMQ8	3.AAD	0	OK	<input type="checkbox"/>
2	ST3750525AS	698.64 GB	5VP7W39N	JC45	1	OK	<input type="checkbox"/>
3	ST3750525AS	698.64 GB	5VP7WVBV	JC45	1	OK	<input type="checkbox"/>
4	ST3750525AS	698.64 GB	5VP7XP8T	JC45	1	OK	<input type="checkbox"/>
5	ST3750640AS	698.64 GB	5QD0D099	3.AAE	??	OK	<input type="checkbox"/>
6	ST3750640AS	698.64 GB	5QD09873	3.AAE	2	OK	<input type="checkbox"/>
7	ST3750640AS	698.64 GB	5QD0D0WL	3.AAE	2	OK	<input type="checkbox"/>

7. Under Management, click **Maintenance**. The Maintenance page is displayed.

3ware 3DM[®]2 VTS21.commstor.crossroads.com (Linux 2.6.18-128.7.1.el5) Administrator logged in Logout

Summary	Information	Management	Monitor	3DM 2 Settings	Help
Refresh	Maintenance		Select Controller	Controller ID 0 (9650SE-16ML) ▼	

Rescan Controller (This will scan all ports for newly inserted drives/units)

Unit Maintenance (Controller ID 0)						
Unit 0	<input type="checkbox"/>	2 drives	RAID 1		74.50 GB	OK
Port 1			ST380815AS	SATA	74.53 GB	OK [Remove Drive]
Port 0			ST380815AS	SATA	74.53 GB	OK [Remove Drive]
Unit 1	<input checked="" type="checkbox"/>	4 drives	RAID 5		2.05 TB	DEGRADED
			--	--	--	NOT PRESENT
Port 4			ST3750525AS	SATA	698.64 GB	OK
Port 3			ST3750525AS	SATA	698.64 GB	OK
Port 2			ST3750525AS	SATA	698.64 GB	OK
Unit 2	<input type="checkbox"/>	2 drives	RAID 1		698.48 GB	OK
Port 7			ST3750640AS	SATA	698.64 GB	OK [Remove Drive]
Port 6			ST3750640AS	SATA	698.64 GB	OK [Remove Drive]

Verify Unit Rebuild Unit Migrate Unit Remove Unit Delete Unit

*Before removing or deleting a unit, make sure there is no I/O on the unit and unmount it

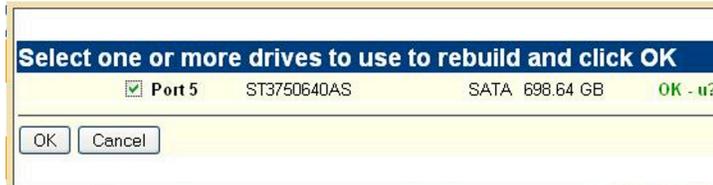
Available Drives (Controller ID 0)				
Port	Model	Capacity	Status	
<input type="checkbox"/>	5 ST3750640AS	698.64 GB	OK - u?	

Select All Drives

Create Unit Remove Drive Set Spare(s) Clear Configuration

8. Click the checkbox next to the unit showing a DEGRADED status, such as Unit 1.

9. Click **Rebuild Unit**. The following pop-up dialog is displayed.



10. Click the checkbox next the hard drive you just installed, such as Port (slot) 5.
11. Click **OK**. The following message is displayed on the Maintenance page:

Successfully started Rebuild on Unit 1.

When the RAID array finishes rebuilding, the status of the drive changes from DEGRADED to OK.

CAUTION! It may take several hours for SPHiNX to rebuild the array. While SPHiNX can be used during this time, its performance will be slow. Removing another hard drive while the array is rebuilding will cause the loss of all data.

12. Follow your RMA instructions to return the old hard drive for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing a drive in the 1U-s, 2U-s, 3U-s, or 3U-ns

CAUTION! Failure to follow the instructions could result in data loss. Contact SPHiNX Support if you need assistance.

To replace a failed disk drive

1. Identify the failed disk using the command line:
 - a. Log in to the SPHiNX server as **bill** or **root**.
 - b. Enter the following command to identify the failed drive:

```
/opt/MegaRAID/MegaCli/MegaCli64 -LDInfo -Lall -aALL
```

Here is an example of the output for the failed drive. Note that the state is "Degraded":

```
Virtual Drive: 1 (Target Id: 1)
Name           :
RAID Level     : Primary-5, Secondary-0, RAID Level
Qualifier-3
Size           : 8.087 TB
State          : Degraded
Strip Size     : 256 KB
Number Of Drives : 4
Span Depth     : 1
Default Cache Policy: WriteBack, ReadAhead, Direct, No Write
Cache if Bad BBU
...
```

Note that the number of drives in the degrade virtual drive is four.

- c. To determine which of the drives in the degraded virtual drive is bad, enter this command to determine if the drive is in a Failed state:

```
/opt/MegaRAID/MegaCli/MegaCli64 -PDList -a0 |grep state
```

Here is an example of the output:

```
Firmware state: Online, Spun Up
Firmware state: Online, Spun Up
Firmware state: Online, Spun Up
Firmware state: Failed
Firmware state: Online, Spun Up
```

- d. If you still cannot identify the failed disk, you can use this command, which can show the status of a drive that is "Predicted" to fail and may be causing the system to beep:

```
for d in $disks; do echo "-----DISK ID: $d-----
-----"; smartctl -H -d megaraid,$d /dev/sda; done
```

Here is an example of the output (disk number and health status is bolded):

```
-----DISK ID: 30-----
smartctl 5.42 2011-10-20 r3458 [x86_64-linux-2.6.32-
504.12.2.el6.x86_64] (local build)
Copyright (C) 2002-11 by Bruce Allen,
http://smartmontools.sourceforge.net
SMART Health Status: OK

-----DISK ID: 31-----
smartctl 5.42 2011-10-20 r3458 [x86_64-linux-2.6.32-
504.12.2.el6.x86_64] (local build)
Copyright (C) 2002-11 by Bruce Allen,
http://smartmontools.sourceforge.net
SMART Health Status: OK

-----DISK ID: 32-----
smartctl 5.42 2011-10-20 r3458 [x86_64-linux-2.6.32-
504.12.2.el6.x86_64] (local build)
Copyright (C) 2002-11 by Bruce Allen,
http://smartmontools.sourceforge.net
SMART Health Status: OK

-----DISK ID: 33-----
smartctl 5.42 2011-10-20 r3458 [x86_64-linux-2.6.32-
504.12.2.el6.x86_64] (local build)
Copyright (C) 2002-11 by Bruce Allen,
http://smartmontools.sourceforge.net
SMART Health Status: FAILURE PREDICTION THRESHOLD EXCEEDED
[asc=5d, ascq=0]
```

To get the serial number of the failing disk ID, enter this command:

```
smartctl -i -d megaraid,disk# /dev/sda
```

If you enter **33** for *disk#*, here is an example of its output (serial number is bolded):

```
smartctl 5.42 2011-10-20 r3458 [x86_64-linux-2.6.32-
504.12.2.el6.x86_64] (local build)
Copyright (C) 2002-11 by Bruce Allen,
http://smartmontools.sourceforge.net

Vendor:                SEAGATE
Product:               ST32000444SS
Revision:              0006
User Capacity:         2,000,398,934,016 bytes [2.00 TB]
Logical block size:   512 bytes
Logical Unit id:       0x5000c50034b5a81f
Serial number:         9WM715AN000092011RFK
Device type:           disk
Transport protocol:   SAS
Local Time is:         Tue Sep 15 11:00:15 2015 CDT
Device supports SMART and is Enabled
Temperature Warning Enabled
```

2. Replace the failed drive:

- a. If replacing the failed drive with a new drive, unbox the new disk drive and retain its packaging, which you will use to return the old drive.

Note The replacement hard drive comes mounted in a drive tray, so all you need to do is pull the failed hard drive out and replace it.

- b. Press the release tab and then swing the failed disk drive handle outward.



- c. Pull the failed drive out of the SPHiNX chassis.

