

Host Bus Adapter Installation and Setup Guide 1.1 for Fibre Channel Protocol on Solaris®

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Preface

About this guide	This guide describes how to install and configure a NetApp®-supplied Fibre Channel host bus adapter (HBA) on a Sun® Solaris® host. The host accesses data on Network Appliance™ storage appliances (filers) that run Data ONTAP™ 6.3 software with the Fibre Channel Protocol (FCP) for SCSI licensed.
Audience	This guide is for system installers and administrators who are familiar with the Sun Solaris operating system on a host. It assumes that you are familiar with how to configure and administer a filer and use the filer-licensed SAN protocol, FCP, to store and retrieve data on a filer.
Terminology	This guide uses the following terms: ◆ <i>LUN</i> (Logical Unit Number) refers to a logical unit of storage identified by a number. ◆ <i>LUN ID</i> refers to the numerical identifier for a LUN. ◆ <i>Filer</i> refers to a NetApp® storage appliance that incorporates the CompactFlash™ unit and supports FCP. ◆ <i>Type</i> refers to pressing one or more keys on the keyboard. ◆ <i>Enter</i> refers to pressing one or more keys and then pressing the Enter key.
Command conventions	You can enter filer commands on either the system console or from any host system that can access the filer through a Telnet session.
Keyboard conventions	When describing key combinations, this guide uses the hyphen (-) to separate individual keys. For example, “Ctrl-D” means pressing the “Control” and “D” keys simultaneously. Also, this guide uses the term “Enter” to refer to the key that generates a carriage return, although the key is named “Return” on some keyboards.
Typographic conventions	The following table describes typographic conventions used in this guide.

Convention	Type of information
<i>Italic type</i>	Words or characters that require special attention. Placeholders for information you must supply. For example, if the guide says to enter the arp -d <code>hostname</code> command, you enter the characters “arp -d” followed by the actual name of the host. Book titles in cross-references.
Monospaced font	Command and daemon names. Information displayed on the system console or other computer monitors. The contents of files.
Bold monospaced font	Words or characters you type. What you type is always shown in lowercase letters, unless you must type it in uppercase letters.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Caution

A caution contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

WARNING

A warning contains instructions that you must follow to avoid personal injury.

About this chapter

This chapter provides an overview of the following:

- ◆ A brief explanation of the host and filer communication and configurations
- ◆ A list of tasks to perform before installing and configuring the host bus adapter (HBA)

Topics covered in this chapter

This chapter presents the following topics:

- ◆ [“Understanding host and filer communication and configurations”](#) on page 2
- ◆ [“Before installing and configuring the HBA”](#) on page 7

Understanding host and filer communication and configurations

About host and filer communication

After installing and configuring the NetApp-supplied Fibre Channel HBAs, the Solaris host uses the Fibre Channel Protocol (FCP) for SCSI to access data on NetApp filers that run Data ONTAP 6.3 software. The supported configurations are the following:

- ◆ One or more hosts attached to a filer cluster pair through a Fibre Channel switch or a pair of Fibre Channel switches
- ◆ A single host directly attached to a filer

The filer is a target FCP storage appliance. Each host HBA is an initiator that uses FCP to access logical units of storage (LUNs) on a filer to store and retrieve data.

On a host, a World Wide Port Name (WWPN) identifies each port on an HBA. The host WWPNs are used when creating initiator groups on a filer. An initiator group permits host access to specific LUNs on a filer.

Each target HBA on a filer has two ports; one is active and the other is standby (or passive). All active ports on a filer share the same World Wide Node Name (WWNN), which is also referred to as the FC node name. The filer's WWNN must be persistently bound on the host to a particular target ID. The host operating system then accesses the filer using the bound target ID.

Types of supported configurations

The following types of configurations are supported:

- ◆ Fabric-attached storage area network (SAN)
 - A host is cabled to a Fibre Channel switch or a pair of redundant Fibre Channel switches that are cabled to redundant Fibre Channel ports on a filer (filer cluster pair). The host can be one of the following:
 - ❖ A single-path host that has one HBA
 - ❖ A multipath host that has two HBAs

Note

VERITAS® DMP (Dynamic Multipathing) software is required for a multipath host. VERITAS DMP is a component of the VERITAS Volume Manager. For more information about VERITAS software, see the *SAN Host Release Notes for Fibre Channel Protocol on Solaris*.

◆ Direct-attached

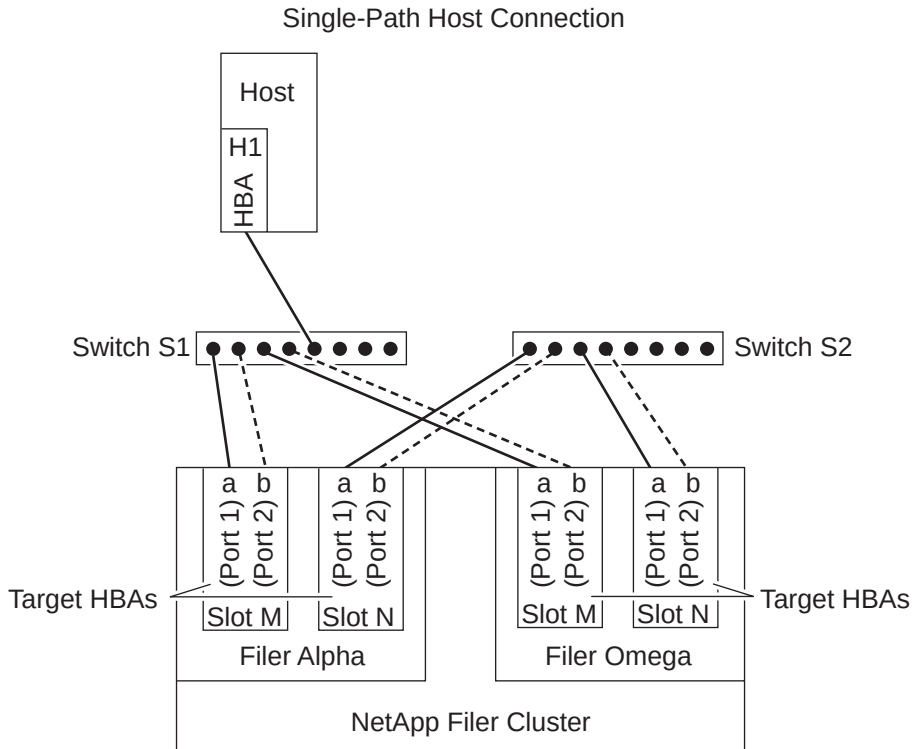
A direct-attached host connection is a host with a single HBA directly connected to a stand-alone filer.

About cluster takeover

In a filer cluster pair, if one filer fails, the other filer takes over for the failed filer until the failed filer is restored.

Fabric-attached SAN configuration

Single-path host connection: A fabric-attached single-path host connection is a host with a single HBA connected through a Fibre Channel switch to a filer cluster pair. The following is an example of a single-path host connection.

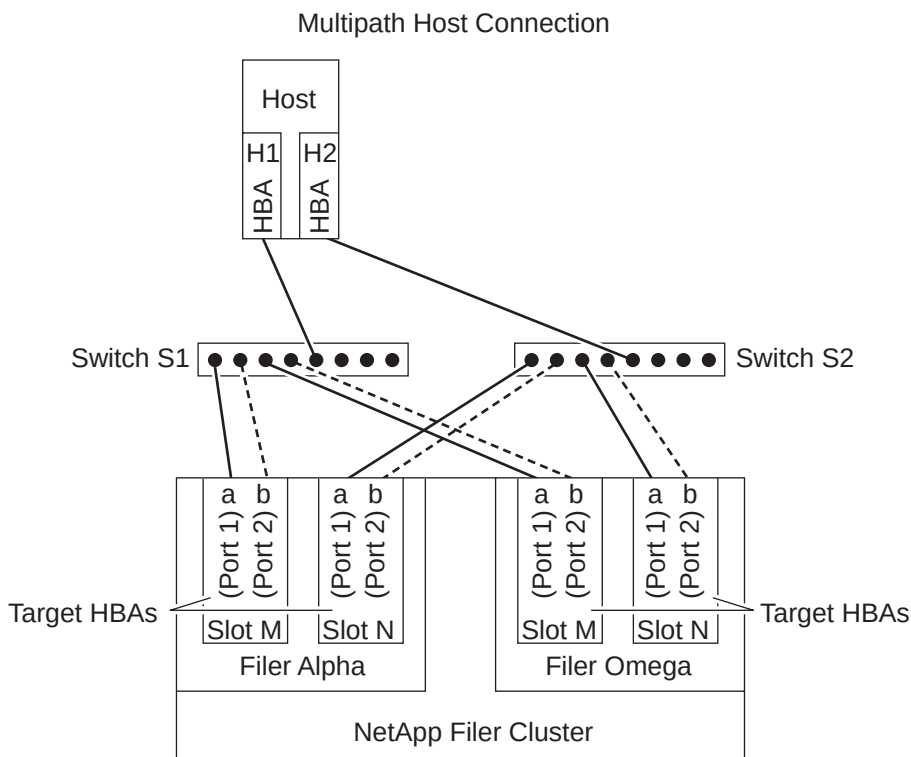


The host with a single HBA H1 is cabled to a switch S1. The filer cluster pair shows each filer with two target HBAs in slots M and N. For each filer, the slot M HBA connects to switch S1 and slot-N HBA connects to switch S2.

Port a and Port b are on the dual-port target HBA in the filer. Port a is represented with a solid line and is the active port. Port b is represented with a dotted line and is the standby (or passive) port until takeover occurs.

Multipath host connection: A fabric-attached multipath host connection is a host with two HBAs connected through two different Fibre Channel switches to a filer cluster pair.

The following is an example of a multipath host connection. By coupling multipathing and filer clustering, this configuration creates a no single point of failure solution between the host and your data.



The host with two HBAs (H1 and H2) is cabled to two different switches. H1 is connected to switch S1. H2 is connected to switch S2. This configuration with the host running VERITAS DMP software provides two hardware paths from the host to the filer and greater reliability through a path failover mechanism. If one connection is lost between the host and the filer, the host continues to access the data over the other sound paths until the failed path is repaired.

The filer cluster pair shows each filer with two target HBAs, in slots M and N. For each filer, the slot M HBA connects to switch S1 and slot N HBA connects to switch S2. Port a and Port b are on the dual-port target HBA in the filer. Port a is represented with a solid line and is the active port. Port b is represented with a dotted line and is the standby (or passive) port until takeover occurs.

If one filer fails, the other filer can take over. For example, if Filer Alpha fails, then in Filer Omega the following occurs:

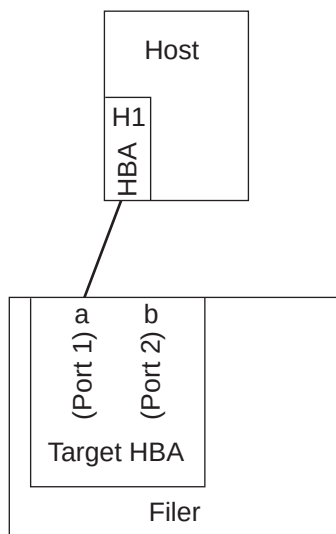
- ◆ Slot M port b on Filer Omega takes over Slot M port a in Filer Alpha.
- ◆ Slot N port b on Filer Omega takes over Slot N port a in Filer Alpha.

The standby (or passive) port b becomes active and enables the host to access the storage until Filer Alpha is repaired and running.

Direct-attached configuration

A direct-attached host connection is a host with a single HBA directly connected to a standalone filer. The following is an example of a direct-attached host connection.

Direct-Attached Host Connection



A host with a single HBA H1 is cabled directly to Port 1 (or port a) on the filer's target HBA. Nothing is attached to Port 2 (or port b) on the filer.

Where to go for host and filer information

The following table describes documents on NetApp's NOW Web site with the most current information about host and filer system requirements, supported configurations, and cabling instructions.

If you want...	Go to...
The currently supported host and filer configurations and cabling guidelines	<i>SAN Configuration Guide</i> online version at http://now.netapp.com/NOW/knowledge/docs/docs.shtml
Cabling instructions for the filer and host	<i>SAN Setup Overview</i>
The supported platforms and system requirements for the Windows® host	<i>SAN Support Matrix</i> online version at http://now.netapp.com/NOW/knowledge/docs/docs.shtml
The supported filer models for Data ONTAP 6.3 licensed with FCP	◆ <i>SAN Support Matrix</i> online version at http://now.netapp.com/NOW/knowledge/docs/docs.shtml ◆ <i>System Configuration Guide</i> for Data ONTAP 6.3 online version at http://now.netapp.com

Before installing and configuring the HBA

Tasks to perform

This section describes the following tasks to perform before installing and configuring the HBA:

Caution

Only NetApp Fibre Channel storage appliances (filers) are supported with this release of the host attach kit. Mixed SAN storage arrays (other than NetApp filers) on the same host or Fibre Channel switch are not supported.

- ◆ Verify the contents of the host attach kit.
- ◆ Review the *SAN Setup Overview*.
- ◆ Verify that the filer is installed and configured properly.
- ◆ Verify that the host can issue commands to the filer.

Verifying the contents of the host attach kit

To verify the contents of the host attach kit, complete the following step.

Step	Action
1	Open the host attach kit and check for the following items: ◆ In PCI attach kit: ❖ Emulex® LP9002L-F2 HBAs with standard PCI bracket, single port ❖ One low-profile PCI mounting bracket ◆ Open Me First envelope ❖ <i>SAN Setup Overview</i> ❖ <i>Host Bus Adapter Installation and Setup Guide for Fibre Channel Protocol on Solaris</i> (this guide) ◆ Media kit ❖ CD-ROM with ntap_solaris_fcp_1_1.tar.Z (or later) software and firmware package ❖ License agreement ❖ <i>SAN Host Release Notes for Fibre Channel Protocol on Solaris</i>

Reviewing the SAN Setup Overview

To review the *SAN Setup Overview*, complete the following step.

Step	Action
1	Read the <i>SAN Setup Overview</i> in the <i>Open Me First</i> envelope. Note_____ This key document provides a high-level overview for setting up your NetApp SAN. Instructions include setting up the filer and host and connecting them. Steps direct you to documentation with information to complete the tasks. _____

Verifying that the filer is installed and configured

To verify that the filer is installed and configured, complete the following step.

Step	Action
1	Check that the filer is set up and configured as outlined in the <i>SAN Setup Overview</i>. Caution_____ The filer must be set up and configured before configuring the host HBA driver and creating initiator groups and LUNs on the filer. _____ It is assumed that you completed the following steps: ◆ Installed the filer and target HBAs (if needed) ◆ Cabled the filer for a fabric-attached or direct-attached configuration ◆ Set up and configured the filer ◆ Licensed and enabled the FCP protocol and any other protocols appropriate for the filer ◆ Created working filer volumes and qtrees (if desired) on the filer Note_____ NetApp highly recommends that you create volumes with space reservations enabled. _____ For more information, see the <i>Data ONTAP 6.3 SAN System Administrator's Guide</i>.

Verifying that the host can issue commands

To verify that the host can issue commands to the filer through the filer's console or command line, complete the following step.

Step	Action
1	Ensure that the host can issue commands to the filer by using, for example, the <code>telnet</code> command, or access the filer's console. Example: A network interface card (NIC) in the host with an IP connection is one method of providing access between the host and the filer.

About this chapter

This chapter describes the system requirements, host system backup procedures, and installation procedures for installing the HBA in the host and cabling the host to one or a pair of Fibre Channel switches (fabric-attached) or directly to a filer.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“System requirements”](#) on page 12
- ◆ [“Installing the HBA in the host”](#) on page 14
- ◆ [“Cabling the host to a filer”](#) on page 18
- ◆ [“Turning on the power to the host”](#) on page 21

System requirements

System requirements

The following table lists the minimum system requirements (at the time this book was printed) for installing the HBA and the NetApp Solaris Fibre Channel software package on the host.

Note

For the most current and complete system requirements, HBA driver and firmware revisions, consult the online *SAN Support Matrix* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

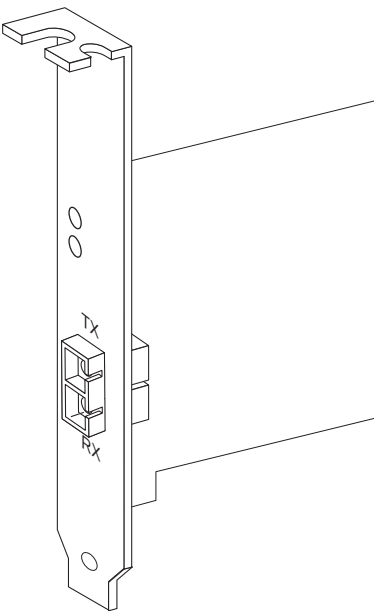
Component	Requirement
HBA	◆ Emulex LP9002L-F2 (single port) ◆ Firmware level: 3.90a7 or later ◆ Driver level: 5.01b or later Note_____ For the latest driver and firmware revision, you must consult the online <i>SAN Support Matrix</i>.
PCI slot for HBA	◆ One open 32-bit or 64-bit (recommended) PCI bus slot can be either 3.3V DC or 5.0V DC signaling interface ◆ PCI bus clock rate of 33 MHz or 66 MHz (recommended)
Hardware platforms	Sun SPARC PCI-based systems Note_____ The LP9002L-F2 HBA requires PCI slots providing 3V bus power. The Sun Ultra-2, Ultra-5, and Ultra-10 platforms do not provide the necessary voltages and are not supported.

Component	Requirement
Operating system and patch level	Solaris 8 and Solaris 9 The following Solaris patches have been tested for each operating system: ◆ Solaris 8: Recommended Patch Cluster from November 18, 2002. ◆ Solaris 9: Recommended Patch Cluster from November 12, 2002. You can obtain the Solaris patches from http://sunsolve.sun.com. Note Consult the online <i>SAN Support Matrix</i> or the <i>SAN Host Release Notes 1.1 for Fibre Channel Protocol on Solaris</i> for the latest operating system and patch revisions.
VERITAS application requirements	See the SAN Support Matrix for the required versions of VERITAS application software and required VERITAS patches and packages.

Installing the HBA in the host

Single-port host HBA illustration

The following is an illustration of a single-port host HBA.



Installing the HBA

To install an HBA in the host, complete the following steps.

Step	Action
1	Using the appropriate tools, back up the host’s system environment, including the following: ◆ Boot partition ◆ Internal disks ◆ External disks that your host system might access

Step	Action
2	Use the appropriate commands to shut down the host and its peripherals.
3	Turn off the host and its peripherals.
4	Put on the antistatic wrist strap and attach the grounding leash to the host chassis. Caution_____ The host and HBA use electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can damage these components. Wear an antistatic wrist strap and attach the grounding leash so that you are appropriately grounded before touching any electronic components. _____
5	Remove the computer case from the host.
6	Identify the appropriate 32-bit or 64-bit PCI bus slots in which you can install one HBA for a direct-attached or single-path host connection or two HBAs for a multipath host connection.
7	Remove the blank faceplate from the empty 32-bit or 64-bit PCI bus slot.

Step	Action						
8	Compare the removed blank faceplate to the bracket on the HBA. Note ————— The HBA comes with a standard PCI bracket installed. The low-profile mounting bracket is shorter than the standard bracket; approximately 3.11 in. (7.9 cm) compared to 4.75 in. (12.06 cm). —————						
	<table><tr><th>If...</th><th>Then...</th></tr><tr><td>The removed faceplate is smaller than the bracket on the HBA</td><td>Change the HBA’s bracket to the low-profile mounting bracket: 1. Remove the mounting bracket screws from the top of the HBA. 2. Remove the bracket and store it for future use. 3. Align the new mounting bracket tabs with the holes in the HBA. 4. Replace the screws that attach the HBA to the bracket. 5. Go to Step 8.</td></tr><tr><td>The removed faceplate is the same size as the bracket on the HBA</td><td>Go to Step 8.</td></tr></table>	If...	Then...	The removed faceplate is smaller than the bracket on the HBA	Change the HBA’s bracket to the low-profile mounting bracket: 1. Remove the mounting bracket screws from the top of the HBA. 2. Remove the bracket and store it for future use. 3. Align the new mounting bracket tabs with the holes in the HBA. 4. Replace the screws that attach the HBA to the bracket. 5. Go to Step 8.	The removed faceplate is the same size as the bracket on the HBA	Go to Step 8.
	If...	Then...					
	The removed faceplate is smaller than the bracket on the HBA	Change the HBA’s bracket to the low-profile mounting bracket: 1. Remove the mounting bracket screws from the top of the HBA. 2. Remove the bracket and store it for future use. 3. Align the new mounting bracket tabs with the holes in the HBA. 4. Replace the screws that attach the HBA to the bracket. 5. Go to Step 8.					
The removed faceplate is the same size as the bracket on the HBA	Go to Step 8.						
9	Record the HBA’s IEEE address and serial number. Note ————— There is an IEEE address for each port. If you prepend “10:00” to the IEEE address, you have the WWPN for the port. —————						
10	Holding the HBA by its top edge, with the faceplate near the back of the host, lower the HBA into the slot until its connector edge meets the grooves in the expansion slot. The faceplate of the HBA should be in position against the back panel, and should cover the endplate slot on the back panel.						

Step	Action	
11	Press carefully on the top edge of the HBA until the edge connector is seated in the expansion slot.	
12	Replace the faceplate screw to secure the HBA to the back panel.	
13	If...	Then...
	You are installing a second HBA	Repeat Step 5 through Step 11, then go to Step 13.
	You are not installing a second HBA	Go to Step 13.
14	Replace the computer case and tighten the case screws. Caution _____ Do not turn on the host, or, if applicable, its peripherals, until you complete the cabling for the SAN system. _____	
15	Cable the SAN system according to the procedures in the <i>SAN Setup Overview for FCP</i> .	

Cabling the host to a filer

Methods of cabling

You can cable a host and filer in the following ways:

- ◆ Fabric-attached, where a host is cabled to one or a pair of redundant Fibre Channel switches that are cabled to redundant Fibre Channel ports on filers (filer cluster pair). The fabric-attached host can be one of the following:
 - ❖ A single-path host that has one HBA
 - ❖ A multipath host that has two HBAs
- ◆ Direct-attached, where a single-path host is cabled directly to a stand-alone filer.

Cable requirements

When cabling a host to a switch or directly to a filer, use a 50 micron multimode fiber optic cable.

This optical cable comes in different lengths. Purchase the optical cable appropriate for your site requirements.

Where to find more configuration information

Before cabling your host, see the online *SAN Configuration Guide* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>. This guide describes all supported host, filer, and switch configurations, including cabling specifications and requirements.

Cabling a fabric-attached host

Single-path host connection: To cable a fabric-attached single-path host to a Fibre Channel switch, complete the following steps.

Step	Action
1	If you have not done so already, set up the Fibre Channel switch by following the configure and connect procedure provided in the Hardware Reference manual for the Fibre Channel switch.
2	Cable the pair of clustered filers to the switches by following the procedure for connecting a filer and a single-path host described in the <i>SAN Setup Overview</i> .

Step	Action
3	Plug one end of the optical cable into one of the switches. Note_____ It is recommended that you reserve ports 0 through 3 on the switch for the filer. The remaining ports are available for the hosts.
4	Plug the other end of the cable into the HBA in the host.
5	Repeat Step 3 and Step 4 for all hosts with a single HBA. See “Understanding host and filer communication and configurations” on page 2 for an illustration of a single-path host connection.

Multipath host connection: To cable a fabric-attached multipath host to a Fibre Channel switch, complete the following steps.

Step	Action
1	If you have not done so already, set up the Fibre Channel switches by following the configure and connect procedure provided in the Hardware Reference manual for the Fibre Channel switch.
2	Cable the pair of clustered filers to the switches by following the procedures for connecting a filer and multipath host described in the <i>SAN Setup Overview</i> .
3	Plug one end of the optical cable into one of the switches. Note_____ It is recommended that you reserve ports 0 through 3 on the switch for the filer. The remaining ports are available for the hosts.
4	Plug the other end of the cable into the first HBA in the host.
5	Plug one end of a second cable into the other switch.
6	Plug the other end of a second cable into the second HBA in the host.

Step	Action
7	Repeat Step 3 through Step 6 for all hosts with two HBAs. See “ Understanding host and filer communication and configurations ” on page 2 for an illustration of a multipath host connection.

Cabling a direct-attached host

To cable a host directly to a filer, complete the following steps.

Step	Action
1	Plug one end of the optical cable into Port 1 (port a) of the dual-port HBA in the filer.
2	Plug the other end of the cable into the HBA in the host. See “ Understanding host and filer communication and configurations ” on page 2 for an illustration of a direct-attached host connection.

Turning on the power to the host

Turning on the power

To turn on the power to the host, complete the following steps.

Step	Action
1	Verify that the connections and cabling are correct. Caution_____ The configured Fibre Channel switches must be turned on before turning on the power for the filers and the hosts. Wait five minutes for the switch to boot. Turn on the power to the hardware in the following order: switches, disk shelves, filers, and hosts.
2	Turn on the power to the host.

About this chapter This chapter describes procedures for installing the NetApp Solaris Fibre Channel software package on the host.

Topics in this chapter This chapter discusses the following topics:

- ◆ “[Preparing for the software package installation](#)” on page 24
- ◆ “[Host software installation options](#)” on page 28
- ◆ “[Upgrading the HBA firmware](#)” on page 43

Preparing for the software package installation

Preparation tasks

Before you install the software package, you must perform the following tasks:

Note

All installation procedures require root privileges.

- ◆ Obtain the software package.
- ◆ Uncompress the software package, if obtained from the NOW site.

Contents of software package

The software package is a tar file that comprises the following:

- ◆ NetApp-customized HBA software driver
- ◆ HBA firmware (NTAPfcfw)
- ◆ lpfc utility for HBA
- ◆ `san lun` utility (NTAPsanlun)

This utility (`san lun` command) helps manage LUNs and host HBAs.

For detailed information

For details about preparing to install the software package, see the following topics:

- ◆ [“Obtaining the software package”](#) on page 25
- ◆ [“Uncompressing the software package from the NOW site”](#) on page 27

Obtaining the software package

Locating the software package

To locate the software package, complete the following step.

Step	Action	
1	See the online <i>SAN Support Matrix</i> at http://now.netapp.com/NOW/knowledge/docs/docs.shtml to verify that you have the latest host software package. At the time this book was printed, the software package name was <code>ntap_solaris_fcp_1_1.tar.Z</code> .	
2	If you obtain the...	Then...
	Software CD-ROM from the media package in your NetApp SAN Host Attach Kit for Fibre Channel Protocol on Solaris	Go to “ Host software installation options ” on page 28.
	Software package from the NetApp NOW site	Go to “ Obtaining the software from NOW ” on page 25.

Obtaining the software from NOW

To download the software from the NOW site, complete the following steps.

Step	Action
1	Use a Web browser to log in to the NOW site at http://now.netapp.com : ◆ Type your user name and password. ◆ From the Select Start Page list box, click Service and Support. ◆ Click the Login button.
2	Click Download Software.
3	In the SAN Host Attach Kit product row of the Software Download table, select Solaris in the Select Platform list box.

Step	Action
4	Click Go!
5	Follow the prompts to reach the Software Download page.
6	Download the ntap_solaris_fcp_1_1.tar.Z software file to a local directory, for example, the /tmp directory.
7	Go to “ Uncompressing the software package from the NOW site ” on page 27.

Uncompressing the software package from the NOW site

Uncompressing and extracting the file

If you obtained the software package from the NOW site, the file is in compressed format.

To uncompress the file and extract the software, complete the following steps.

Step	Action
1	Change to the directory where you downloaded the compressed file. For example, change to the /tmp directory: cd /tmp
2	Enter the following command to uncompress the file: uncompress ntap_solaris_fcp_1_1.tar.Z
3	Enter the following command to extract the software: tar -xvf ntap_solaris_fcp_1_1.tar Result: The extracted software (package contents) is placed in the /tmp/ntap_solaris_fcp_1_1 directory.

Host software installation options

Install, upgrade, or uninstall options

This section describes the following installation options:

- ◆ Install the host software for the first time.
- ◆ Upgrade previously installed host software to the most current version.
- ◆ Uninstall any existing version of the host software and utilities.

For detailed information

For details about installation options, see the following topics:

- ◆ [“Installing the host software”](#) on page 29
- ◆ [“Upgrading the host software”](#) on page 35
- ◆ [“Uninstalling the host software”](#) on page 41

Installing the host software

Methods of installing the software

You can install the software for the first time in the following ways:

- ◆ Using the software CD-ROM from the media package in your NetApp SAN Host Attach Kit for Fibre Channel Protocol on Solaris
- ◆ Using the extracted software, as described in “[Uncompressing the software package from the NOW site](#)” on page 27.

Tasks for installing software

When you install the host software, you must perform the following tasks:

- ◆ Install the Solaris patches in a specified order before installing the host software.

The best practice is to install the latest Solaris-recommended patch cluster.

Note

For the latest patch and operating system information, see the *SAN Support Matrix* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> or the *SAN Host Release Notes for Fibre Channel Protocol on Solaris*.

- ◆ Install the host software.

Installing the Solaris patches

To install the Solaris patches, complete the following steps.

Step	Action
1	Ensure that you are logged in as root.
2	Obtain and install the latest Solaris-recommended patch cluster from your Solaris provider or http://sunsolve.sun.com. Note For Solaris 8, the minimally required Solaris patches are 110380-04 or later and 110934-04 or later, installed in that order using the <code>patchadd</code> command.

Installing the host software

To install the host software, complete the following steps.

Step	Action	
1	Ensure that you are logged in as root.	
2	If you are installing...	Then...
	Software from the CD-ROM	1. Mount the CD-ROM on the host system. 2. Change to the directory where your CD-ROM is mounted. For example, change to /cdrom/cdrom0: cd /cdrom/cdrom0
	Extracted NetApp software obtained from the NOW site	Change to the ntap_solaris_fcp_1_n directory where you extracted the software. 1_n is the version number of the software. For example, change to /tmp/ntap_solaris_fcp_1_n: cd /tmp/ntap_solaris_fcp_1_1
3	Enter the following command to install the software: ./install Result: The <code>install</code> script verifies the status of Solaris and Veritas patches on your system. It then prompts for whether you will be using this device with VERITAS DMP software. Note _____ For more information about warning messages, see “ Error messages or warnings during installation ” on page 84. _____	

Step	Action	
4	If...	Then at the prompt, enter...
	You have a multipath host connection to a filer and you plan to use the VERITAS DMP software	y indicating yes. If you uninstalled an earlier version of the software and saved configuration files, the install script does the following: 1. Displays saved persistent bindings and prompts for whether you want to keep each binding 2. Prompts for whether you want to use the saved sd.conf file. Result: The lpfc driver and san lun utility are installed on the host and the host is configured to operate properly with VERITAS DMP.
	You have a single-path host connection (either fabric-attached or direct-attached).	n indicating no. If you uninstalled an earlier version of the software and saved configuration files, the install script does the following: 1. Displays saved persistent bindings and prompts for whether you want to keep each binding 2. Prompts for whether you want to use the saved sd.conf file. Result: The lpfc driver and san lun utility are installed on the host.
5	On the command line, reboot the host by entering the following command: reboot	

Step	Action															
6	Observe the Light Emitting Diodes (LEDs) for the Power-On Self-Test (POST) through the openings in the HBA's mounting bracket.															
	The following table displays normal LED patterns. Green indicates power and yellow indicates port activity.															
	<table><tr><th>Green LED</th><th>Yellow LED</th><th>State</th></tr><tr><td>OFF</td><td>Flashing (irregularly)</td><td>POST processing in progress</td></tr><tr><td>ON</td><td>Slow blink (1 Hz)</td><td>Normal—1 Gb link rate</td></tr><tr><td>ON</td><td>Fast blink (4 Hz)</td><td>Normal—2 Gb link rate</td></tr><tr><td>Slow blink (1 Hz)</td><td>OFF</td><td>Normal—link down or not yet started</td></tr></table>	Green LED	Yellow LED	State	OFF	Flashing (irregularly)	POST processing in progress	ON	Slow blink (1 Hz)	Normal—1 Gb link rate	ON	Fast blink (4 Hz)	Normal—2 Gb link rate	Slow blink (1 Hz)	OFF	Normal—link down or not yet started
	Green LED	Yellow LED	State													
	OFF	Flashing (irregularly)	POST processing in progress													
	ON	Slow blink (1 Hz)	Normal—1 Gb link rate													
	ON	Fast blink (4 Hz)	Normal—2 Gb link rate													
Slow blink (1 Hz)	OFF	Normal—link down or not yet started														
For a summary of all the HBA LEDs, see “ Complete HBA LEDs ” on page 106.																