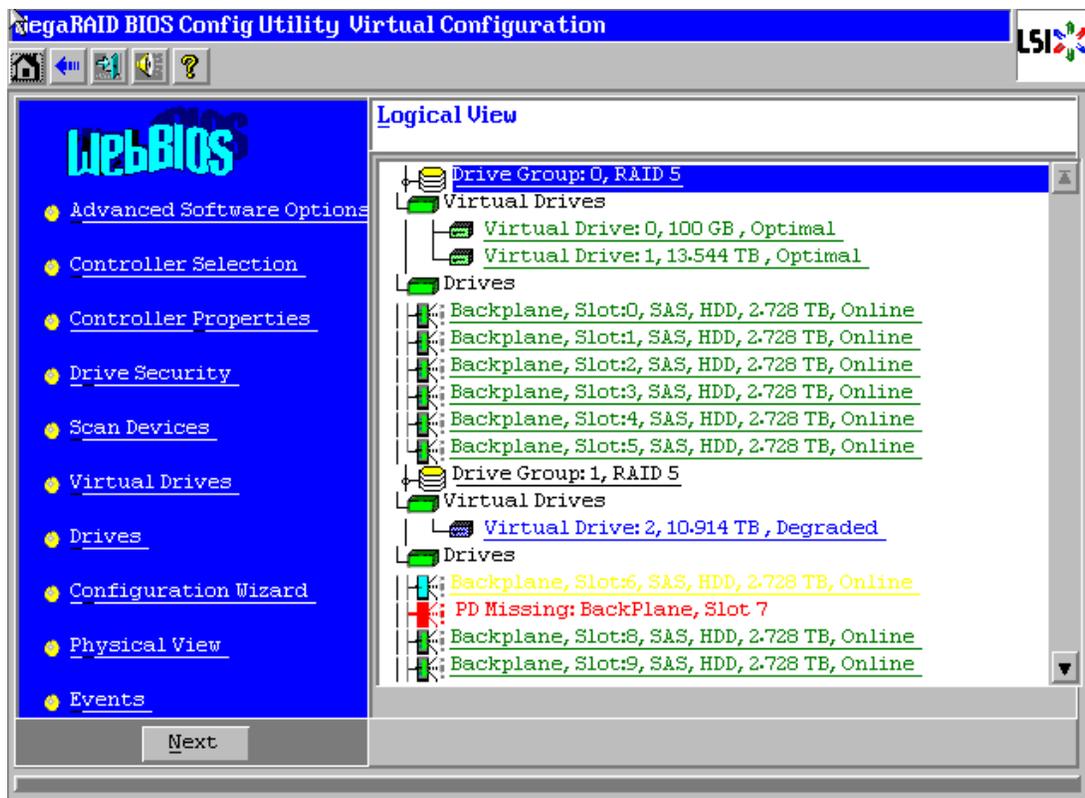
- d. Push the new drive into the open chassis slot and close the tray handle.
- e. To confirm the drive's updated status, enter this command:

```
/opt/MegaRAID/MegaCli/MegaCli64 PDList aALL
```

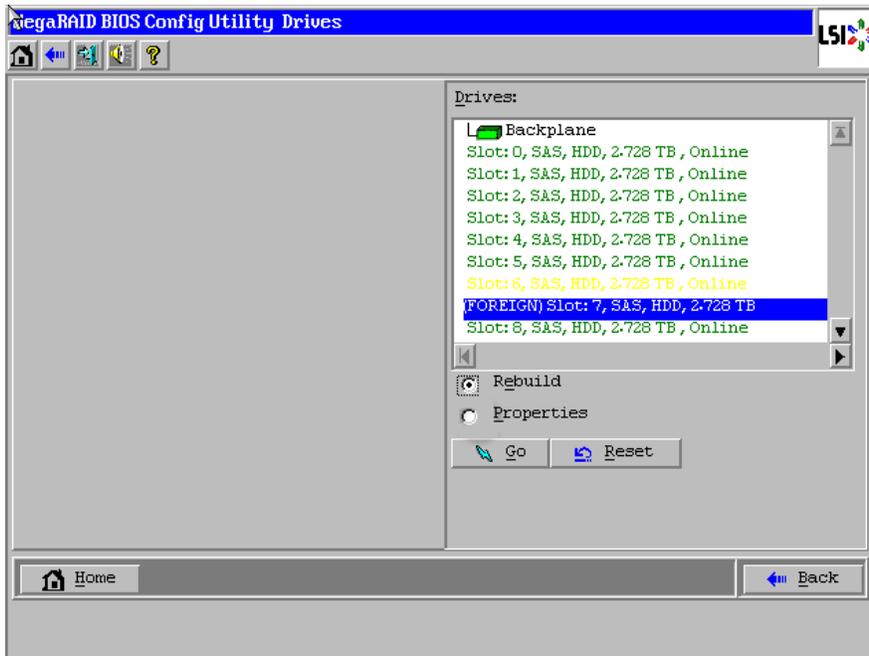
3. If you replaced the failed drive with a used or reconditioned drive, it may not be automatically accepted. If it is not accepted, it is marked as "FOREIGN", and it is not updated automatically by the RAID controller. Therefore, a full rebuild is required. Use the MegaRAID web interface to accept the new (foreign) disk and rebuild it.

Note If the replaced drive is accepted, it is marked as "Rebuild" and you can skip this step.

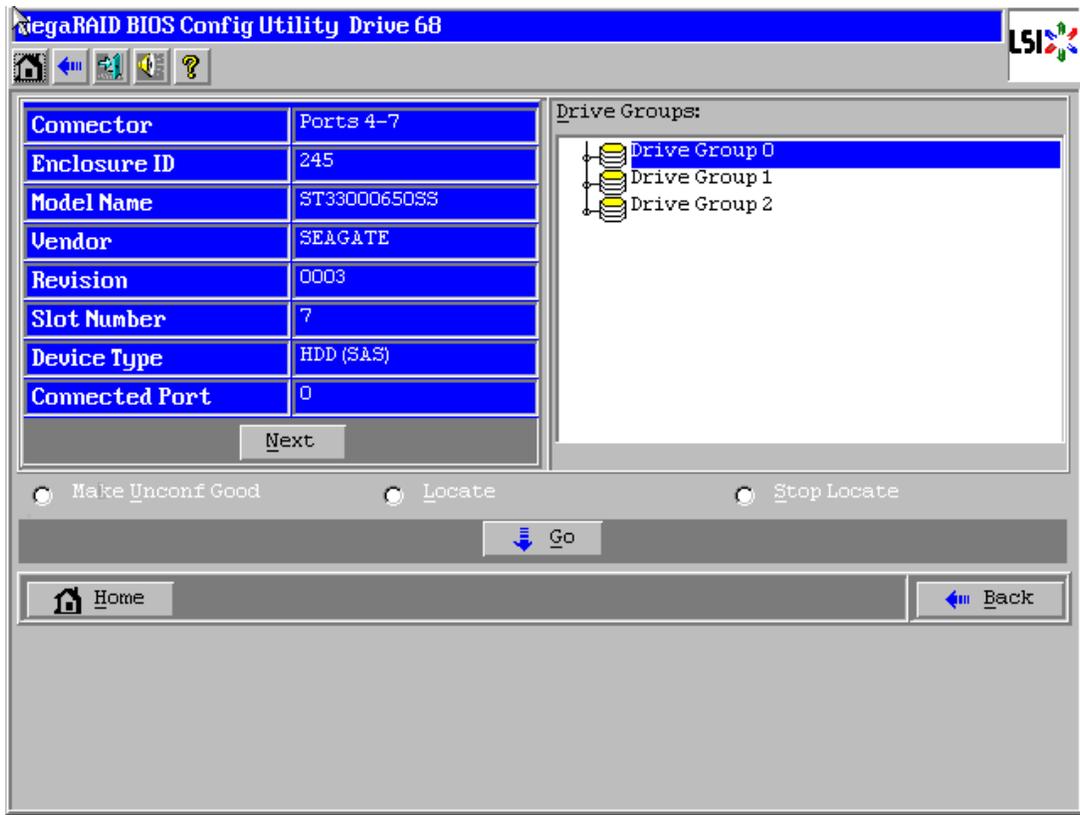
- a. Reboot the SPHiNX appliance.
- b. From the console, press **Ctrl+H** to display the LSI MegaRAID WebBIOS, which can be used to manage the RAID configuration(s). The WebBIOS window is then displayed. This example shows a bad drive in slot 7:



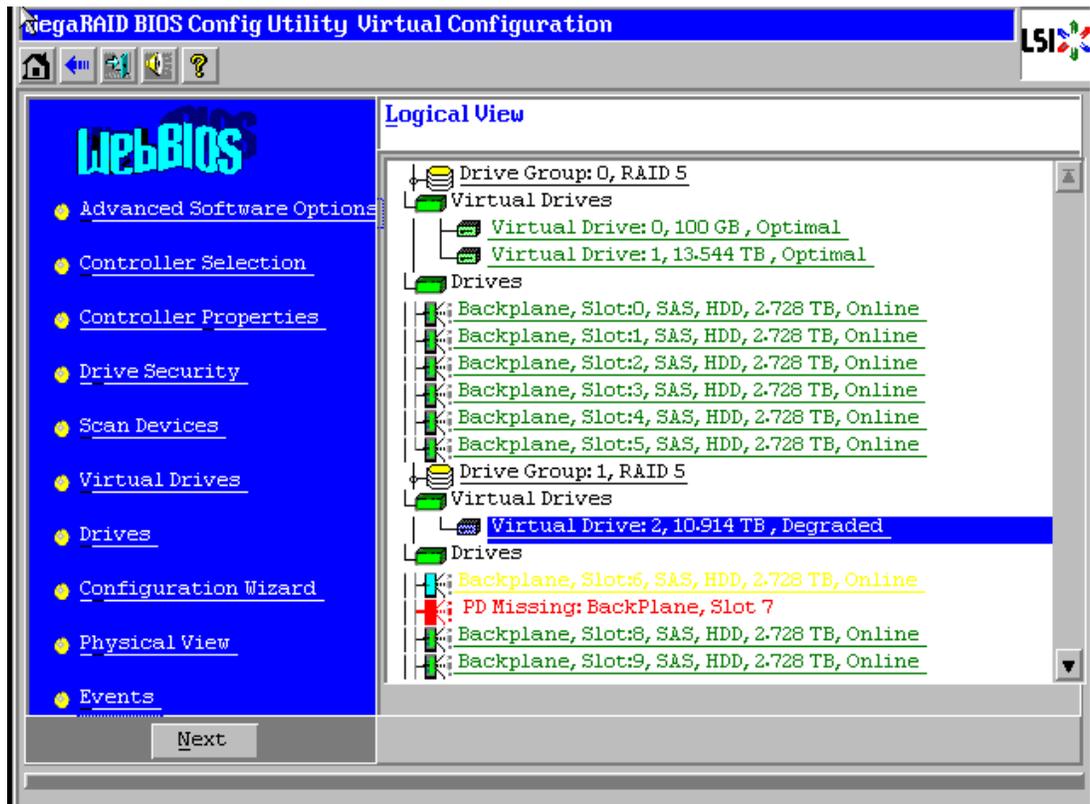
- c. Select **Drives** on the left side of the window, and then on the right side, select the foreign drive:



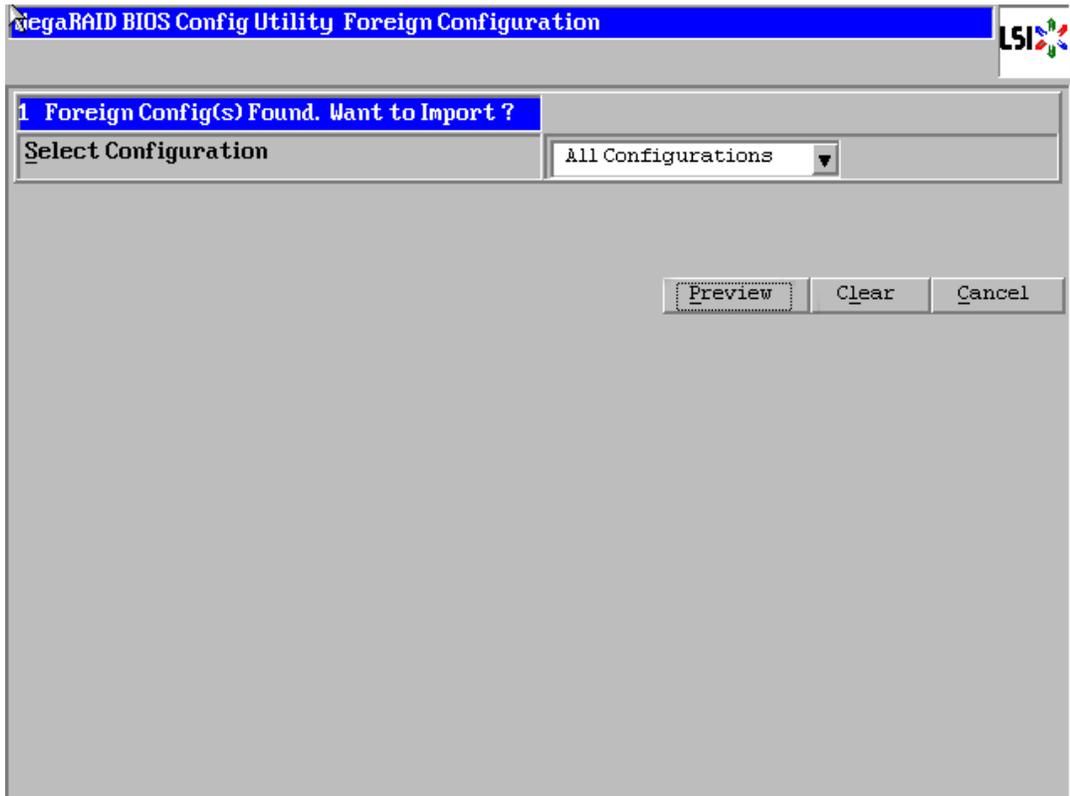
- d. Select the **Properties** option and then click **Go**.
- e. On the configuration window, select **Make Unconf Good** and then click **Go**.



f. On the left side of the window, select **Scan Devices**.

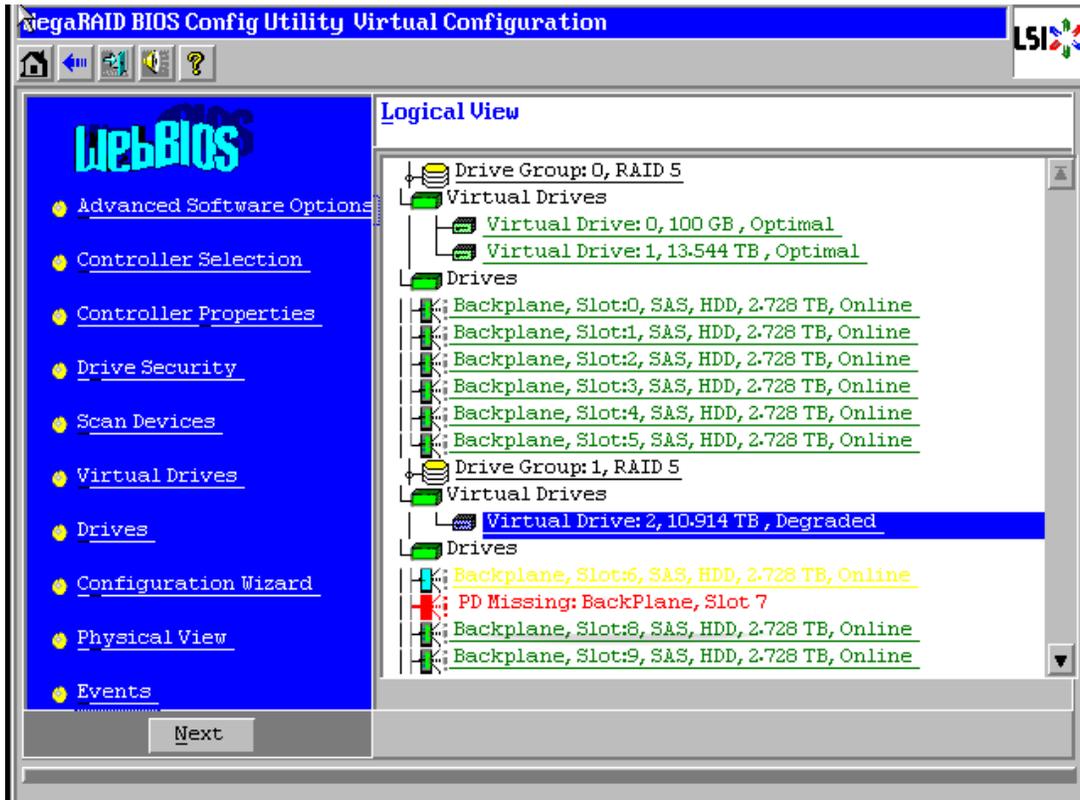


g. Preview all configurations by clicking **Preview**.