Sample output from the install script

The following examples show sample output from the `install` script.

Successful single-path host connection installation: The following is an example of a first-time installation for a fabric-attached or direct-attached single-path host connection that does not use VERITAS DMP software:

```
# ./install

Will you be using this device with Veritas DMP (Dynamic
Multipathing)? n
Installing Emulex driver lpfc now ...

lpfc install completed successfully.

Updating sd parameters in /etc/system
Installing NTAPfcfw now ...

NTAPfcfw install completed successfully.

Installing NTAPsanlun now ...
```

NTAPsanlun install completed successfully.

sanlun Installation complete. Log is in
/tmp/sanlun_install_log.434.

Please reboot your system now.

Successful multipath host connection installation: The following is an example of a first-time installation for a fabric-attached multipath host connection that uses VERITAS DMP software:

```
# ./install
```

```
Will you be using this device with Veritas DMP (Dynamic  
Multipathing)? y  
Installing Emulex driver lpfc now ...
```

lpfc install completed successfully.

```
Updating sd parameters in /etc/system  
Installing NTAPfcfw now ...
```

NTAPfcfw install completed successfully.

```
Installing NTAPsanlun now ...
```

NTAPsanlun install completed successfully.

sanlun Installation complete. Log is in
/tmp/sanlun_install_log.825.

Please reboot your system now.

Successful installation with saved configuration files: The following is an example in which the install script detects files saved from a previous configuration.

```
# ./install
```

```
Checking Solaris Patches.
```

```
Will you be using this device with Veritas DMP (Dynamic  
Multipathing)? [y,n,?,q] y
```

```
Installing Emulex driver lpfc now ...
```

Saved persistent binding entries were found
WWNN bindings:

50a980000200d02d:lpfc0t0

50a980000200d02d:lpfc1t0

50a980000200d02e:lpfc0t1

50a980000200d02e:lpfc1t1

WWNN 50a980000200d02d:lpfc0t0 Keep it? (y/n) [y]y

WWNN 50a980000200d02d:lpfc1t0 Keep it? (y/n) [y]y

WWNN 50a980000200d02e:lpfc0t1 Keep it? (y/n) [y]y

WWNN 50a980000200d02e:lpfc1t1 Keep it? (y/n) [y]y

Installer has detected sd.conf.save file.

Do you want to use the saved sd.conf.save file? [y,n,?,q] y

lpfc install completed successfully.

Updating sd parameters in /etc/system

Installing NTAPfcfw now ...

NTAPfcfw install completed successfully.

Installing NTAPsanlun now ...

NTAPsanlun install completed successfully.

sanlun Installation complete. Log is in
/tmp/sanlun_install_log.296.

Please reboot your system now.

Host software installation options

Upgrading the host software

Methods of upgrading the software

- You can upgrade existing software in the following ways:
- ◆ Using the software CD-ROM from the media package in your NetApp SAN Host Attach Kit for Fibre Channel Protocol on Solaris
 - ◆ Using the extracted software, as described in “[Uncompressing the software package from the NOW site](#)” on page 27.

Upgrading the host software To upgrade the host software, complete the following steps.

Step	Action	
1	Ensure that you are logged in as root.	
2	If you are installing...	Then...
	Software from the CD-ROM	1. Mount the CD-ROM on the host system. 2. Change to the directory where your CD-ROM is mounted. For example, change to /cdrom/cdrom0: <code>cd /cdrom/cdrom0</code>
	Extracted NetApp software obtained from the NOW site	Change to the ntap_solaris_fcp_1_1 directory where you extracted the software. For example, change to /tmp/ntap_solaris_fcp_1_1: <code>cd /tmp/ntap_solaris_fcp_1_1</code>

Step	Action	
3	Enter the following command to install the software: <pre>./install</pre> Result: The <code>install</code> script shows you the following: ◆ Current software packages with versions already installed or missing on your system ◆ The new software packages that the <code>install</code> script will install Note_____ If you encounter an installation error or warning message, see “Error messages or warnings during installation” on page 84 for more information. _____	
4	If...	Then...
	You already have software components installed and you want to upgrade to the latest software version	1. At the prompt, enter n or q to quit the installation. Result: The installation is terminated. 2. Uninstall the existing driver. Go to “Uninstalling the host software” on page 41. 3. Reinstall the new host software. Go to “Installing the host software” on page 29.
	You are missing some software packages on your host	1. At the prompt, enter y to continue with the installation; only the missing software packages are installed on the host. Note_____ Continuing with the installation does not overwrite any existing software packages (or components) on the host. _____ Result: The <code>install</code> script prompts for whether you are using this device with VERITAS DMP software. 2. Go to Step 5.

Step	Action	
5	At the prompt, if you enter...	Then...
	y indicating yes	You have a multipath host connection to a filer and you plan to use the VERITAS DMP software. Result: The missing software packages are installed on the host and integration with VERITAS DMP is enabled.
	If you...	Then...
	Received an error	Go to Step 6.
	Did not receive an error	Go to Step 7.
	n indicating no	You have a single-path host connection (either fabric-attached or direct-attached). Result: The missing software packages are installed on the host. Go to Step 7.
	? indicating repeat the question	The question “Will you be using this device with VERITAS DMP (Dynamic Multipathing) [y,n,?,q]” is repeated.
	q indicating quit	The <code>install</code> script is terminated. Result: The software package is not installed.

Step	Action	
6	At the prompt, if you entered...	Then...
	y and received the error, “Failed to modify /kernel/drv/lpfc.conf” Note _____ This error occurs when the driver is already installed and you want to keep it. You must change the timeout entries to be able to use VERITAS DMP.	1. With a text editor, edit the /kernel/drv/lpfc.conf file and change the following entries: <pre>linkdown - tmo=30; nodev - tmo=120;</pre> Note _____ You must edit the lpfc.conf file before rebooting the host. The lpfc.conf file is a configuration file for the NetApp-modified SCSI lpfc device driver with tuneable parameters that can be specified for all HBAs attached to the host. 2. Go to Step 7.
7	On the command line, reboot the host by entering the following command: reboot	
8	Observe the LEDs for the Power-On Self-Test (POST) through the openings in the HBA’s mounting bracket.	
	The following table displays normal LED patterns. Green indicates “power” and yellow indicates “port activity.”	
	Green LED	Yellow LED
	OFF	Flashing (irregularly)
	ON	Slow blink (1 Hz)
	ON	Fast blink (4 Hz)
	Slow Blink (1 Hz)	OFF
For a summary of all the HBA LEDs, see “ Complete HBA LEDs ” on page 106.		

Sample output for an upgrade installation

The following examples show sample output from the `install` script upgrading the host software.

Upgrade to latest version installation: The following is an example of an upgrade installation where the software components already exist. The `install` script is terminated so that the current software can be uninstalled and then reinstalled with the latest software versions.

```
# ./install
```

```
Some components of this product are already installed.
```

```
NTAPsanlun: 0.99
lpfc:       Release 5.00e/NetApp
NTAPfcfw:   3.90a7
```

```
This script will install the following components:
```

```
NTAPsanlun: 1.00
lpfc:       Release 5.01c/NetApp
NTAPfcfw:   3.90a7
```

To upgrade to the latest versions, please first run the `uninstall` script, then re-run the `install` script.

If some packages are missing on your system, please continue with `install`. (Continuing with `install` will not overwrite any existing components.)

```
Continue with install? [y,n,?,q] n
```

```
Install terminated.
```

```
#
```

Upgrade to install missing software: The following is an example of an upgrade installation where one software component is missing for a multipath host connection that uses VERITAS DMP software. The `install` script continues and the missing software is installed.

```
# ./install
```

```
Some components of this product are already installed.
```

```
NTAPsanlun: NOT INSTALLED -- NEEDED
lpfc:       Release 5.01c/NetApp
NTAPfcfw:   3.90a7
```

```
This script will install the following components:
```

```
NTAPsanlun: 1.00
lpfc:       Release 5.01c/NetApp
NTAPfcfw:   3.90a7
```

To upgrade to the latest versions, please first run the uninstall script, then re-run the install script.

If some packages are missing on your system, please continue with install.(Continuing with install will not overwrite any existing packages.)

Continue with install? [y,n,?,q] y
Updating sd parameters in /etc/system

Installing NTAPsanlun now ...

NTAPsanlun install completed successfully.

sanlun Installation complete. Log is in
/tmp/sanlun_install_log.660.

Please reboot your system now.

Host software installation options

Uninstalling the host software

**Version of the
uninstall script to
use**

You must use the `uninstall` script from the version 1.1 software you obtained in “[Obtaining the software package](#)” on page 25 to uninstall previous versions of the host software. This `uninstall` script saves copies of the HBA configuration files. When you reinstall new host software, you can reuse your persistent bindings and other HBA-specific configuration information.

Caution—
Do not use the uninstall script from your 1.0 software. The 1.0 `uninstall` script removes HBA configuration information, including persistent bindings. If your path uses the existing 1.0 `uninstall` script in the `/opt/NTAPsanlun/bin` directory, you will not have backups of your persistent bindings.

**Uninstalling the
host software**

To uninstall the host software, complete the following steps.

Step	Action	
1	Ensure that you are logged in as root.	
2	If...	Then...
	You are using software obtained from a CD-ROM	1. Mount the CD-ROM on the host system. 2. Change to the directory where your CD-ROM is mounted. For example, change to <code>/cdrom/cdrom0</code> : cd /cdrom/cdrom0
	You are using software obtained from the NOW site	Change to the <code>ntap_solaris_fcp_1_1</code> directory where you extracted the software. For example, change to <code>/tmp/ntap_solaris_fcp_1_1</code> : cd /tmp/ntap_solaris_fcp_1_1
3	Enter the following command to remove the existing software: ./uninstall	

Step	Action
4	Enter y when prompted to confirm the uninstall. Result: he <code>uninstall</code> script creates a backup copy of the <code>lpfc.conf</code> and <code>sd.conf</code> HBA configuration files to <code>/usr/tmp</code>. The backup files are named as follows: ◆ <code>lpfc.conf.save</code> ◆ <code>sd.conf.save</code> If a backup copy already exists, the install script prompts you to overwrite the backup copy.
5	On the command line, reboot the host by entering the following command: reboot
6	If you want to install the latest software version, go to “Installing the host software” on page 29.

Sample output for uninstalling the software

The following example shows sample output from the `uninstall` script when uninstalling software.

```
# ./uninstall
Are you sure you want to uninstall lpfc and sanlun packages?
[y,n,?,q] y
Creating backup copy of lpfc.conf...
/usr/tmp/lpfc.conf.save already exists.
Do you want to overwrite? If not, uninstall will exit.) [y,n,?,q] y
Creating backup copy of sd.conf...
/usr/tmp/sd.conf.save already exists.
Do you want to overwrite?(If not, uninstall will exit.) [y,n,?,q] y
Saving /kernel/drv/lpfc.conf and /kernel/drv/sd.conf to /usr/tmp
Removing lpfc ...
lpfc successfully removed.
Removing NTAPfcfw ...
NTAPfcfw successfully removed.
Removing changes to /etc/system file ...
Removing NTAPsanlun ...
NTAPsanlun successfully removed.
Remove process complete. Log is in /tmp/sanlun_remove_log.318
PLEASE REBOOT THE SYSTEM NOW
```

Upgrading the HBA firmware

Tasks for upgrading firmware

To upgrade HBA firmware, you must complete the following tasks:

- ◆ Check the current firmware revision level and determine whether the HBA firmware needs to be upgraded.
- ◆ If the latest firmware revision level is not installed, obtain the correct firmware file in the host software package on the CD-ROM or the NetApp NOW site.

Note

For the most current and complete system requirements, HBA driver, and firmware revisions, see the online *SAN Support Matrix* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

- ◆ Upgrade the HBA firmware.

Note

The `install` command installs the firmware file in the `/opt/NTAPfcfw` directory during the host software installation.

When to upgrade firmware

The firmware must be upgraded if it does not match the level required by the HBA driver. At the time this book was printed, the correct firmware revision level was 3.90a7 and the name of the firmware file was `cd390a7.dwc`.

Note

See the online *SAN Support Matrix* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> or the *SAN Host Release Notes for Fibre Channel Protocol on Solaris* to verify that you have the correct firmware revision.

Utility to use to upgrade firmware

You use the `lputil` utility to upgrade the HBA firmware for a Solaris host. The `lputil` utility is automatically loaded when the driver is installed.

Checking the firmware version

To check the firmware version level, complete the following step.

Step	Action
1	On the host command line, enter the following command: <pre>sanlun fcp show adapter -v all</pre> Result: The configuration information for each HBA is displayed, including the firmware version. Note_____ If you want to view configuration information for a specific HBA, you can enter the <code>sanlun fcp show adapter</code> command with the “adapter name” instead of the “all” option. _____

Sample output of sanlun fcp show adapter command

The following example shows sample output from the `sanlun fcp show adapter` command. In the output marked with boldface type, the adapter `lpfc0` has the 3.90a7 firmware version level.

```
# sanlun fcp show adapter -v all
```

```

lpfc0                WWPN:10000000AA11BB22
WWNN:                20000000AA11BB22
driver name:         lpfc
model:               LP9002
model description:   Emulex LightPulse LP9002 2 Gigabit PCI Fibre
Channel Adapter
serial number:       0000AA11BB22
hardware version:    2002606d
driver version:      5.01c; HBAAPI v1.3, 3-29-02
firmware version:  3.90A7 (C2D3.90A7)
Number of ports:     1
port type:           Fabric
port state:          Operational
supported speed:     2 GBit/sec
negotiated speed:    2 GBit/sec
OS device name:      /devices/pci@1f,4000/fibre-channel@2
#
```

Obtaining the correct firmware

The HBA firmware is included in and installed with the NetApp Solaris Fibre Channel software package.

If the correct firmware file is not installed in the /opt/NTAPfcfw directory, complete the following steps to obtain the correct firmware.

Step	Action	
1	Obtain the correct host software package, as described in “ Obtaining the software package ” on page 25.	
2	Install the host software.	
	If you are...	Then...
	Installing for the first time	Go to “ Installing the host software ” on page 29.
	Upgrading the host software	Go to “ Upgrading the host software ” on page 35.
3	Go to “ Upgrading the HBA firmware ” on page 45.	

Upgrading the HBA firmware

To upgrade the HBA firmware with the `lputil` utility, complete the following steps.

Step	Action
1	Change to the /usr/sbin/lpfc directory: cd /usr/sbin/lpfc
2	Enter the following command to start the <code>lputil</code> utility: ./lputil Result: The utility opens, displaying the Main menu.
3	On the Main menu, enter the number 3 option for Firmware Maintenance. Result: The Firmware Maintenance menu is displayed.
4	On the Firmware Maintenance menu, enter the number 1 option for Load Firmware Image.

Step	Action
5	Enter the firmware file name found in the /opt/NTAPfcfw directory. An example is /opt/NTAPfcfw/cd390a7.dwc. Result: The new firmware is transferred to flash ROM (upgraded).
6	Enter the 0 option to return to the Main menu.
7	On the Main menu, enter the number 2 option for Adapter Information, and then enter the number 2 for Adapter Revision Level. Result: The adapter revision level is displayed. Verify that this is in the new revision level.
8	Enter 0 to return to the Main menu.
9	Enter 0 to exit the utility.
10	On the command line, reboot the host with the reconfigure option by entering the following command: reboot -- -r
11	On the host command line, enter the following command and verify that the new firmware revision level is displayed: sanlun fcp show adapter -v all Result: The configuration information for each HBA is displayed, including the new firmware version.

About the chapter

This chapter describes how to configure the host HBA driver after installing the driver as described in Chapter 3, “[Installing the NetApp Software Package](#),” on page 23.

Topics in this chapter

This chapter discusses the following topics:

- ◆ “[Creating persistent bindings for the filer](#)” on page 48
- ◆ “[Checking host and filer connectivity](#)” on page 51

Creating persistent bindings for the filer

Reason to create persistent bindings for the filer

The filer’s WWNN is persistently bound on the host to a particular target ID. The host operating system then accesses the filer using the bound target ID. Creating persistent bindings between a filer (target) and the host (initiator) HBAs guarantees that the filer is always available at the correct SCSI target ID on the host. Without persistent bindings, the SCSI target ID is not guaranteed.

Note_____

If you have multiple filers and hosts, repeat the following procedures for each host and the filers with which the host communicates.

Finding the filer’s WWNN

To find the filer’s WWNN, complete the following steps.

Step	Action
1	On the host, use the <code>telnet</code> command to access the filer.
2	On the filer command line, enter the following command to show the filer’s WWNN: fcpl nodename Result: The filer’s WWNN (or Fibre Channel node name) is displayed in a format with colons and without colons. Example: filerX> fcpl nodename Fibre Channel nodename: 50:a9:80:00:55:CC:66:DD (50a9800055CC66DD) filerX>
3	Keep this session available, so that you can copy and paste the WWNN (without colons) in the next procedure when you create persistent bindings between the host’s target IDs and the filer’s WWNN.

Creating persistent bindings

To map the filer WWNN to the host target ID and thereby create persistent bindings, complete the following steps.

Note

The host HBAs are named by the operating system. In the examples in this book, the default names assigned to the HBAs are lpfc0 and lpfc1.

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /usr/sbin/lpfc directory: cd /usr/sbin/lpfc
3	Enter the following command to start the <code>lputil</code> utility: ./lputil Result: The utility displays the Main menu.
4	From the Main menu, enter the number 5 option for Persistent Bindings. Result: The Persistent Bindings menu is displayed.
5	From the Persistent Bindings menu, enter the number 4 option for Bind Target Manually. Result: A list of host HBAs is displayed. Example: Host Adapter 0 (lpfc0) is an LP9K (Ready Mode) Host Adapter 1 (lpfc1) is an LP9K (Ready Mode) Adapter (or X to Cancel) => 0
6	Select the desired adapter number to create a persistent binding. For example, enter 0 for Host Adapter 0 (lpfc0). Result: The Select Binding Method menu is displayed.
7	From the Select Binding Method menu, enter the number 1 option to bind by Node Name.

Step	Action
8	Enter the 16 Character Node Name by copying and pasting the filer WWNN that you discovered in “Finding the filer’s WWNN” on page 48.
9	Enter the Target Number. You can choose any target number from 0 to 511. Best-practice guideline: The best-practice guideline is to bind the WWNN to the same target number (target ID) for all HBAs on every host using this particular filer. In a SAN with multiple filers, choose a different target number (target ID) for each filer.
10	If you have a second host HBA, repeat Step 5 through Step 9 to create a persistent binding.
11	Enter the 0 option to return to the Main menu.
12	Enter 0 (again) to return to the Main menu.
13	Enter 0 to exit the utility.
14	With a text editor, open the /kernel/drv/sd.conf file on the host and verify that the target ID you entered in Step 9 is listed in this file. Example: The following line shows that the target ID mapped to the filer’s WWNN is 10. <pre>name="sd" parent="lpfc" target=10 lun=0;</pre>
15	On the command line, reboot the host with the reconfigure option by entering the following command: <pre>reboot -- -r</pre>

Checking host and filer connectivity

Displaying current persistent bindings

To verify the host and filer connectivity by displaying the current persistent bindings, complete the following steps.

Note

You can perform this only after creating the persistent bindings and rebooting with the reconfigure option, as described in “[Creating persistent bindings](#)” on page 49.

Step	Action
1	Change to the /usr/sbin/lpfc directory: <code>cd /usr/sbin/lpfc</code>
2	Enter the following command to start the <code>lputil</code> utility: <code>./lputil</code> Result: The utility displays the Main menu.
3	From the Main menu, enter the number 5 option for Persistent Bindings. Result: The Persistent Bindings Menu is displayed.
4	From the Persistent Bindings menu, enter the number 2 option for Display All Nodes. Result: A select-an-adapter menu is displayed.

Step	Action																																								
5	Enter the number for the host adapter. Result: The visible node information is displayed with the node state, target IDs, WWPNs, and WWNNs. Example: Visible Nodes: <table><tr><th>Node</th><th>Target</th><th>WWPN</th><th>WWNN</th></tr><tr><td>----</td><td>-----</td><td>-----</td><td>-----</td></tr><tr><td>In Transition</td><td>0</td><td>20-0e-00-60-AA-50-FF-11</td><td>10-00-00-60-AA-50-FF-11</td></tr><tr><td>In Transition</td><td>0</td><td>20-fc-00-60-AA-50-FF-11</td><td>10-00-00-60-AA-50-FF-11</td></tr><tr><td>In Transition</td><td>0</td><td>10-00-00-00-BB-28-de-34</td><td>20-00-00-00-BB-28-de-34</td></tr><tr><td>In Transition</td><td>0</td><td>10-00-00-00-BB-5c-77-99</td><td>20-00-00-00-BB-5c-77-99</td></tr><tr><td>In Transition</td><td>0</td><td>10-00-00-00-BB-14-FF-de</td><td>20-00-00-00-BB-14-FF-de</td></tr><tr><td>In Transition</td><td>0</td><td>10-00-00-00-BB-00-22-6f</td><td>20-00-00-00-BB-00-22-6f</td></tr><tr><td>Automapped FCP Node</td><td>1</td><td>50-a9-80-03-55-CC-63-DE</td><td>50-a9-80-00-55-CC-63-DE</td></tr><tr><td>Mapped FCP Node</td><td>0</td><td>50-a9-80-03-55-CC-66-DD</td><td>50-a9-80-00-55-CC-66-DD</td></tr></table> Press any key to continue:	Node	Target	WWPN	WWNN	----	-----	-----	-----	In Transition	0	20-0e-00-60-AA-50-FF-11	10-00-00-60-AA-50-FF-11	In Transition	0	20-fc-00-60-AA-50-FF-11	10-00-00-60-AA-50-FF-11	In Transition	0	10-00-00-00-BB-28-de-34	20-00-00-00-BB-28-de-34	In Transition	0	10-00-00-00-BB-5c-77-99	20-00-00-00-BB-5c-77-99	In Transition	0	10-00-00-00-BB-14-FF-de	20-00-00-00-BB-14-FF-de	In Transition	0	10-00-00-00-BB-00-22-6f	20-00-00-00-BB-00-22-6f	Automapped FCP Node	1	50-a9-80-03-55-CC-63-DE	50-a9-80-00-55-CC-63-DE	Mapped FCP Node	0	50-a9-80-03-55-CC-66-DD	50-a9-80-00-55-CC-66-DD
Node	Target	WWPN	WWNN																																						
----	-----	-----	-----																																						
In Transition	0	20-0e-00-60-AA-50-FF-11	10-00-00-60-AA-50-FF-11																																						
In Transition	0	20-fc-00-60-AA-50-FF-11	10-00-00-60-AA-50-FF-11																																						
In Transition	0	10-00-00-00-BB-28-de-34	20-00-00-00-BB-28-de-34																																						
In Transition	0	10-00-00-00-BB-5c-77-99	20-00-00-00-BB-5c-77-99																																						
In Transition	0	10-00-00-00-BB-14-FF-de	20-00-00-00-BB-14-FF-de																																						
In Transition	0	10-00-00-00-BB-00-22-6f	20-00-00-00-BB-00-22-6f																																						
Automapped FCP Node	1	50-a9-80-03-55-CC-63-DE	50-a9-80-00-55-CC-63-DE																																						
Mapped FCP Node	0	50-a9-80-03-55-CC-66-DD	50-a9-80-00-55-CC-66-DD																																						
6	For each HBA, verify that it has the correct target IDs and is persistently bound to the correct filer WWNN. Note_____ The filer WWNN must appear as Mapped FCP Node and not Automated FCP Node. The filer is correctly bound only if it is reported as mapped. _____																																								
7	Upon completion, enter 0 to return to the Main menu.																																								
8	Enter 0 to exit the <code>lputil</code> utility.																																								

About this chapter

This chapter provides the following information:

- ◆ How to create initiator groups and LUNs on the filer
- ◆ How to configure LUNs and make them accessible by the host
- ◆ How to use the `san lun` utility to manage host LUN and HBA information

Topics in this chapter

This chapter discusses the following topics:

- ◆ “[Creating LUNs on the filer](#)” on page 54
- ◆ “[Configuring the LUNs](#)” on page 64
- ◆ “[Displaying LUN and HBA Information](#)” on page 78

Creating LUNs on the filer

Tasks to create and map LUNs on the filer

Before you can complete the host driver configuration, you must perform the following tasks:

- ◆ Create an initiator group on the filer.
An initiator group is a collection of host WWPNs.
- ◆ Create one or more LUNs on the filer and map the LUNs to an initiator group.
- ◆ Record the LUN IDs that you used to map the LUNs to the initiator group.
The host can access only the LUNs mapped to an initiator group.

Rule for creating LUNs

You must ensure that the LUNs are in the filer's qtree root or root of a volume.

Best practices for creating LUNs

The best practices for creating LUNs are the following:

- ◆ Do not put LUNs in /vol/vol0 (the root volume).
- ◆ Enable space reservations.
- ◆ Disable scheduled auto snapshots.

For more information about creating and managing LUNs, see *Data ONTAP 6.3 SAN System Administrator's Guide*.

Creating an initiator group on the filer

To create initiator group on the filer, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	On the host, change to the /usr/sbin directory: cd /usr/sbin

Step	Action
3	Enter the following command to print a command to be run on the filer that creates an initiator group containing all the HBAs on your host: <pre>./sanlun fcp show adapter -c</pre> -c option prints the initiator-group-creation command on the screen. Result: An <code>igroup create</code> command with the host's WWPNs appears on the screen. The initiator group's name matches the name of the host. Example: Enter this filer command to create an initiator group for this system: <pre>igroup create -f -t solaris "hostA" 10000000AA11BB22 10000000AA11EE33</pre> In this example, the name of the host is "hostA," so the name of the initiator group with the two WWPNs is "hostA."
4	On the host in a different session, use the <code>telnet</code> command to access the filer.
5	Copy the <code>igroup create</code> command from Step 2, paste the command on the filer's command line, and press Enter to run the <code>igroup</code> command on the filer. Result: An initiator group is created on the filer.
6	On the filer's command line, enter the following command to verify the newly created initiator group: <pre>igroup show</pre> Result: The newly created initiator group with the host's WWPNs is displayed. Example: <pre>filerX> igroup show hostA (FCP) (ostype: solaris): 10:00:00:00:AA:11:BB:22 10:00:00:00:AA:11:EE:33 filerX></pre>

Step	Action
7	On the filer's command line, enter the following command to show the FCP initiator port names: <pre>fcv show initiator</pre> Result: The WWPNs for the FCP initiator HBAs and their initiator group are displayed. Example: The following example is for a fabric-attached SAN configuration with a clustered filer pair (adapter 4a and 5a): <pre>filerX> fcv show initiator Initiators connected on adapter 4a: Portname Group 10:00:00:00:AA:01:02:03 10:00:00:00:AA:11:BB:22 hostA</pre> Adapter 4b is running on behalf of the partner. Use the partner command to view this adapter when in takeover mode. <pre>Initiators connected on adapter 5a: Portname Group 10:00:00:00:AA:01:02:04 10:00:00:00:AA:11:EE:33 hostA</pre> Adapter 5b is running on behalf of the partner. Use the partner command to view this adapter when in takeover mode. <pre>filerX></pre> Example: The following example is for a direct-attached configuration: <pre>filerY> fcv show initiator Initiators connected on adapter 5a: Portname Group 10:00:00:00:AA:88:CC:11 hostB</pre> Initiators connected on adapter 5b: None connected. <pre>filerY></pre>

Creating LUNs with the lun setup command

The `lun setup` command prompts you for information required for creating a LUN and an initiator group and mapping the LUN to an initiator group. When a default in brackets [] is provided, you can press Enter to accept the default.

You can create an initiator group and add the WWPNs to it when prompted. If you already created an initiator group, you can use an existing initiator group and add the WWPNs.

You can interrupt the `lun setup` process at any time by pressing Ctrl-C. Any information that you entered is discarded.

To create LUNs on the filer using the `lun setup` command, complete the following steps.

Step	Action
1	On the filer’s command line, enter the following command to create a LUN: lun setup
2	Enter y in response to the prompt: Do you want to create a LUN? [y]: y
3	Enter solaris in response to the next prompt: OS type of LUN (default/solaris/windows) [default]: solaris Note _____ If you select “default,” Data ONTAP determines which operating system to use. _____

Step	Action
4	Enter the appropriate LUN path in response to the next prompt: A LUN path must be absolute. A LUN can only reside in a volume or qtree root. For example, to create a LUN with the name "lun0" in the qtree root /vol/vol1/q0, specify the path as "/vol/vol1/q0/lun0" Enter LUN path: <i>lun_path</i> Example: An example of a <i>lun_path</i> is /vol/vol1/mtree1/lun_sdata or /vol/vol1/hostA_0. Caution_____ Do not create LUNs in /vol/vol0. Result: The name of the LUN (the LUN path) is defined.
5	Enter the LUN size in response to the next prompt: Size for a LUN is specified in bytes. You can use single-character multiplier suffixes: b(sectors), k(KB), m(MB), g(GB) or t(TB). Enter LUN size: ____ Example: An example is 5g, meaning 5 GB of raw disk. Result: A LUN with the specified size of raw disk is created if the configuration information is accepted later in this program. The quantity of usable disk space by the host varies depending on the host's operating system and the application using the LUN.

Step	Action
6	Enter a comment string, if desired, or press Enter in response to the next prompt: You can add a comment string to describe the contents of the LUN. Please type a string (without quotes), or hit ENTER if you don't want to supply a comment. Enter comment string:_____ Note_____ If you press Enter and do not add a comment, you can add a comment later with the <code>lun comment</code> command. If you are using the FilerView® interface, a LUN description is the same as a comment. For more information about the <code>lun comment</code> command, see the <code>na_lun (1)</code> man page on the filer.