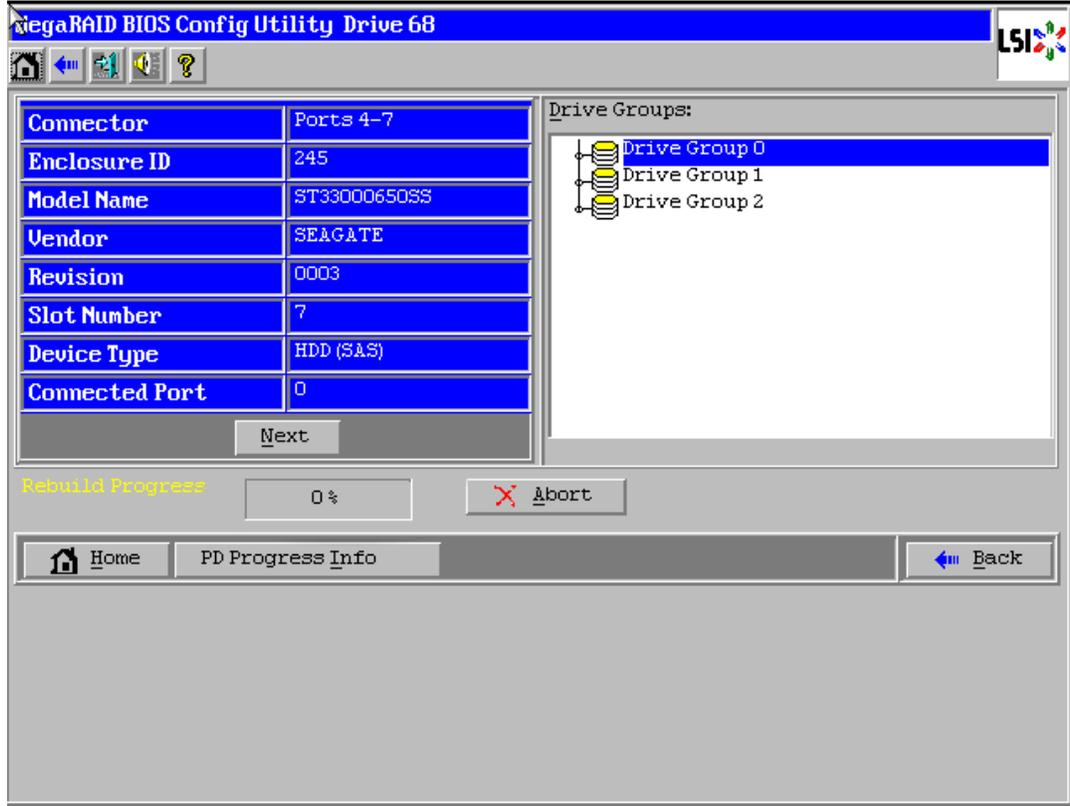


h. Import the new configuration by clicking **Import**.

i. Select the drive from Logical View list:



- j. Press Enter to monitor the Rebuild status. The rebuild progress is shown.



- k. Exit WebBIOS and then reboot the system.
4. Follow your RMA instructions to return the old hard drive for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing a drive in the CS, ES, or WS

CAUTION! Failure to follow the instructions could result in data loss. Contact SPHiNX Support if you need assistance.

Before beginning

- Stop all tape operations on the system. You can view tape activity on the [System Status](#) page and [View jobs](#) page.

To determine which disk is defective

1. issue the command `zpool status` to get details on the defective hard disk.
2. from the same command, determine the state of the pool, it should be either: ONLINE, DEGRADED or FAULTY.
3. if the state is **ONLINE**, usually, there should not be any disk to replace, try to issue the command `zpool clear storage <disk_wwn>` to clear transient error on the disk.
4. if the state is **DEGRADED**, proceed to disk replacement

5. if the state is **FAULTY**, some data will be lost, try the command `zpool status -v` to see the list of files that are affected, then proceed to disk replacement - you will need to restore those files latter.

```
[root@vts40 bill]# zpool status
pool: storage
state: DEGRADED
status: One or more devices are faulted in response to persistent
errors.
Sufficient replicas exist for the pool to continue functioning in a
degraded state.
action: Replace the faulted device, or use 'zpool clear' to mark the
device repaired.
scan: scrub repaired 0 in 6h56m with 0 errors on Tue Feb 7 15:56:59
2017
config:
NAME STATE READ WRITE CKSUM
storage ONLINE 0 0 0
raidz2-0 ONLINE 0 0 0
wwn-0x5000c500849b47c7 ONLINE 0 0 0
wwn-0x5000c500849a899b ONLINE 0 0 0
wwn-0x5000c500849b4ebf ONLINE 0 0 0
wwn-0x5000c500849a8937 ONLINE 0 0 0
wwn-0x5000c5005648af37 ONLINE 0 0 0
```

Identify Disk by WWN

Note The command `lsblk` lists disks by their name - they need to be matched with `/dev/disk/by-id`. The easiest way to get the WWN of a disk is (before inserting it in its bay) to copy it as it's printed on its label. In case you didn't copy the WWN label, follow the instructions below:

```
[bill@vts40 ~]$ lsblk | grep disk
sdg 8:96 0 232.9G 0 disk
sde 8:64 0 1.8T 0 disk
sdc 8:32 0 1.8T 0 disk
sdb 8:16 0 1.8T 0 disk
sda 8:0 0 1.8T 0 disk
sdf 8:80 0 232.9G 0 disk
sdh 8:112 0 1.8T 0 disk
```

`sdg` and `sdf` cannot be assigned to ZFS storage because they are used for VAULT00.

Use the command below to list the WWNs with their respective ids on two columns:

```
[bill@vts40 ~]$ ls -l /dev/disk/by-id | grep wwn | grep -v part | awk
'/sd*/ {print $9 " " $11}'
```

The list of WWNs will look like this:

```
wwn-0x5000c5005648af37 ../../sde
wwn-0x5000c500849a899b ../../sdb
wwn-0x5000c500849b47c7 ../../sda
wwn-0x5000c500849b4ebf ../../sdc
wwn-0x5000c500858eb02b ../../sdh
wwn-0x5002538d41442108 ../../sdf
```

Disk Replacement

To replace a failed internal disk drive

Requires the Factory Setup Activities access right

1. Click **Configuration > System > Edit System Settings > Disk Storage** to display the Disk Storage section of the Manage Settings page.
2. Click  next to the drive you want to replace. This takes the disk offline.
3. Click  next to the offline drive to replace it. This step removes the disk from the SPHiNX configuration.

Note: To identify the position of the drive in the rack, click on the blink button . When blinking, it indicates which is the physical drive that has to be removed/replaced.

4. Make note of the serial number and WWN of the offline drive and then click **Halt and replace**. This step powers down the system.
5. Verify that the system is completely shutdown. You can make sure that only the power LED is lit on the appliance. Or, you can issue a command from the console; no response should be returned.
6. Replace the failed drive:
 - a. If replacing the failed drive with a new drive, unbox the new disk drive and retain its packaging, which you will use to return the old drive.