Step	Action
7	To create an initiator group (igroup), enter your information when prompted. Note_____ Entering ? shows you a list of existing initiator groups. If you previously created the initiator group in “Creating an initiator group on the filer” on page 54, the existing group names are displayed. You can accept the previously created initiator group (for example, hostA) or create a new initiator group (for example, <i>new_group_name</i>). _____ The LUN will be accessible to an initiator group. You can use an existing group name, or supply a new name to create a new initiator group. Enter '?' to see existing initiator group names. Name of initiator group [shows igroup name if exists]: <i>new_group_name</i> Example: In this example, a new initiator group name is created. An example of a <i>new_group_name</i> is solaris_groupB or hostA. Note_____ If you want to accept the default initiator group, press Enter. _____ Result: An initiator group is created or specified.
8	Respond to the next prompt by pressing Enter to accept FCP: Type of initiator group <i>new_group_name</i> (FCP/iSCSI) [FCP]: Result: Choosing FCP means that the initiator WWPNs in this initiator group are using FCP for SCSI protocol.

Step	Action								
9	Enter comma-separated port names in response to the next prompt: A Fibre Channel Protocol (FCP) initiator group is a collection of initiator port names. Each port name (WWPN) is 16 hexadecimal digits, separated (only) by optional colon (:) characters. You can separate port names by commas. Enter '?' to display a list of connected initiators. Hit ENTER when you are done adding port names to this group. Enter comma separated portnames: Note Enter ? to see the list of initiator WWPNs connected to the target HBAs and associated initiator groups (if they exist). The <code>san lun fcp show adapter</code> command run on the host lists the initiator HBAs and their WWPNs specific to that host. Example: Enter comma separated portnames?: Initiators connected on adapter 5a: <table> <tr> <td>Portname</td><td>Group</td></tr> <tr> <td>10:00:00:00:AA:22:BB:33</td><td></td></tr> <tr> <td>10:00:00:00:AA:33:BB:44</td><td></td></tr> <tr> <td>10:00:00:00:AA:55:BB:66</td><td></td></tr> </table> Initiators connected on adapter 5b: None connected. Initiators connected on adapter 7a: None connected. Initiators connected on adapter 7b: None connected. Enter comma separated portnames:10:00:00:00:AA:55:BB:66 Enter comma separated portnames: In this example, the initiator HBA with WWPN 10:00:00:00:AA:55:BB:66 is added to <i>new_group_name</i>. Result: The initiator WWPNs are added to a previously specified initiator group.	Portname	Group	10:00:00:00:AA:22:BB:33		10:00:00:00:AA:33:BB:44		10:00:00:00:AA:55:BB:66	
Portname	Group								
10:00:00:00:AA:22:BB:33									
10:00:00:00:AA:33:BB:44									
10:00:00:00:AA:55:BB:66									

Step	Action
10	Enter solaris in response to the next prompt: <pre>OS type of initiator group "new_group_name" (default/solaris/windows):solaris</pre> Result: The operating system for the initiator group is defined.
11	Enter the LUN ID for the LUN that is mapped to the initiator group in response to the next prompt. You can also enter ? to display the LUNs already in use by one or more initiators in the specified initiator group. Note_____ This is where you record the LUN ID associated with the <i>lun_path</i> and the initiator group name (<i>new_group_name</i>). The program supplies the next available LUN ID. _____ The LUN will be accessible to all the initiators in the initiator group. Enter '?' to display LUNs already in use by one or more initiators in group <i>"new_group_name"</i>. LUN ID at which initiator group <i>"new_group_name"</i> sees <i>"lun_path"[0]</i>: Example: In this example, 0 is the next available LUN ID (as shown in the brackets). Pressing Enter creates a LUN 0. Result: The LUN ID is assigned to the LUN (LUN path) and mapped to the initiator group.
12	Respond to the next prompt by entering y to accept the configuration or n to discard the configuration: <pre>Do you want to accept this configuration? [y]:</pre> Result: If you enter y, the LUN is mapped to the specified initiator group and all changes to the system are committed. At this point, Ctrl-C cannot undo the changes.
13	Terminate or continue creating LUNs by responding to the final prompt: <pre>Do you want to create another LUN? [n]:</pre>

Verifying the mapped LUN

To verify the mapped LUN, complete the following step.

Step	Action
1	On the filer's command line, enter the following command to show the mapped LUN. lun show -v <lun-path> <i>lun-path</i> is the name of a specific LUN. Result: The information for the specified LUN is displayed. Example: <pre>filerX> lun show -v /vol/vol1/hostA /vol/vol1/hostA_0 2.0g (2144337920) (r/w, online, mapped) Serial#: 0c1NP1234ABC Share: none Multiprotocol Type: image Maps: hostA=0 filerX></pre>

Configuring the LUNs

About configuring the LUNs

To complete the host configuration, you must perform the following tasks on the host:

- ◆ Configure the host to find the filer LUN IDs.
Use a text editor to edit the `/kernel/drv/sd.conf` file and add entries for the LUN IDs (for example, LUN 0, LUN 1) that you mapped on the filer during `lun setup` (in the previous section).
- ◆ Enable the host to discover the new LUNs with `devfsadm` (device administration) command.
- ◆ Verify that the new LUNs are visible to the host and displayed correctly with the `san lun lun show` command.
- ◆ Label the new LUNs as Solaris disks with one of the following:
 - ❖ Create a standard partition table and with the `format` command, labeling the new LUNs as Solaris disks.
 - ❖ Partition the LUNs for multiprotocol access with the `format` command and the All Free Hog partitioning base.

Note

This is not supported for LUNs that are in VERITAS Volume Manager disk groups.

- ◆ Reboot the host system.

Optional file system choice

You can optionally install the VERITAS File System. The VERITAS File System provides improved logging and file system recovery.

- ◆ For installation guidelines, see the *SAN Host Release Notes for Fibre Channel Protocol on Solaris*.
- ◆ For more information about the VERITAS File System product, see <http://www.veritas.com>.

Configuring the host to find LUNs

The sd.conf file is a SCSI driver configuration file for configuring SCSI storage. This file tells the system which disks to probe when the system is booted. For FCP targets with multiple LUNs or target IDs greater than 17, or if you have non-zero LUNs, this file must be modified so that the multiple LUNs and target IDs can be located at boot time.

To configure the host to find the filer LUN IDs, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	With a text editor on the host, edit the /kernel/drv/sd.conf file and look for a number of lines with the following format: name="sd" parent="lpfc" target=0 lun=0; Note_____ These lines are typically near the end of the file. _____ The following comment precedes the desired lines: # Start lpfc auto-generated configuration -- do NOT alter or delete this line # WARNING: anything you put within this auto-generated section will # be DELETED if you execute pkgmgr to remove the lpfc driver package. # You may need to add additional lines to probe for additional LUNs # or targets. You SHOULD delete any lines that represent lpfc targets # or LUNs that are not used.
3	If your target ID is greater than 17, you must create new entries, or find the lines that correspond to the target IDs that you persistently bound to the filer’s WWNN. Example: name="sd" parent="lpfc" target=9 lun=0; In this example, the target ID that you mapped to the filer’s WWNN is 9. Look for the line with “target=9.”

Step	Action
4	Edit the lines and add the LUN IDs that you created on the filer and made available to the initiator group for the host. Best-practice guideline: If you anticipate mapping additional LUNs to this host, add all the entries to the sd.conf file during one editing session. This means that later on a reboot is not required when the LUNs are needed. If no sd.conf edits are required, for example, the LUN IDs were already in the sd.conf file, the <code>devfsadm</code> command can be run without requiring a reboot (as in Step 6). Example: If you added LUN 0, LUN 1, LUN 5, and LUN 19 on a filer to the initiator group for the host with the target ID of 9, copy the line that you found in Step 2, three times. Modify the “lun=” to reflect the LUNs you added: <pre>name="sd" parent="lpfc" target=9 lun=0; name="sd" parent="lpfc" target=9 lun=1; name="sd" parent="lpfc" target=9 lun=5; name="sd" parent="lpfc" target=9 lun=19;</pre>
5	After you edit all the target IDs with the newly created LUN IDs, save the sd.conf file. Result: The host is now configured to find the LUN IDs.
6	On the command line, reboot the host by entering the following command: reboot

Enabling the host to discover the new LUNs

To enable the host to discover the new LUNs, complete the following steps.

Note

Occasionally LUNs are not found. In this case, reboot the host system and rerun the `devfsadm` command.

Step	Action
1	Ensure that you are logged in as root on the host.

Step	Action
2	Change to the /usr/sbin directory: cd /usr/sbin
3	Enter the following command to discover the new LUNs: ./devfsadm Result: The system probes for new devices. When it finds the new LUNs, it might generate a warning on the console and in the system log complaining about a corrupt label. Note_____ This warning implies that the host discovered the new LUNs and they need to be labeled as Solaris disks by using the format command, as described in “Labeling the new LUNs as disks” on page 68. _____ Example: <pre>Apr 4 16:13:25 hostA scsi: [ID 107833 kern.warning] WARNING: /pci@1f,2000/pci@1/fibre-channel@5/sd@0,0 (sd529): Apr 4 16:13:25 hostA corrupt label - wrong magic number</pre>

Verifying LUN visibility

To verify that the new LUNs are visible to the host, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /usr/sbin directory: cd /usr/sbin

Step	Action
3	On the host's command line, enter the following command to verify that the new LUNs are visible: <pre>./sanlun lun show <i>filer_name:path_name</i></pre> <i>filer_name</i> is the filer's name. <i>path_name</i> is the name of the LUN. Result: The command displays the filer name, LUN path name, device name, HBA name, LUN size, and LUN state. Example: <pre># sanlun lun show filerX:/vol/vol2/testlun filer: lun-pathname device filename adapter lun size lun state filerX: /vol/vol2/testlun /dev/rdisk/c2t1d2s2 lpfc0 7.0g (7516192256) GOOD #</pre>

Labeling the new LUNs as disks

To label a new LUN as Solaris disk, complete the following steps.

Step	Action	
1	If...	Then...
	You want to partition the LUNs for multiprotocol access	Go to “ Partitioning LUNs for multiprotocol access ” on page 70
	You are going to put the LUN into VERITAS Volume Manager disk group or you do not want to partition your LUNs for multiprotocol access	Go to Step 2.
2	Ensure that you are logged in as root on the host.	
3	Change to the /usr/sbin directory: cd /usr/sbin	

Step	Action
4	Enter the following command to label the new LUNs as Solaris disks: <pre>./format</pre> Result: The <code>format</code> command searches for disks and displays configured disks and available disk selections. The utility prompts you to specify a disk by entering its number. Example: <pre># format Searching for disks...done c1t3d0: configured with capacity of 10.00GB c2t3d0: configured with capacity of 10.00GB AVAILABLE DISK SELECTIONS: 0. c0t0d0 <ST315320A cyl 29649 alt 2 hd 16 sec 63> /pci@1f,0/ide@d/dad@0,0 1. c1t3d0 <NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@0/sd@3,0 2. c1t3d1 <NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@0/sd@3,1 3. c2t3d0 <NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@1/sd@3,0 4. c2t3d1 <NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@1/sd@3,1</pre>
5	Enter the disk's number in the available disk selections list in response to the next prompt: Specify disk (enter its number): Result: The disk to be labeled is specified. Example: Specify disk (enter its number): 3 In this example, item 3 in the Available Disk Selections list is c2t3d0.

Step	Action	
6	Enter y to label the disk now in response to the next prompt: Disk not labeled. Label it now? y Result: The disk is labeled and the Format menu (or the format prompt) is displayed. Example: selecting c2t3d0 [disk formatted] Disk not labeled. Label it now? y	
7	If...	Then...
	You want to label other disks	1. At the format prompt, enter disk to display available disk selections. Note_____ You can enter ? at the prompt to redisplay the Format menu. _____ 2. Repeat Step 5 and Step 6 for all new LUNs that need to be labeled as disks.
	You are done	Quit the format utility.

Partitioning LUNs for multiprotocol access

You can access the data in a LUN both as a raw character device (for example, /dev/rdisk/c3t0d5s6) and as an NFS file. To do this, your LUN must have a compatible partition table. The requirements are the following:

- ◆ Partition 0 (zero) must contain one disk cylinder only.
- ◆ Partition 2 must contain the entire LUN, from cylinder 0 to the end.
- ◆ The remainder of the disk must be contained in a single partition.

Caution

If your LUN is part of a volume under VERITAS Volume Manager, the data within that LUN cannot be accessed as if it were an NFS file. Data on a LUN that has a VxFS file system on it is also inaccessible through NFS.

Data on LUNs that are not part of a VERITAS volume and that do not have a VERITAS file system on them can be accessed through NFS if the partition table conforms to the rules defined above.

To partition your LUN (or disk) for multiprotocol access, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	On the host, change to the /usr/sbin directory: cd /usr/sbin

Step	Action
3	Enter the following command to partition your LUNs (or disks): <pre>./format</pre> Result: The <code>format</code> command searches for disks and displays configured disks and available disk selections. The utility prompts you to specify a disk by entering its number. Example: <pre># format Searching for disks...done c1t3d0: configured with capacity of 10.00GB c2t3d0: configured with capacity of 10.00GB AVAILABLE DISK SELECTIONS: 0. c0t0d0 <ST315320A cyl 29649 alt 2 hd 16 sec 63> /pci@1f,0/ide@d/dad@0,0 1. c1t3d0 <NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@0/sd@3,0 2. c1t3d1 <NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@0/sd@3,1 3. c2t3d0 <NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@1/sd@3,0 4. c2t3d1 <NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128> /pci@1f,0/pci@5/fibre-channel@1/sd@3,1</pre>
4	Enter the disk's number in the available disk selections list in response to the next prompt: Specify disk (enter its number): Result: The available disk is specified. Example: Specify disk (enter its number): 3 In this example, item 3 in the Available Disk Selections list is c2t3d0.

Step	Action
5	Enter n to not label the disk in response to the next prompt: Disk not labeled. Label it now? n Result: The disk is not labeled and the Format menu (or the format prompt) is displayed. Example: selecting c2t3d0 [disk formatted] Disk not labeled. Label it now? n
6	At the format prompt, enter partition to select (or define) a partition table: format> partition Result: The Partition menu is displayed.
7	At the partition prompt, enter modify to change a predefined table: PARTITION MENU: 0 - change '0' partition 1 - change '1' partition 2 - change '2' partition 3 - change '3' partition 4 - change '4' partition 5 - change '5' partition 6 - change '6' partition 7 - change '7' partition - select - select a predefined table - modify - modify a predefined partition table - name - name the current table - print - display the current table - label - write partition map and label to the disk !<cmd> - execute <cmd>, then return - quit partition> modify Result: The utility prompts you to select the partitioning base.