- b. Locate the failed drive. You may need to remove each drive to identify the failed drive, comparing each drive's serial number and WWN to those noted in step 4. To remove a drive, press the release tab and then swing the failed disk drive handle outward.



- c. Pull the failed drive out of the SPHiNX chassis.
 - d. Make note of the serial number on the new drive.
 - e. Push the new drive into the open chassis slot and close the tray handle.
 - f. Power on the system.
7. Power on the system.
 8. After about five minutes, refresh the web interface and return to the Manage Settings page. The new disk should be listed, though drives may be listed as unavailable until the resilvering process completes.
 9. Follow your RMA instructions to return the old hard drive for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing an SSD

The CS, ES, NS, and WS models provide mirrored RAID1 SSDs that store the SPHiNX operating system and firmware.

- On the CS, ES, and NS models, the SSDs are located in the lower left corner on the back of the appliance (callout #1 below):

- | | | |
|----------------|--|-------------|
| 1. SSDs | 4. USB ports | 6. VGA port |
| 2. Serial port | 5. Ethernet ports
(left: eth0, right: eth1) | |
| 3. IPMI port | | |

- On the WS model, the SSDs are located on the front panel of the appliance (callout #3 below):

1. Power button
2. LT05 tape drive
3. **SSDs**

If an SSD needs to be replaced, you can follow the instructions below.

Before beginning

You may want to review this information:

- https://www.howtoforge.com/replacing_hard_disks_in_a_raid1_array
- <http://www.ducea.com/2009/03/08/mdadm-cheat-sheet/>
- https://wiki.nikhef.nl/grid/RAID-1_configuration_and_management
- <http://serverfault.com/questions/525066/how-to-boot-after-raid-failure-software-raid>

To replace a failed SSD

1. Check the RAID status of the SSDs by entering the following command:

```
cat /proc/mdstat
```

Here is an example of the output:

```
Personalities : [raid1]
md4 : active raid1 sdq4[0] sdr4[1] (F)
      221107068 blocks super 1.1 [2/1] [U_]
      bitmap: 0/2 pages [0KB], 65536KB chunk

md1 : active raid1 sdq3[2] sdr3[1] (F)
      511988 blocks super 1.0 [2/1] [U_]

md2 : active raid1 sdq1[0] sdr1[1] (F)
      20478908 blocks super 1.1 [2/1] [U_]
      bitmap: 1/1 pages [4KB], 65536KB chunk
```

```
md3 : active raid1 sdq2[2] sdr2[1] (F)
      2096120 blocks super 1.1 [2/1] [U_]
```

```
unused devices: <none>
```

The **U** indicates a partition is available, and the **_** and **(F)** indicates a partition is failed or missing. In the output listed above, all four /dev/sdr partitions have failed.

To view more detailed status of the RAID, use the following command:

```
mdadm -D /dev/md?
```

Here is an example of the output:

```
/dev/md1:
Version : 1.0
Creation Time : Mon Oct 19 23:51:47 2015
Raid Level : raid1
Array Size : 511988 (500.07 MiB 524.28 MB)
Used Dev Size : 511988 (500.07 MiB 524.28 MB)
Raid Devices : 2
Total Devices : 2
Persistence : Superblock is persistent

Update Time : Tue Oct 20 14:14:45 2015
State : clean, degraded
Active Devices : 1
Working Devices : 1
Failed Devices : 1
Spare Devices : 0

Name : sphinx:1
UUID : 145c8320:bd343cc9:4b92617d:36f39dcb
Events : 49

Number   Major   Minor   RaidDevice State
2         65      3       0         active sync  /dev/sdq3
2         0       0       2         removed
1         65     19      -         faulty    /dev/sdr3

/dev/md2:
Version : 1.1
Creation Time : Mon Oct 19 23:51:48 2015
Raid Level : raid1
Array Size : 20478908 (19.53 GiB 20.97 GB)
Used Dev Size : 20478908 (19.53 GiB 20.97 GB)
Raid Devices : 2
Total Devices : 2
Persistence : Superblock is persistent

Intent Bitmap : Internal

Update Time : Tue Oct 20 14:18:13 2015
State : clean, degraded
Active Devices : 1
```

Working Devices : 1
Failed Devices : 1
Spare Devices : 0

Name : sphinx:2
UUID : 0b87e68e:0c8cbf69:60432a70:72a16278
Events : 337

Number	Major	Minor	RaidDevice	State	
0	65	1	0	active sync	/dev/sdq1
2	0	0	2	removed	
1	65	17	-	faulty	/dev/sdr1

/dev/md3:

Version : 1.1
Creation Time : Mon Oct 19 23:51:49 2015
Raid Level : raid1
Array Size : 2096120 (2047.34 MiB 2146.43 MB)
Used Dev Size : 2096120 (2047.34 MiB 2146.43 MB)
Raid Devices : 2
Total Devices : 2

Persistence : Superblock is persistent

Update Time : Tue Oct 20 14:15:45 2015
State : clean, degraded
Active Devices : 1
Working Devices : 1
Failed Devices : 1
Spare Devices : 0

Name : sphinx:3
UUID : a61f421e:1293a5af:8a74aa36:728a21dc
Events : 43

Number	Major	Minor	RaidDevice	State	
2	65	2	0	active sync	/dev/sdq2
2	0	0	2	removed	
1	65	18	-	faulty	/dev/sdr2

/dev/md4:

Version : 1.1
Creation Time : Mon Oct 19 23:51:49 2015
Raid Level : raid1
Array Size : 221107068 (210.86 GiB 226.41 GB)
Used Dev Size : 221107068 (210.86 GiB 226.41 GB)
Raid Devices : 2
Total Devices : 2

Persistence : Superblock is persistent

Intent Bitmap : Internal

Update Time : Tue Oct 20 14:14:21 2015
State : clean, degraded

```
Active Devices : 1
Working Devices : 1
Failed Devices : 1
Spare Devices : 0

Name : sphinx:4
UUID : 22af569c:673308fc:67ccaf1f:8c25fa92
Events : 229
```

Number	Major	Minor	RaidDevice	State	
0	65	4	0	active sync	/dev/sdq4
2	0	0	2	removed	
1	65	20	-	faulty	/dev/sdr4

2. To find the serial number of the faulty SSD (/dev/sdr in this example), enter this command:

```
sg_inq -p 0x80 /dev/sdr
```

Here is an example of the output:

```
VPD INQUIRY: Unit serial number page
Unit serial number: S251NWAG406619F
```

3. Power down the SPHiNX appliance.
4. Unplug the power cable.
5. Remove the LT05 tape drive.
6. Remove the faulty SSD that corresponds to the serial number (above). You can verify the serial number on the bottom of the SSD once you pull it out of the chassis.
7. Insert the new SSD and make note of its serial number.
8. Power on the SPHiNX appliance.
9. Enter these commands to determine the SD device name of the new SSD with the serial number from step 4:

```
/usr/local/tape/bin/devserials | grep SSD
```

Here is the output:

```
[10:0:0:0], disk, sata:, /dev/sdq, /dev/sg19, , Samsung SSD 850 EVO
250GB, [250 GB], 8, 5 002538 d40054ac9, S21NNXAG408436K
[11:0:0:0], disk, sata:, /dev/sdj, /dev/sg20, , Samsung SSD 850 PRO
256GB, [256 GB], 8, 5 002538 8700e96ab, S21NNXAG408405Z
```

The second line in the output above shows the new SSD. The SD device name for the replacement SSD may be different after rebooting SPHiNX. In this case, the new replacement SSD is discovered as /dev/sdj.