Step	Action																																																						
8	Enter 1 to select the All Free Hog partitioning base in response to the next prompt: Select partitioning base: 0. Current partition table (default) 1. All Free Hog Choose base (enter number) [0]? 1 Result: A partition table is displayed.																																																						
9	Enter yes in response to the next prompt to continue creating a new partition table based on the displayed table: <table><tr><th>Part</th><th>Tag</th><th>Flag</th><th>Cylinders</th><th>Size</th><th>Blocks</th></tr><tr><td>0</td><td>root</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>1</td><td>swap</td><td>wu</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>2</td><td>backup</td><td>wu</td><td>0 - 10237</td><td>10.00GB</td><td>(10238/0/0) 20967424</td></tr><tr><td>3</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>4</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>5</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>6</td><td>usr</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>7</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr></table> Do you wish to continue creating a new partition table based on above table[yes]? yes Result: The utility asks which partition should be the Free Hog partition.	Part	Tag	Flag	Cylinders	Size	Blocks	0	root	wm	0	0	(0/0/0) 0	1	swap	wu	0	0	(0/0/0) 0	2	backup	wu	0 - 10237	10.00GB	(10238/0/0) 20967424	3	unassigned	wm	0	0	(0/0/0) 0	4	unassigned	wm	0	0	(0/0/0) 0	5	unassigned	wm	0	0	(0/0/0) 0	6	usr	wm	0	0	(0/0/0) 0	7	unassigned	wm	0	0	(0/0/0) 0
Part	Tag	Flag	Cylinders	Size	Blocks																																																		
0	root	wm	0	0	(0/0/0) 0																																																		
1	swap	wu	0	0	(0/0/0) 0																																																		
2	backup	wu	0 - 10237	10.00GB	(10238/0/0) 20967424																																																		
3	unassigned	wm	0	0	(0/0/0) 0																																																		
4	unassigned	wm	0	0	(0/0/0) 0																																																		
5	unassigned	wm	0	0	(0/0/0) 0																																																		
6	usr	wm	0	0	(0/0/0) 0																																																		
7	unassigned	wm	0	0	(0/0/0) 0																																																		
10	Enter 6 to designate partition 6 as the Free Hog partition in response to the next prompt: Free Hog partition[6]? 6 Result: The utility prompts you to define the partition size for each of the other partitions (0, 1, 3, 4, 5, and 7).																																																						

Step	Action																																																						
11	Enter 1c as the size of partition 0 in response to the next prompt: Enter size of partition '0' [0b, 0c, 0.00mb, 0.00gb]: 1c Note_____ It is mandatory that the size is one cylinder (1c) for partition 0. _____ Result: The utility prompts you to define the partition size for each of the other partitions (1, 3, 4, 5, and 7).																																																						
12	For each prompt after the partition 0, press Enter to designate that the other partitions have no size (zero): Enter size of partition '0' [0b, 0c, 0.00mb, 0.00gb]: 1c Enter size of partition '1' [0b, 0c, 0.00mb, 0.00gb]: Enter size of partition '3' [0b, 0c, 0.00mb, 0.00gb]: Enter size of partition '4' [0b, 0c, 0.00mb, 0.00gb]: Enter size of partition '5' [0b, 0c, 0.00mb, 0.00gb]: Enter size of partition '7' [0b, 0c, 0.00mb, 0.00gb]: Result: A new partition table is displayed. The utility prompts for whether it is OK to make this the current partition table.																																																						
13	Enter yes to make the table the current partition table in response to the next prompt: <table><tr><th>Part</th><th>Tag</th><th>Flag</th><th>Cylinders</th><th>Size</th><th>Blocks</th></tr><tr><td>0</td><td>root</td><td>wm</td><td>0 - 0</td><td>1.00MB</td><td>(1/0/0) 2048</td></tr><tr><td>1</td><td>swap</td><td>wu</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>2</td><td>backup</td><td>wu</td><td>0 - 10237</td><td>10.00GB</td><td>(10238/0/0) 20967424</td></tr><tr><td>3</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>4</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>5</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr><tr><td>6</td><td>usr</td><td>wm</td><td>1 - 10237</td><td>10.00GB</td><td>(10237/0/0) 20965376</td></tr><tr><td>7</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr></table> Okay to make this the current partition table[yes]? yes Result: The utility prompts you to enter the table name with surrounding quotes.	Part	Tag	Flag	Cylinders	Size	Blocks	0	root	wm	0 - 0	1.00MB	(1/0/0) 2048	1	swap	wu	0	0	(0/0/0) 0	2	backup	wu	0 - 10237	10.00GB	(10238/0/0) 20967424	3	unassigned	wm	0	0	(0/0/0) 0	4	unassigned	wm	0	0	(0/0/0) 0	5	unassigned	wm	0	0	(0/0/0) 0	6	usr	wm	1 - 10237	10.00GB	(10237/0/0) 20965376	7	unassigned	wm	0	0	(0/0/0) 0
Part	Tag	Flag	Cylinders	Size	Blocks																																																		
0	root	wm	0 - 0	1.00MB	(1/0/0) 2048																																																		
1	swap	wu	0	0	(0/0/0) 0																																																		
2	backup	wu	0 - 10237	10.00GB	(10238/0/0) 20967424																																																		
3	unassigned	wm	0	0	(0/0/0) 0																																																		
4	unassigned	wm	0	0	(0/0/0) 0																																																		
5	unassigned	wm	0	0	(0/0/0) 0																																																		
6	usr	wm	1 - 10237	10.00GB	(10237/0/0) 20965376																																																		
7	unassigned	wm	0	0	(0/0/0) 0																																																		

Step	Action																																
14	Enter your table name (surrounded with quotes) in response to the next prompt: Enter table name (remember quotes): Result: The utility prompts for whether you are ready to label the disk. Example: Enter table name (remember quotes): "my_part_table"																																
15	Enter y to label the disk in response to the next prompt: Ready to label disk, continue? y Result: The disk is labeled and the Partition menu (or prompt) for the disk is displayed.																																
16	Enter quit to quit the Partition menu (or prompt): partition>quit Result: The Format menu (or prompt) is displayed. Example: FORMAT MENU: <table> <tbody> <tr> <td>disk</td><td>- select a disk</td></tr> <tr> <td>type</td><td>- select (define) a disk type</td></tr> <tr> <td>partition</td><td>- select (define) a partition table</td></tr> <tr> <td>current</td><td>- describe the current disk</td></tr> <tr> <td>format</td><td>- format and analyze the disk</td></tr> <tr> <td>repair</td><td>- repair a defective sector</td></tr> <tr> <td>show</td><td>- translate a disk address</td></tr> <tr> <td>label</td><td>- write label to the disk</td></tr> <tr> <td>analyze</td><td>- surface analysis</td></tr> <tr> <td>defect</td><td>- defect list management</td></tr> <tr> <td>backup</td><td>- search for backup labels</td></tr> <tr> <td>verify</td><td>- read and display labels</td></tr> <tr> <td>save</td><td>- save new disk/partition definitions</td></tr> <tr> <td>volname</td><td>- set 8-character volume name</td></tr> <tr> <td>!<cmd></td><td>- execute <cmd>, then return</td></tr> <tr> <td>quit</td><td></td></tr> </tbody> </table>	disk	- select a disk	type	- select (define) a disk type	partition	- select (define) a partition table	current	- describe the current disk	format	- format and analyze the disk	repair	- repair a defective sector	show	- translate a disk address	label	- write label to the disk	analyze	- surface analysis	defect	- defect list management	backup	- search for backup labels	verify	- read and display labels	save	- save new disk/partition definitions	volname	- set 8-character volume name	!<cmd>	- execute <cmd>, then return	quit	
disk	- select a disk																																
type	- select (define) a disk type																																
partition	- select (define) a partition table																																
current	- describe the current disk																																
format	- format and analyze the disk																																
repair	- repair a defective sector																																
show	- translate a disk address																																
label	- write label to the disk																																
analyze	- surface analysis																																
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verify	- read and display labels																																
save	- save new disk/partition definitions																																
volname	- set 8-character volume name																																
!<cmd>	- execute <cmd>, then return																																
quit																																	

Step	Action	
17	If...	Then...
	You want to select another disk to partition for multiprotocol access	1. At the format prompt, enter disk to display available disk selections. 2. Repeat Step 4 to Step 16 to create a multiprotocol disk.
	You are done	Enter q to quit the format utility.

Displaying LUN and HBA Information

Utility for displaying information

The `san lun` utility is a NetApp Solaris host configuration tool that aids in collecting and reporting information when configuring hosts to use FCP for SCSI to communicate with filers. For example, you can use the `san lun` utility to show the mapping between filer LUNs and host drives. You can also use this command to display information about the host HBA.

For detailed information

For detailed information, see the following topics:

- ◆ [“Displaying host LUN information”](#) on page 79
- ◆ [“Displaying host HBA information”](#) on page 81

Displaying host LUN information

Displaying host LUN information

To display host LUN information, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /usr/sbin directory: cd /usr/sbin

Step	Action
3	At the host command line, enter the following command to display LUN information: <pre>./sanlun lun show [-v] [-d <i>host device filename</i> <i>all</i> <i>filer name</i> <i>filer name:filer pathname</i>]</pre> -v option produces verbose output. -d is the device option and can be one of the following: ◆ <i>host device filename</i> is the special device file name for the disk on Solaris (which might represent a filer LUN). ◆ <i>all</i> lists all filer LUNs under /dev/rdisk. ◆ <i>filer name</i> lists all filer LUNs under /dev/rdisk on a specified filer. ◆ <i>filer name: filer pathname</i> lists all filer LUNs under /dev/rdisk that are connected to the filer path name LUN on a specified filer. Result: The requested LUN information is displayed. Example: <pre># sanlun lun show -v -d /dev/rdisk/c2t1d2s2 filer: lun-pathname device filename adapter lun size lun state filerX: /vol/vol1/hostA_lun2 /dev/rdisk/c2t1d2s2 lpfc1 150.0g (161061273088) GOOD Serial number: 2eFcLndDjKlM Filer FCP nodename:50a9800055CC66DD Filer FCP portname:50a9800355CC66DD Filer adapter name: 5a Filer IP address: 10.22.110.36 Filer volume name:vol1 FSID:0xfffffc139 Filer qtree name:/vol/vol1 ID:0x0 Filer snapshot name: ID:0x0 LUN partition table permits multiprotocol access: no why: there can be only one data partition LUN has valid label: yes #</pre>

Displaying host HBA information

Displaying host HBA information

To manage the host HBA information, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /usr/sbin directory: cd /usr/sbin

Step	Action
3	At the host command line, enter the following command to display host HBA information: <pre>./sanlun fcp show adapter[-c] [-v] [adapter name all]</pre> -c option produces configuration instructions. -v option produces verbose output. all lists information for all FCP adapters. <i>adapter name</i> lists information for a specified adapter. Result: The FCP adapter information is displayed. Example: <pre># sanlun fcp show adapter -v</pre> <pre>lpfc0 WPN:10000000AA11BB22 WWNN: 20000000AA11BB22 driver name: lpfc model: LP9002 model description: Emulex LightPulse LP9002 2 Gigabit PCI Fibre Channel Adapter serial number: 0000AA11BB22 hardware version: 2002606d driver version: 5.01c; HBAAPI v1.0, 8-15-01 firmware version: 3.90A7 (C2D3.90A7) Number of ports: 1 port type: Public Loop port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /devices/pci@1f,4000/fibre-channel@2</pre> <pre>lpfc1 WPN:10000000AA11EE33 WWNN: 20000000AA11EE33 driver name: lpfc model: LP9002 model description: Emulex LightPulse LP9002 2 Gigabit PCI Fibre Channel Adapter serial number: 0000AA11EE33 hardware version: 2002606d driver version: 5.01c; HBAAPI v1.0, 8-15-01 firmware version: 3.90A7 (C2D3.90A7) Number of ports: 1 port type: Public Loop port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /devices/pci@1f,4000/fibre-channel@4</pre>

About this chapter This chapter describes how to troubleshoot software installation and HBA and LUN management problems.

Topics covered in this chapter This chapter discusses the following topics:

- ◆ “[Error messages or warnings during installation](#)” on page 84
- ◆ “[Troubleshooting LUN management](#)” on page 89
- ◆ “[Error messages during I/O](#)” on page 91
- ◆ “[Sanlun firmware revision messages](#)” on page 92
- ◆ “[Checking the status of the link](#)” on page 93

Error messages or warnings during installation

About this section

This section describes error messages that might be displayed during the installation process.

SunFire 280R or SunBlade 1000 warning

Problem: If you are installing NetApp host software on a SunFire 280R or SunBlade 1000, the following warning is displayed during the installation procedure:

WARNING: This platform has special PCI slot requirements for placement of the Fibre-channel HBA.

Explanation: The SunFire 280R and the SunBlade 1000 have a known issue with PCI slot-placement of the LP9002L and the video adapter card. The two cards cannot share the same PCI bus. If they do, the system does not boot until the LP9002L card is removed.

What to do: Install the LP9002L and the video adapter on separate PCI buses. The first PCI slot is a 33/66 Mhz slot on its own bus. PCI slots 2, 3, and 4 are located on a second 33 Mhz bus.

If you have multiple LP9002L HBAs, move the video adapter to the first PCI slot, and move the LP9002L HBAs to slots 2 through 4.

If you have one LP9002L HBA, either the video card or LP9002L can be in the first PCI slot.

You can safely continue the installation procedure if the HBAs are in the correct PCI slots.

HBA incompatibility warning

Problem: The install script exits after displaying the following warning:

WARNING: This platform is incompatible with the Fibre-channel HBA in this product.

Please consult your Network Appliance customer support representative.

Explanation: This message is displayed if you try to install the LP9002L-F2 HBA and NetApp software on a Sun Ultra-2, Ultra-5, or Ultra-10 platform. The LP9002L-F2 HBA requires PCI slots providing 3V bus power. These platforms do not provide the necessary voltages and are not supported.

What to do: For up-to-date information about supported platforms, see the *SAN Support Matrix* online version at the following URL:

<http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

VERITAS patch warning

Problem: The install script displays a list of patches required when installing VERITAS Volume Manager version 3.2 on Solaris 8:

The following patches are required for Veritas installation:

109529-06 or higher - Solaris 8 patch NOT INSTALLED

111413-06 or higher - Solaris 8 patch NOT INSTALLED

111909-04 or higher - (VRTSvxvm) VERITAS Volume Manager Patch NOT INSTALLED

111904-04 or higher - (VRTSvmsa) VERITAS Volume Manager Storage Administrator Patch NOT INSTALLED

110435-05 or higher - (VRTSvmsa VERITAS File System Patch NOT INSTALLED

Always check the Veritas Support web site for the latest instructions:

<http://support.veritas.com>

Continue with install? [y,n,?,q]

Explanation: These patches are required if you are installing VERITAS multipathing software on a host running Solaris 8. You can continue with the installation. If you plan to install Veritas multipathing software, you must install these patches in a specific order. For more information, see Appendix A, “[Installing Multipathing Software](#),” on page 95.

lpfc.conf file configuration error

Problem: The install script displays a failure message similar to the following:

Failed to modify /kernel/drv/lpfc.conf:

Please change the following values in /kernel/drv/lpfc.conf as follows:

```
linkdown-tmo=30;  
nodev-tmo=120;
```

BEFORE rebooting.

Explanation: The /kernel/drv/lpfc.conf file lists HBA configuration values. The install script automatically modifies these configuration values for the Solaris host in the NetApp SAN. If this step fails, you might have to modify this file manually to ensure that the correct values are set.

What to do: Ensure that the lpfc.conf file lists the correct values. The following table shows the correct values.

Caution

Network Appliance recommends that you use the values listed in the following table. If you change these values, you might experience problems with your setup.

Setting in lpfc.conf	Default Emulex setting	NetApp setting without multipathing	NetApp setting with multipathing	What the setting means
automap	0	0	0	Only assign target IDs to devices that have been mapped using persistent bindings.
linkdown-tmo	255	255	30	The time before the link from the HBA is deemed down and failed.
nodev-tmo	255	255	120	The time before a device, which is not returning any status, is taken offline and that status is returned to the OS.
scan-down	0	0	0	How the HBA driver scans a table to map a target ID to an ALPA For Fibre Channel Arbitrated Loop (FC-AL) configurations.

Setting in lpfc.conf	Default Emulex setting	NetApp setting without multipathing	NetApp setting with multipathing	What the setting means
tgt-queue- depth	32	32	32	Default value used to limit the number of outstanding commands per FCP target.
lun-queue- depth	16	16	16	Default value used to limit the number of outstanding commands per LUN.