10. Check the RAID status to ensure the only MD devices are md1 thru md4:

```
cat /proc/mdstat
```

Output:

```

Personalities : [raid1]
md4 : active raid1 sda4[1]
      221107068 blocks super 1.1 [2/1] [_U]
      bitmap: 1/2 pages [4KB], 65536KB chunk

md1 : active raid1 sda3[1]
      511988 blocks super 1.0 [2/1] [_U]

md2 : active raid1 sda1[1]
      20478908 blocks super 1.1 [2/1] [_U]
      bitmap: 1/1 pages [4KB], 65536KB chunk

md3 : active raid1 sda2[1]
      2096120 blocks super 1.1 [2/1] [_U]

```

In this output, the active, functional SSD has changed from `/dev/sdq` to `/dev/sda`.

11. If extra MD devices are shown, such as `md124` and so on, this may be because the new replacement SSD was formatted or partitioned previously. Here is an example of the output for the **cat `/proc/mdstat`** command that lists extra devices:

```

Personalities : [raid1]
md124 : inactive sdj1[1] (S)
       2096128 blocks super 1.1

md125 : inactive sdj4[1] (S)
       511988 blocks super 1.0

md126 : inactive sdj3[1] (S)
       2096128 blocks super 1.1

md127 : inactive sdj2[1] (S)
       511988 blocks super 1.0

md4 : active raid1 sda4[1]
      221107068 blocks super 1.1 [2/1] [_U]
      bitmap: 1/2 pages [4KB], 65536KB chunk

md1 : active raid1 sda3[1]
      511988 blocks super 1.0 [2/1] [_U]

md2 : active raid1 sda1[1]
      20478908 blocks super 1.1 [2/1] [_U]
      bitmap: 1/1 pages [4KB], 65536KB chunk

md3 : active raid1 sda2[1]
      2096120 blocks super 1.1 [2/1] [_U]

```

If this is the case, complete these steps to remove the extra devices. Otherwise, skip to step 9.

- a. Remove any existing MD RAID partitions and superblocks from the replacement SSD using these commands:

```

mdadm --stop MDpartition      MDpartition ...
mdadm --zero-superblock /dev/device# /dev/device# ...

```

Here are examples:

```
mdadm --stop md124 md125 md126 md127
```

```
mdadm --zero-superblock /dev/sdj1 /dev/sdj2 /dev/sdj3 /dev/sdj4
```

- b. Erase the partition table and last 1MB of the disk using the following commands:

```
dd if=/dev/zero of=/dev/device# bs=1M count=1
```

```
dd bs=512 if=/dev/zero of=/dev/device# count=2048 \
seek=$((`blockdev --getsz /dev/device#` - 2048))
```

Here are examples:

```
dd if=/dev/zero of=/dev/sdj bs=1M count=1
```

```
dd bs=512 if=/dev/zero of=/dev/sdj count=2048 \
seek=$((`blockdev --getsz /dev/sdj` - 2048))
```

- c. Verify that the leftover devices (md124 and so on) are no longer shown.

```
cat /proc/mdstat
```

Output:

```
Personalities : [raid1]
md3 : active raid1 sda4[1]
      221107068 blocks super 1.1 [2/1] [_U]
      bitmap: 1/2 pages [4KB], 65536KB chunk

md0 : active raid1 sda3[1]
      511988 blocks super 1.0 [2/1] [_U]

md1 : active raid1 sda1[1]
      20478908 blocks super 1.1 [2/1] [_U]
      bitmap: 1/1 pages [4KB], 65536KB chunk

md2 : active raid1 sda2[1]
      2096120 blocks super 1.1 [2/1] [_U]
```

12. Copy the original operating system (OS) from the active working SSD to the new replacement SSD to recreate the OS mirror. To do this, copy the partition table from the active working SSD to the new SSD. In the example below, /dev/sda is the active working SSD and /dev/sdj is the new SSD.

CAUTION! This command can delete your existing operating system. Make sure that the first disk that you list is the original SSD and the second is the new SSD.

Here is the command:

```
sfdisk -d /dev/<activeSSD> | sfdisk -f /dev/<newSSD>
```

Example:

```
sfdisk -d /dev/sda | sfdisk -f /dev/sdj
```

Output:

```
Checking that no-one is using this disk right now ...
OK
```

```
Disk /dev/sdj: 31130 cylinders, 255 heads, 63 sectors/track
/dev/sdj: unrecognized partition table type
```

```
Old situation:
```

```
No partitions found
```

```
New situation:
```

```
Units = sectors of 512 bytes, counting from 0
```

Device	Boot	Start	End	#sectors	Id	System
/dev/sdj1		2048	40962047	40960000	fd	Linux raid
autodetect						
/dev/sdj2		40962048	45156351	4194304	fd	Linux raid
autodetect						
/dev/sdj3	*	45156352	46180351	1024000	fd	Linux raid
autodetect						
/dev/sdj4		46180352	488396799	442216448	fd	Linux raid
autodetect						

```
Warning: partition 1 does not end at a cylinder boundary
Successfully wrote the new partition table
```

```
Re-reading the partition table ...
```

13. To quicken the rebuild process, enter this command:

```
echo 500000 > /proc/sys/dev/raid/speed_limit_max
```

14. Add each of the partitions on the replacement SSD to the MD RAID sets using this command:

```
mdadm --add <partition> <MDRAIDset>
```

Enter this command for each partition (md0, md1, md2, and md 3 in this example):

```
mdadm --add /dev/md4 /dev/sdj4
```

```
mdadm --add /dev/md1 /dev/sdj3
```

```
mdadm --add /dev/md2 /dev/sdj1
```

```
mdadm --add /dev/md3 /dev/sdj2
```

15. Check the RAID status to ensure that the MD RAID mirrored partitions are recovering:

```
cat /proc/mdstat
```

Output:

```
Personalities : [raid1]
md3 : active raid1 sdj4[2] sda4[1]
      221107068 blocks super 1.1 [2/1] [_U]
      [===>.....] recovery = 19.5% (43309184/221107068)
      finish=14.6min speed=201404K/sec
      bitmap: 1/2 pages [4KB], 65536KB chunk
```

```
md0 : active raid1 sdj3[2] sda3[1]
      511988 blocks super 1.0 [2/1] [_U]
      resync=DELAYED

md1 : active raid1 sdj1[2] sda1[1]
      20478908 blocks super 1.1 [2/1] [_U]
      resync=DELAYED
      bitmap: 1/1 pages [4KB], 65536KB chunk

md2 : active raid1 sdj2[2] sda2[1]
      2096120 blocks super 1.1 [2/1] [_U]
      resync=DELAYED
```

If the system does not boot, you may need to edit the **grub.conf** file and comment out the following lines:

```
splashimage=(hdX,2)/grub/splash.xpm.gz
root (hdX,2)
```

If you cannot boot from one of the boot SSDs, you can try to reconfigure grub to boot from the SSDs by entering this command:

```
grub
find /grub/stage1
(hd0,2)
(hd5,2)
root (hd0,2)
setup (hd0)
root (hd5,2)
setup (hd5)
```

Replacing a horizontal HBA

In the unlikely event that a host bus adapter (HBA) goes down, you can replace it fairly quickly and easily. Your support representative will help you identify the particular horizontal HBA card you will be replacing in your 1U or 2U appliance.

Note If you have a 3U appliance, see the following section, "Replacing a vertical HBA" on page 42.

To replace a horizontal HBA

1. Shut down SPHiNX by completing these steps:

CAUTION! Shutting down the appliance disables all functions and the web interface. Do not shut down if active connections or running jobs are in progress.

- a. Turn off the SCSI converter using the power switch on the rear panel, if necessary.
- b. Execute the halt command by clicking **Administration > System Tasks** on the navigation pane of the web interface and then click **Halt the System**.

Allow SPHiNX five minutes to completely shut down before proceeding. Verify that the system is halted by looking at the LEDs on the front of the system and verify that there is no activity. The power LED will turn from green to yellow if it does not shut down, use the power button instead.

- c. Detach the front bezel (faceplate).
2. Unplug the appliance and attach your grounded wrist strap to the chassis to prevent static discharge.
3. Open the chassis by pressing the two buttons on the top and sliding the cover backward.
4. Lift the cover up from the front and set it aside.

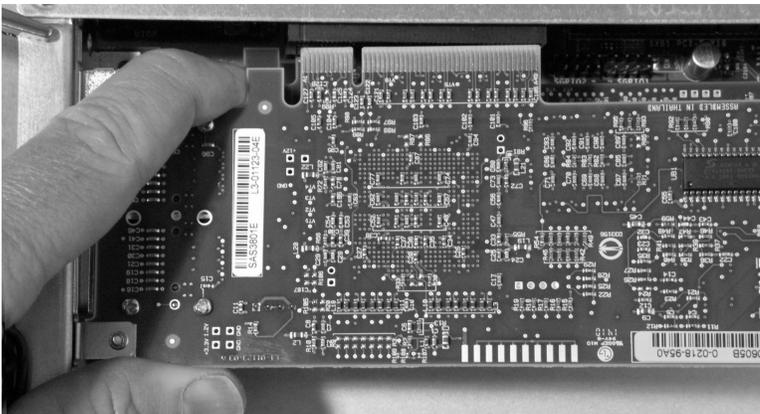


Note If the cover does not slide back easily, check for retaining screws (behind the rails) holding it to the chassis.

5. Unbox the replacement HBA, making sure you keep its packaging.
6. At the rear of the appliance, unclip the clasp near the corner of the chassis and swing it towards you.



7. Gently pull the defective HBA card out of the *top* slot on the right. Replace it with a new one.



—OR—

First, remove the HBA card(s) *above* the defective card. Carefully set them aside, making sure you can return them to their respective slots. Then, remove the *defective* card and replace it with the new one. Reinstall the cards above it.

8. Clip the corner retaining clasp back in place.
9. Slide the chassis cover back in place and replace the retaining screw.
10. Plug the appliance in and turn it on.

Note When you replace an HBA, the World Wide Port Name (WWPN) for each port on the new card do not match those on the old one. As a result, the host server(s) and any fiber switches on your network can may not be able to communicate with the SPHiNX drives.

11. To reestablish communication between SPHiNX and any fiber switches on your network complete these steps:

- a. Use the SPHiNX web interface to confirm that SPHiNX discovered the new WWPNs.
 - b. Check your host server(s) to confirm that they also discovered the new WWPNs.
 - c. If you have switches on your network and you have zones configured, make sure to update your zone configuration with the new WWPN information.
12. Follow your RMA instructions to return the old HBA for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing a vertical HBA

In the unlikely event that a host bus adapter (HBA) goes down, you can replace it fairly quickly and easily. Your support representative will help you identify the particular vertical HBA card you will be replacing in your 3U appliance.

Note If you have a 1U or 2U appliance, see the preceding section, "Replacing a horizontal HBA" on page 38

To replace a vertical HBA

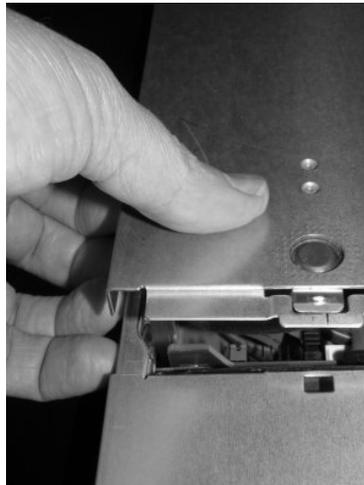
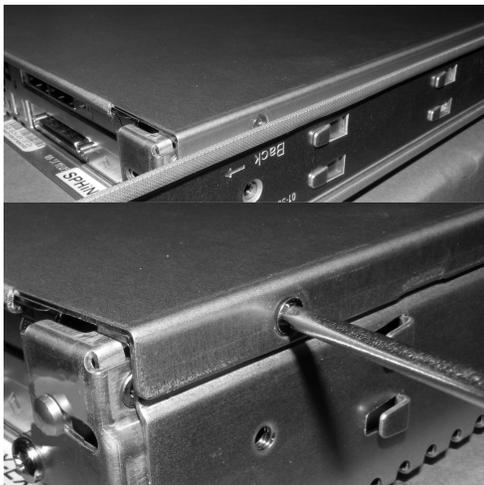
1. Shut down SPHiNX by completing these steps:

CAUTION! Shutting down the appliance disables all functions and the web interface. Do not shut down if active connections or running jobs are in progress.

- a. Turn off the SCSI converter using the power switch on the rear panel, if necessary.
- b. Execute the halt command by clicking **Administration > System Tasks** on the navigation pane of the web interface and then click **Halt the System**.

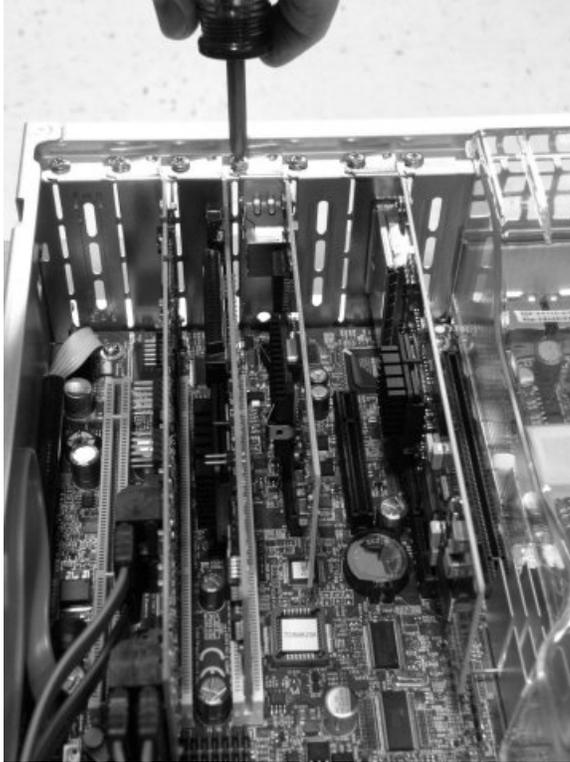
Allow SPHiNX five minutes to completely shut down before proceeding. Verify that the system is halted by looking at the LEDs on the front of the system and verify that there is no activity. The power LED will turn from green to yellow. If it does not shut down, use the power button instead.

- c. Detach the front bezel (faceplate).
 - d. On the front panel of the SPHiNX appliance, press and hold the power button for four seconds to force SPHiNX to shut down.
2. Unplug the appliance and attach your grounded wrist strap to the chassis to prevent static discharge.
 3. Open the chassis by pressing the two buttons on the top and sliding the cover backward.
 4. Lift the cover up from the front and set it aside.



Note If the cover does not slide back easily, check for retaining screws (behind the rails) holding it to the chassis.

5. Remove the HBA's retaining screw.



6. Gently pull the defective HBA upward.
7. Unbox the replacement HBA, making sure you keep its packaging.
8. Install the new HBA in the slot that is now available.
9. Replace the retaining screw, and then slide the chassis cover back in place.
10. Plug the appliance in and turn it on.

Note When you replace an HBA, the World Wide Port Name (WWPN) for each port on the new card do not match those on the old (defective) one. As a result, the host server(s) and any fiber switches on your network can may not be able to communicate with the SPHiNX drives.

11. To reestablish communication between SPHiNX and any fiber switches on your network, complete these steps:
 - a. Use the SPHiNX web interface to confirm that SPHiNX discovered the new WWPNs.
 - b. Check your host server(s) to confirm that they also discovered the new WWPNs.
 - c. If you have switches on your network and you have zones configured, make sure to update your zone configuration with the new WWPN information.
12. Follow your RMA instructions to return the old HBA for failure analysis. (The instructions are in a PDF sent by your Support representative.) See "Returning the old SPHiNX chassis" on page 13 for instructions.

Replacing a RAID controller

If your RAID controller battery does not hold a charge, the steps to replace it are fairly straightforward.

To replace a RAID controller battery

1. Shut down SPHiNX by completing these steps:

CAUTION! Shutting down the appliance disables all functions and the web interface. Do not shut down if active connections or running jobs are in progress.

- a. Turn off the SCSI converter using the power switch on the rear panel, if necessary.
- b. Execute the halt command by clicking **Administration > System Tasks** on the navigation pane of the web interface and then click **Halt the System**.