/etc/system file configuration failure

Problem: The installation script displays the following message:

Failed to modify /etc/system:

Please change the following values in /etc/system as follows:

```
sd_io_time=0x78
```

```
sd_retry_count=5
BEFORE rebooting.
```

Explanation: The `install` script modifies the `/etc/system` file to set `sd_io_time` and `sd_retry_count`. If this step fails, the error message is displayed.

What to do: Add the `sd_io_time` and `sd_retry_count` parameters to the `/etc/system` file. Use the values recommended by the `install` script. The following lines show example values.

```
set sd:sd_io_time=0x78
set sd:sd_retry_count=5
```

Existing configuration settings in /etc/system file

Problem: The `install` script displays a message indicating that you have existing I/O settings in the `/etc/system` file:

Your `/etc/system` file appears to set the following:

```
set sd:sd_io_time=0x3C
set sd:sd_retry_count=3
```

Please make sure `sd_io_time` is at least `0x78` and `sd_retry_count` is at least `5` for optimal performance.

Explanation: If your `/etc/system` file already has values defined for `sd_io_time` and `sd_retry_count`, the `install` script does not change either of these variables.

What to do: Edit the `/etc/system` file to ensure that that `sd_io_time` and `sd_io_retry` use the minimum values recommended by the `install` script and reboot your system.

Troubleshooting LUN management

The `sanlun` command shows deleted LUNs

The `sanlun` command reports a LUN that was deleted. The `format` command also shows the deleted LUN, even after you run the `devfsadm` command.

Example: `sanlun` and `format` output is shown below.
`# sanlun lun show`

```
May 31 11:16:15 shblade-ca1 scsi: WARNING: /pci@1f,0/pci@5/fibre-channel@0/sd@0,0 (sd1):  
May 31 11:16:15 solaris-host-1 Error for Command: test unit ready Error Level:  
Informational
```

```
May 31 11:16:15 solaris-host-1 scsi: Requested Block: 0 Error Block: 0  
May 31 11:16:15 solaris-host-1 scsi: Vendor: NETAPP Serial Number: 112233445566  
May 31 11:16:15 solaris-host-1 scsi: Sense Key: Illegal Request  
no filer LUNs available  
#format  
format> disk  
AVAILABLE DISK SELECTIONS:  
0. c0t0d0 <ST320011A cyl 38790 alt 2 hd 16 sec 63> /pci@1f,0/ide@d/dad@0,0  
1. c0t2d0 <ST320011A cyl 38790 alt 2 hd 16 sec 63> /pci@1f,0/ide@d/dad@2,0  
2. c1t0d0 <drive type unknown> /pci@1f,0/pci@5/fibre-channel@0/sd@0,0
```

Explanation: `devfsadm` does not clean up this type of entry. The `sanlun` commands reports this entry because there is still a `/dev/rdisk` listing and the filer returns this output when queried for a LUN that isn't mapped to the host.

What to do: Reboot the host system. You can also run the `devfsadm -C` command to remove these entries.

New LUNs are not visible to the host

Problem: You created new LUNs on the filer, mapped them to an initiator group and ran the `devfsadm` command, but the new LUNs are not visible to the host.

What to do: To make the new LUNs visible to the host, complete the following steps.

Step	Action
1	Modify the /kernel/drv/sd.conf to scan for the new LUN numbers. The following example shows text from a sample sd.conf file. In this example, the filer is bound to target 0 and has four LUNs available. <pre>name="sd" parent="lpfc" target=0 lun=0; name="sd" parent="lpfc" target=0 lun=1; name="sd" parent="lpfc" target=0 lun=2; name="sd" parent="lpfc" target=0 lun=3;</pre>
2	Enter the following command to reboot the host: <pre>reboot -- -r</pre>

Error messages during I/O

SCSI transport errors

Problem: The system console and system log display I/O error messages similar to the following:

```
Jul 21 11:04:48 solaris-host-A scsi:  
[ID 107833 kern.warning] WARNING: /pci@7,2000/lpfc@2/sd@1,1 (sd91):  
Jul 21 11:04:48 solaris-host-A  
SCSI transport failed: reason 'tran_err': retrying command
```

Explanation: These messages indicate that the filer cluster might have failed over from one filer to another. You might also see this type of message if a cable connection is disrupted.

What to do: Verify that no components in your configuration failed. I/O should proceed normally, provided you are using a configuration with no single point of failure.

Sanlun firmware revision messages

Firmware revision messages

The `san lun` utility checks the revision of the HBA firmware on each HBA. If the HBA has a firmware revision level that is lower than the required minimum, the `san lun` command displays the following error:

```
sanlun lun show
```

```
Current firmware rev (3.60A3 (C2D3.60A3)) on adapter 0 is lower
than the minimum required firmware rev (3.90A7 (C2D3.90A7))
```

If the firmware revision for the HBA is higher than any of the qualified revisions, a message is displayed but the `san lun` command processing continues.

Example: In the following example the firmware revision is higher than currently qualified firmware revisions:

```
sanlun lun show
```

```
NOTE: Current firmware rev (3.91A1 (C2D3.91A1)) on adapter 0 is higher than most
recently qualified firmware rev (3.90A7 (C2D3.90A7))
```

filer:	lun-pathname	device filename	adapter	lun size	lun state
filer-A:	/vol/vol0/testlun	/dev/rdisk/c2t0d2s2	lpfc2	7.0g (7516192256)	GOOD
filer-A:	/vol/vol0/bonitolun1	/dev/rdisk/c2t0d1s2	lpfc2	5.0g (5368708608)	GOOD
filer-A:	/vol/vol0/lunbonito0	/dev/rdisk/c2t0d0s2	lpfc2	5.0g (5368708608)	GOOD

What to do: Upgrade the firmware on the HBA according to the procedure described in [“Upgrading the HBA firmware”](#) on page 43.

Checking the status of the link

Verifying the link to the switch or filer

To verify the link from the host to a switch or filer, complete the following steps.

Step	Action
1	On the host console, enter the following command: <pre># sanlun fcp show adapter -v</pre> Result: The <code>sanlun</code> command shows the status of the HBA. The following text shows example output: <pre>lpfc0 WWPN:1000000011223344 WWNN: 2000000011223344 driver name: lpfc model: LP9002 model description: Emulex LightPulse LP9002 2 Gigabit PCI Fibre Channel Adapter serial number: 000011223344 hardware version: 2002606d driver version: 5.01c; HBAAPI v1.3, 3-29-02 firmware version: 3.90A7 (C2D3.90A7) Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /devices/pci@6,2000/lpfc@2</pre>

Interpeting sanlun output

The following fields provide information about the status of the link:

- ◆ Port state—Operational indicates that the HBA is connected and functioning correctly.
- ◆ Supported speed—2 Gbit/sec indicates that the HBA is capable of supporting an up to 2 Gbit/sec transfer rate.
- ◆ Negotiated speed—1 Gbit/sec indicates that the HBA is transferring data at a rate no greater than 1 Gbit/sec. This speed indicates that the host might be connected to a switch that only supports 1 Gbit/sec. The filer and switches by Network Appliance support a 2 Gbit/sec data transfer rate.

About this appendix This appendix describes how to install Veritas Volume Manager (VxVM) 3.2 and 3.5 multipathing software on the Solaris host.

Note

The VERITAS software must be purchased from VERITAS Software.

Note

This appendix describes VERITAS software supported and installation procedures at the time this book was printed. See the online *SAN Support Matrix* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> for the most up-to-date information.

Upgrading from a previous version of VERITAS

If you are currently running a previous version of VxVM that is not supported with the Solaris host attach kit and you want to upgrade, see the *VERITAS Volume Manager Installation Guide*, VERITAS Document # 30-000395-011.

Topics in this appendix

This chapter discusses the following topics:

- ◆ “[Preparing to install VERITAS multipathing software](#)” on page 96
- ◆ “[Installing VERITAS multipathing software](#)” on page 99
- ◆ “[Taking VERITAS software offline before scheduled filer maintenance](#)” on page 102

Preparing to install VERITAS multipathing software

Required Sun packages and patches for Solaris 8

The VERITAS software requires specific Sun packages and patches for Solaris 8. If you are installing the VERITAS software on a Solaris 8 host, you must install these patches before you install the VERITAS software. For a list of packages and patches and the order in which they must be installed, see the *VERITAS Volume Manager Installation Guide* for your version.

Installing VERITAS packages

To install VERITAS packages, complete the following steps.

Step	Action	
1	Obtain the VERITAS Foundation Suite CD-ROM and VERITAS documentation.	
2	Ensure you are logged on as root	
3	If...	Then...
	You already have VERITAS VXVM 3.1 or VXFS 3.3 installed on your system	Uninstall the software by following the procedures in the VERITAS documentation. Result: The older-version software is removed. Proceed to Step 4 .
	You already installed the packages for the currently supported versions of VERITAS Volume Manager, and you want to use multipathing with the filer	Go to “ Adding the root disk controller number to the VERITAS exclude list ” on page 98.
4	Insert and mount the VERITAS Foundation Suite CD-ROM on the host.	
5	Change to the pkgs directory on the CD-ROM: cd /cdrom/cdrom0/pkgs	
6	Verify that you have your VERITAS license key.	

Step	Action
7	Install the VERITAS Volume Manager (VxVM) packages. The packages installed depend on the version of the VxVM software: Veritas 3.2 example: <code>pkgadd -d 'pwd' VRTSlic VRTSvxvm VRTSvmsa VRTSvmdoc VRTSvmman VRTSvmdev</code> Veritas 3.5 example: <code>pkgadd -d 'pwd' VRTSvlic VRTSvxvm VRTSob VRTSobgui VRTSfspro VRTSvmpo VRTSvmdoc VRTSvmman</code> Note_____ If you want to install the VERITAS Volume Replicator utility, add the package names VRTSvras and VRTSvrdoc to the end of the pkgadd list. _____ Result: The VERITAS Volume Manager script displays a message listing required Sun patches for Solaris 8. Enter y to continue the installation. Example: Installing VxVM for Solaris 8 The following Sun patch(s) are required for Solaris 8. Sun patch(s): 111413 Continue installation? [y,n,q,?] (default: n): y · · · Installation of...was successful. Result: The packages are installed.
8	Install the VERITAS patches required by your operating system. For information about VERITAS patches required for Solaris 8 and Solaris 9, see the <i>VERITAS Volume Manager Installation Guide</i>.

Adding the root disk controller number to the VERITAS exclude list

To add the controller number of the root disk to the Veritas exclude list, complete the following step.

Step	Action
1	With a text editor, open the /etc/vx/cntrl.exclude file and add the root disk to the file. An example of a root disk is c0. Note_____ This step prevents VERITAS from trying to encapsulate your root partition and simplifies a future uninstall procedure. _____

Using VERITAS DMP

To use VERITAS Dynamic Multipathing (DMP), complete the following step.

Step	Action
1	Enter the following command to add NETAPP to the VERITAS DDL layer as a jbod device: vxddladm addjbod vid=NETAPP
2	Enter the following command to verify that NETAPP is a jbod device: vxddladm listjbod Result: The NETAPP device is listed. Example: <pre># vxddladm listjbod VID PID Opcode Page Code Page Offset SNO length ===== NETAPP ALL PIDs 18 -1 36 12</pre>

Labeling LUNs used with VxVM

New LUNs must have a default volume label written to them to be visible to VxVM. If you do not label the LUN, the host can see the new LUN and VxVM cannot.

For detailed information about labeling LUNs, see [“Labeling the new LUNs as disks”](#) on page 68.

Installing VERITAS multipathing software

Installing the software

To install the VERITAS software for multipathing, complete the following steps.

Step	Action
1	Enter the following command to install the VERITAS software: <pre>vxinstall</pre> Note_____ The install script dialog asks you questions that pertain to your configuration and system administrator’s preferences. For more information, see the following documents: <i>VERITAS Volume Manager 3.2 Installation Guide for Solaris</i>, 30-000395-011. <i>VERITAS Volume Manager 3.5 Installation Guide for Solaris</i>, N08835F _____ Result: The VERITAS software is installed.
2	Reboot the host by entering the following command: <pre>reboot -- -r</pre> Result: The VERITAS software installation becomes effective.
3	Enter the following command to verify that the filer LUNs you selected are under VERITAS Volume Manager control: <pre>vxdisk list</pre> Result: A list of devices, type, disk, group, and status is displayed. Example: <pre># vxdisk list DEVICE TYPE DISK GROUP STATUS c0t0d0s2 sliced - - error c1t0d0s2 sliced c1t0d0s2 rootdg online c1t1d0s2 sliced c1t1d0s2 rootdg online</pre>

Step	Action
4	Enter the following command for a multipath device to verify that the multipathing information is correct: <pre>vxdisk list <i>disk_name</i></pre> <i>disk_name</i> is the name of the disk. Result: A list of disk details is displayed, including the multipathing information at the end of the list. Example: <pre># vxdisk list c1t0d0s2 Device: c1t0d0s2 devicetag: c1t0d0 type: sliced hostid: elastica disk: name=c1t0d0s2 id=1017952447.1033.elastica group: name=rootdg id=1017952438.1025.elastica flags: online ready private autoconfig autoimport imported pubpaths: block=/dev/vx/dmp/c1t0d0s4 char=/dev/vx/rmdp/c1t0d0s4 privpaths: block=/dev/vx/dmp/c1t0d0s3 char=/dev/vx/rmdp/c1t0d0s3 version: 2.2 iosize: min=512 (bytes) max=256 (blocks) public: slice=4 offset=0 len=10477568 private: slice=3 offset=1 len=2047 update: time=1017952655 seqno=0.9 headers: 0 248 configs: count=1 len=1486 logs: count=1 len=225 Defined regions: config priv 000017-000247[000231]: copy=01 offset=000000 enabled config priv 000249-001503[001255]: copy=01 offset=000231 enabled log priv 001504-001728[000225]: copy=01 offset=000000 enabled Multipathing information: numpaths: 2 c1t0d0s2 state=enabled c2t0d0s2 state=enabled</pre>

Step	Action
5	Check the multipathing information for the disk and verify that the number of paths (numpaths) is two and that the disk is enabled (or online). Result: The multipathing software is set up and functioning properly.

Taking VERITAS software offline before scheduled filer maintenance

Taking the software offline

To take VERITAS File System software offline, complete the following steps.

Note—
The following steps are Network Appliance-recommended steps only.

Step	Action
1	Use your preferred backup method to backup any data that is stored on the VERITAS volume(s) associated with LUNs on the filer.
2	In the VxFS, use the following command to unmount the file systems that are in use: umount/mountpoint Result: The file system is unmounted.

Step	Action
3	In VxVM perform the following operations. Note You can run these commands from the command-line interface, through <code>vxdiskadm</code>, or through the GUI (on Solaris or Windows) for your version of VERITAS. 1. Stop the volume by first checking the status of volumes with the following command: vxdisk list 2. Select a single volume from the list of volumes. 3. Enter the following command vxvol stop vol_name Result: The volume is stopped. Note To stop all volumes, use the <code>vxvol stop all</code> command. 4. Enter the following command to deport the disk group: vxvg deport diskgroup Note When deporting a disk group, you might find it helpful to specify the host name of the host that will import the disk group after the operation is completed. This avoids any host that you don't want to import the disk group from doing so and potentially overwriting any data. 5. Enter the following command to import the disk group: vxvg import diskgroup 6. Perform the normal start/mount operations to remount and start the volumes.

Step	Action
4	In the VERITAS Cluster Services, complete the following steps. You can complete these steps through the command-line interface or the GUI: 1. Enter the following command to check the status of the cluster: hastatus -sum 2. Enter the following command to shut down all service groups (maintenance): hastop -all 3. Enter the following command to stop the application services and the cluster: hastop -force Note_____ If you are using VCS with VxVM and VxFS, shut down VCS before shutting down VxVM and VxFS. CVM (Clustered Volume Manager) still functions if VCS is shut down. CVM puts a lock on the volume and you must force an import to clear the locks. _____

About this appendix This appendix provides additional information about the LP9002L-F2 HBA.

Topics in this appendix

This appendix discusses the following topics:

- ◆ [“HBA LEDs and specifications”](#) on page 106
- ◆ [“FCC and regulatory notices”](#) on page 108
- ◆ [“Declaration of Conformity”](#) on page 112
- ◆ [“Laser Safety”](#) on page 114

HBA LEDs and specifications

Complete HBA LEDs

The following table summarizes all Power-On Self-Test (POST) conditions and results for the HBA LEDs.

Green LED	Yellow LED	State
OFF	OFF	Wake-up failure (dead board)
OFF	ON	POST failure (dead board)
OFF	Slow blink (1 Hz)	Wake-up failure (dead board)
OFF	Fast blink (4 Hz)	Failure in POST (dead board)
OFF	Flashing (irregular)	POST processing in progress
ON	OFF	Failure while functioning
ON	ON	Failure while functioning
ON	Slow blink (1 Hz)	Normal—1 Gb link rate
ON	Fast blink (4 Hz)	Normal—2 Gb link rate
Slow blink (1 Hz)	OFF	Normal—link down or not yet started
Slow blink (1 Hz)	ON	Not defined
Slow blink (1 Hz)	Slow blink	Offline for download
Slow blink (1 Hz)	Fast blink	Restricted offline mode (waiting for restart)
Slow blink (1 Hz)	Flashing	Restricted offline mode, test active
Fast blink (4 Hz)	OFF	Debug monitor in restricted mode
Fast blink (4 Hz)	ON	Not defined

Green LED	Yellow LED	State
Fast blink (4 Hz)	Slow blink	Debug monitor in test fixture mode
Fast blink (4 Hz)	Fast blink	Debug monitor in remote debug mode
Fast blink (4 Hz)	Flashing	Debug monitor output active

LP9002L-F2 HBA specifications

The following table describes the LP9002L-F2 specifications.

Parameter	Range
Media interface	Dual LC connector
Physical dimensions	Low-profile PCI form factor 6.6" x 2.54"
Power requirements	8.5 watts (typical) @ + 3.3 VDC, + or – 5%
Airflow	100 lf/min (minimum)
Temperature	◆ Operating: 32° to 113° F (0° to 45° C) ◆ Storage: -40° to 158° F (-40° to 70° C)
Humidity	5% to 95% noncondensing
Agency approvals for LP9002L-F2	◆ Class 1 Laser Product per DHHS 21CFR (J) & EN60825 ◆ UL recognized to UL1950 ◆ CUR recognized to CSA22.2, No.950 ◆ TUV certified to EN60950 ◆ FCC Rules, Part 15, Class A ◆ Industry Canada, ICES-003, Class A ◆ EMC Directive 89/336/EEC (CE Mark) ◆ EN55022, Class A ◆ EN55024 ◆ Australian EMC Framework (C-Tick Mark) ◆ AS/NZS 3548: Class A ◆ VCCI, Class A

FCC and regulatory notices

CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A' LASER DE CLASSE 1

The above statement applies to products marketed in the European Union.

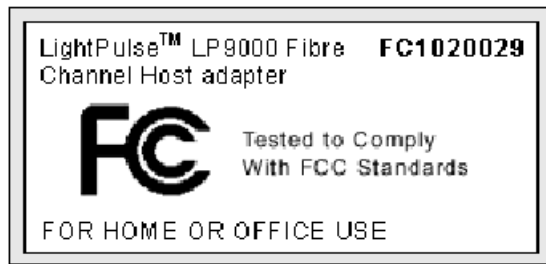
Model LP9002 / LP9002L / LP952L / LP9002S / LP9002DC / LP9002C /
LP9402DC (2x5 SFF Models)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Shielded cables must be used between this equipment and attached peripheral devices. The reader is cautioned that changes or modifications made to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment. The above statement applies to products marketed in the USA.

This class A digital apparatus meets all requirements of the Industry Canada (IC) Interference - Causing Equipment Standard (ICES-003). Cet appareil numerique de la Classe A respecte toutes les exigences du reglement sur le materiel brouilleur du Canada. This statement applies to products marketed in Canada.

FCC Compliance Information Statement; Models LP9000-N1/L1/T1 (GBIC Models):



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party: Paul Folino, President & CEO, Emulex Corporation, 3535 Harbor Blvd., Costa Mesa, CA 92626, USA, (714) 662-5600

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ◆ Reorient or relocate the receiving antenna.
- ◆ Increase the separation between the equipment and receiver.
- ◆ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ◆ Consult the dealer or an experienced radio/TV technician for help.

The reader is cautioned that any changes or modifications to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment.

This class B digital apparatus meets all requirements of the Canadian Interference - Causing Equipment Regulations. Cet Appareil numerique de la classe B respecte toutes les exigences du reglement sur le material brouilleur du Canada.

The above statement applies to products marketed in Canada.

VCCI Notices and Translations (Japan Only)

Note: VCCI regulations provide that changes or modifications not expressly approved by Emulex Corporation could void your authority to operate this equipment.

LP9000-N1/L1/T1 (GBIC Model):

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

This is a Class B product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

LP9002/LP9002L/LP952L/LP9002S/LP9002DC/LP9002C/LP9402DC (2x5 SFF models)

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A

Manual Notice

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Declaration of Conformity

LP9002 / LP9002L / LP952L / LP9002S / LP9002C / LP9002DC / LP9402DC-F2 (2x5 SFF models)

Note

Changes or modifications not expressly approved by Emulex Corporation could void the user's authority to operate this equipment. This equipment complies with CISPR22/EN55022 Class A.

WARNING

This is a class A product. In a domestic environment, this product may cause radio interference requiring the user to take adequate measures.

Manufacturer: Emulex Corporation
3535 Harbor Blvd., Costa Mesa, CA 92626 USA

declares under sole responsibility that the product:

Product Name: LightPulse™ LP9000 Fibre Channel PCI Host Adapters
Models: LP9002-F2, LP9002L-F2/X2, LP952L-F2, LP9002S-F2,
LP9002DC-F2, LP9002C-F2/X2, LP9402DC-F2
Assembly Number: FC1020033-XX (FC1010466-XX) - PCI, 2x5 SFF model
FC1020034-XX (FC1010472-XX) - PCI, 2x5 SFF model
FC1020035-XX (FC1010474-XX) - PCI, Dual Channel, 2x5 SFF model
FC1020036-XX (FC1010483-XX) - PCI-X, Dual Channel, 2x5 SFF model
FC1020037-XX (FC1010475-XX) - SBUS, 2x5 SFF model
FC1020043-XX (FC1010488-XX) - cPCI, 2x5 SFF model

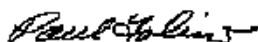
to which this declaration relates is in conformity with the following standards or other documents for Information Technology Equipment (ITE):

Safety: UL Recognized to UL1950
CUR Recognized to CSA22.2, No. 950
IEC 950 (1991) + Amendments 1,2,3,4, and 11
EN60950 (1992)+ Amendments 1,2,3,4, and 11
EN60825-1 (1994) + Amendment 11
EN60825-2 (1994)
CFR Title 21, Laser AEL Class 1, FDA/CDRH

EMC: FCC Rules, CFR Title 47, Part 15, Subpart B, Class A
Industry Canada, ICES-003, Class A
EN55022 (1998) / CISPR-22 (1997), Class A
EN55024 (1998)
AZ/NZS 3548: Class A and VCCI, Class A

Supplementary Information:

1. The product was tested in a typical configuration with shielded cables.
2. The product complies with the requirements of the following directives:
 - European Union Low Voltage Directive
 - European Union EMC Directive 89/336/EEC (as amended by 92/31/EEC)
 - CE-Marking Directive 93/68/EEC (Carries the CE-Mark accordingly)
 - Australian EMC Framework (Carries the C-Tick mark accordingly)



February 22, 2002
Costa Mesa, CA

Paul Folino, President & CEO

European Contact: Emulex Corporation
7 & 8 Forrest Court, Oaklands Park, Fishponds Road

Telephone: 44-118-977-2929
Fax: 44-118-977-3237

Laser safety

This laser safety information contains certification and product information covering laser products known as optical Gigabaud Link Modules (GLMs), Gigabit Interface Converters (GBICs), 1x9 and small form factor transceivers sold as accessories to or incorporated in Emulex LightPulse host adapters. The GLM, GBIC, 1x9 and small form factor transceiver are the primary cable connection mechanisms for any optical port on the host adapter and hub. This data is not intended to be a replacement for any safety regulations and standards; relevant safety documents should always be consulted if necessary. Contact Emulex Corporation with any questions or concerns about laser safety.

Certification and Classification

LP6000 and LP7000E PCI host adapters may contain a laser product known as an optical Gigabaud Link Module (GLM). The optical GLM is attached to the host adapter using an 80-pin connector and extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI slot.

The LH5000 hub may contain a laser product known as a Gigabit Interface Connector (GBIC). The GBIC provides the physical connector to the optical cable. The GBIC can be inserted into any pluggable hub port.

The LP8000, LP850 and LP9000 PCI host adapter may contain a laser product known as a Gigabit Interface Converter (GBIC) or an embedded 1x9 transceiver. The GBIC and or 1x9 transceiver provide the physical connection to the optical cable, and its SC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI slot.

The LP9002, LP9002L, LP952L, LP9002S, LP9002DC, LP9002C, or LP9402DC PCI host adapters may contain a laser product known as a small form factor transceiver. This transceiver provides the physical connection to the optical cable, and its LC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI/cPCI slot.

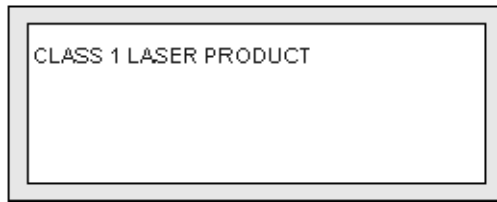
In the United States, all optical GLMs, GBICs, 1x9 and small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated by a label located on the optical GLM, GBIC, 1x9 or small form factor transceiver.

In Europe, all optical GLMs, GBICs, 1x9 and small form factor transceivers sold by Emulex are certified as Class 1 laser component assemblies that conform to the requirements contained in the CENELEC (European Committee for Electrotechnical Standardization) standard EN60825-1:1994 (including

amendment 11) and EN60825-2:1994. GLMs, GBICs, 1x9 and small form factor transceivers are certified by a recognized European testing agency and have appropriate markings on the assembly. The DHHS conformity label and European conformity mark will not be visible externally once the optical GLM, GBIC, 1x9 or small form factor transceiver is connected to or inserted in the host adapter and the adapter is installed into a system.

Labeling Requirements

No caution or danger labels are required for use of the GLM, GBIC, 1x9 or small form factor transceiver since they are Class 1 laser component assembly. In the U.S., the only laser safety label required is the DHHS certification label that already appears on the GLM, GBIC, 1x9 and small form factor transceiver. In Europe, the EN60825-1/EN60825-2 standards require that the system-level product has a Class 1 information label permanently attached and clearly visible whenever access to the GLM, GBIC, 1x9 and small form factor transceiver optical port is possible. Each Class 1 product shall have affixed an explanatory label bearing the words:



Alternatively, at the discretion of the manufacturer, the same statement may be included in user information. If a label is used, an example of the IEC Class 1 information label that is suitable for most European countries is shown below. The label consists of black printing on a white background. Languages represented on this label are English, German, Finnish and French, and they represent the minimum set for acceptance of a Class 1 product in most European countries.



Product Information

GLM

The optical GLM is a single port communications card. Each communication port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser diode of gallium aluminum arsenide (GaAlAs). This material emits in the wavelength range of 770 to 860 nanometers for shortwave and 1270 to 1355 nanometers for long wave, and are commonly referred to as short wavelength (SW) or long wavelength (LW) lasers. The discrete laser diodes are classified as Class 3B laser products. Once they are incorporated into the GLM, the product's automatic power control maintains the average power launched into a fiber at a value below the Class 1 limit.

Note OFC GLMs are found only on the LP6000. Any reference to OFC or non-OFC products applies only to the LP6000, and not to the LP7000E, LP8000, LP850 or LP9000.

For OFC GLMs (Open Fiber Control) the optical fiber link between two GLM ports is continuously monitored by the open fiber link detection and laser safety control system (OFC). In the event of a break anywhere in the path, this control system prevents laser emissions from exceeding Class 1 levels. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed on any GLM accessory.

GBIC

The optical GBIC is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each GBIC consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave length GBICs and 1270 to 1355 nanometers for long wavelength GBICs. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the GBIC.

Small Form Factor Transceiver

The small form factor transceiver is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each small form factor transceiver consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser

emitting in the wavelength range of 770 to 860 nanometers for shortwave length small form factor transceivers and 1270 to 1355 nanometers for long wavelength small form factor transceivers. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the small form factor transceiver.

1x9 Transceiver

The 1x9 transceivers is an integrated duplex data link for bi-directional communications over multimode fiber. Each 1x9 consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave 1x9s. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the 1x9 transceiver.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and could possible lead to points of access that may emit laser radiation levels above the Class 1 limits established in the U. S. by the DHHS and within Europe by EN60825-1/EN60825-2.

GLM

The GLM is designed and certified for applications using point-to-point optical fiber links only. Use of the product with multiple input or multiple output optical links (for example, star couplers) is prohibited since it is incompatible with the GLM's certification.

The GLM will not allow normal data transmission on the optical link unless it is connected to another similar GLM or compatible laser product. For OFC GLMs, another manufacturer's laser product is not considered compatible unless it contains the open fiber link detection and laser safety control system (OFC) and is properly certified as a Class 1 laser product. Similarly, for non-OFC GLMs, a compatible laser device must be non-OFC.

Any system level product that incorporates the GLM must provide power supply protection that guarantees a voltage of 6.0 volts or less at the GLM. The functional power supply range of the GLM product is specified as 4.75 to 5.25 volts typically. Operation outside of this range may degrade the performance and lifetime of the GLM. The GLM will remain operational with laser emissions

below Class 1 limits provided the power supply level at the adapter remains at or below 6.0 volts. If the power supply level rises above 6.0 volts, the GLM cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

GBIC

Short wavelength and long wavelength GBICs allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength GBICs sold by Emulex as accessories are non-OFC devices. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

1 x 9 Transceiver

Short wavelength 1x9 transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength 1x9s embedded in Emulex host adapters are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Small Form Factor Transceiver

Short wavelength and long wavelength small form factor transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength small form factor transceivers embedded in Emulex host adapter are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Any system level product that incorporates the small form factor transceivers must provide power supply protection that guarantees a voltage of 5.0 volts or less at the small form factor transceivers. The functional power supply range of the small form factor transceivers product is specified as 3.135 to 3.465V typically. Operation outside of this range may degrade the performance and lifetime of the transceiver. The transceiver will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 5.0 volts. If the power supply level rises above 5.0 volts, the small form factor transceiver cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

System Level Certification

All GLMs and GBICs sold as accessories by Emulex or host adapters containing embedded 1x9 or small form factor transceivers are certified as Class 1 laser products within the U.S. and Class 1 laser component assemblies outside of the U.S. Manufacturers of products properly incorporating the GLM, GBIC, 1x9 or small form factor transceiver do not need to recertify their product for laser

safety. The procedure for full system certification is therefore identical to that used for any other electronic system. When applying for system level certification to electronic standards such as IEC950, the regulatory engineers may want to see the DHHS and European conformity labeling on the GLM, GBIC, 1x9 or small form factor transceiver, and the system level documentation and labeling. Copies of the certificate of conformity for any GLM, GBIC, 1x9 or small form factor transceiver sold by Emulex can be obtained upon request from Emulex Corporation, Costa Mesa.

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