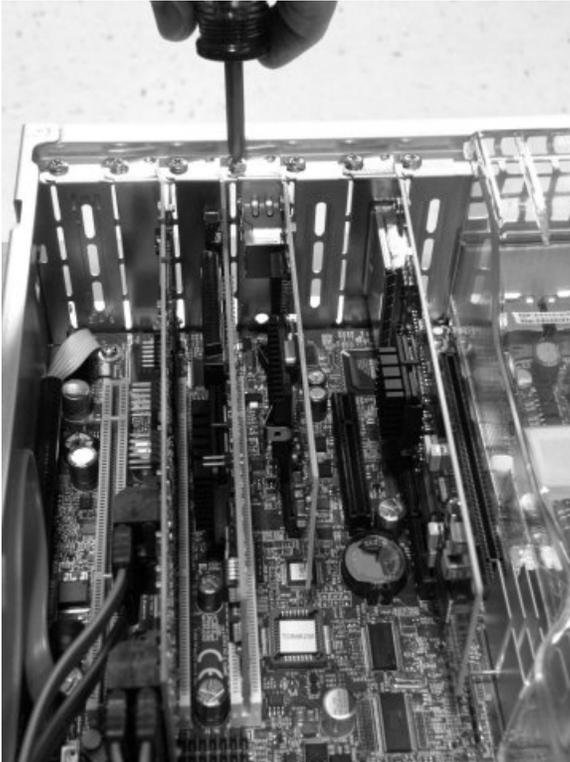
Allow SPHiNX five minutes to completely shut down before proceeding. The SPHiNX appliance console will indicate “System Halted.” If it does not shut down, use the power button instead.

- c. Detach the front bezel (faceplate).
2. Unplug the appliance and attach your grounded wrist strap to the chassis to prevent static discharge.
 3. Open the chassis by pressing the two buttons on the top and sliding the cover backward.
 4. Lift the cover up from the front and set it aside.



Note If the cover does not slide back easily, check for retaining screws (behind the rails) holding it to the chassis.

5. Remove the RAID controller card's retaining screw.



6. Gently pull the RAID controller card upward.

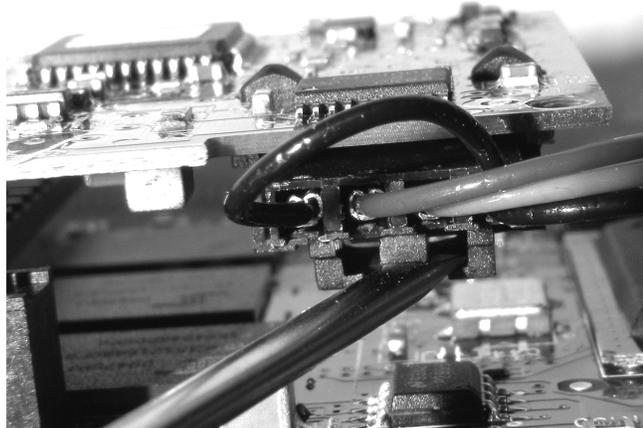
7. Lay the card down, battery side up.



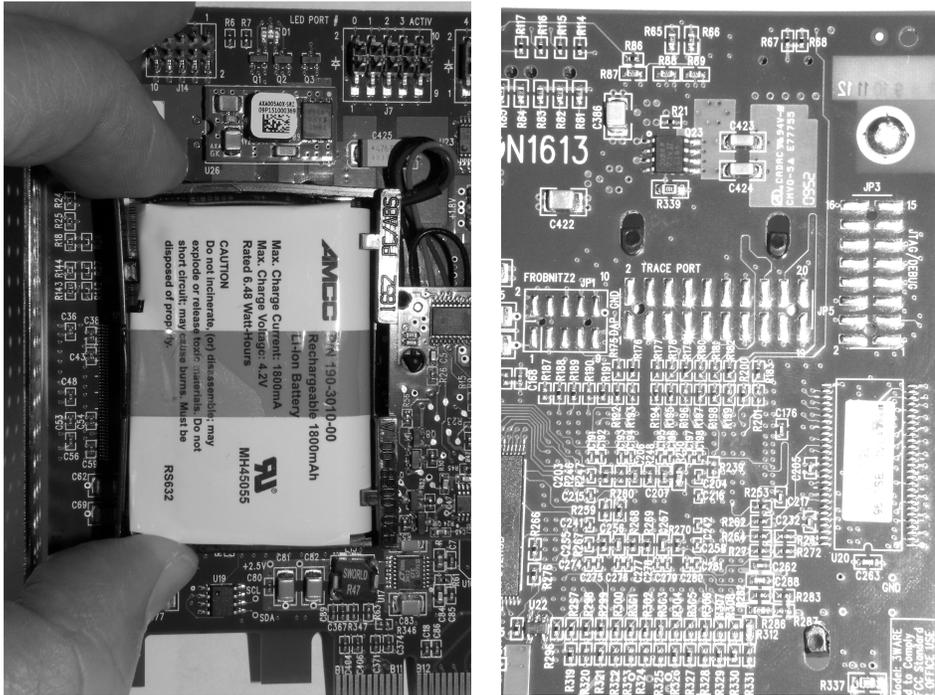
8. Unscrew the nylon screw holding the daughter card onto the RAID card.



9. Pull the daughter card away from the RAID card.
10. Use your fingers to release the tab locking the battery's plug to the card.

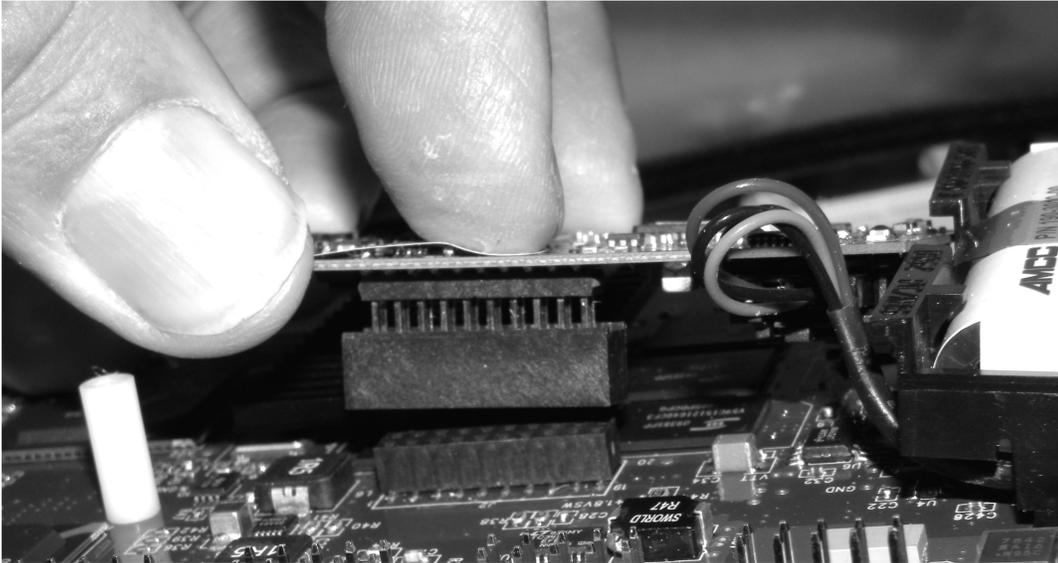


Three plastic L-shaped tabs hold the battery to the card.



11. Remove the battery by pushing up along the plane of the card to release the top two tabs.
12. Pull it downward slightly to release the single tab at the bottom.
13. Set the old battery aside.
14. Unbox the replacement RAID controller battery.
15. Mount the new battery on the card by first hooking the single bottom tab, then the top two tabs.
16. Push the plug of the new battery into the daughter card socket until it clicks.

17. Plug the daughter card into the RAID card and secure it with the nylon screw you removed in step 8.



18. Replace the RAID controller in its slot.
19. Replace the retaining screw for the RAID card, and then slide the chassis cover back in place.
20. Plug the appliance in and turn it on.
21. Properly dispose of the old RAID controller battery.