

# FCP Solaris® Attach Kit 2.0

## **Installation and Setup Guide**

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# Preface

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|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>About this guide</b>    | 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™ software with the Fibre Channel Protocol (FCP).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Audience</b>            | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Terminology</b>         | <p>This guide uses the following terms:</p> <ul style="list-style-type: none"><li>◆ <i>igroup</i> refers to a collection of unique identifiers, either FCP WWPNs in a SCSI network or iSCSI node names of initiators (hosts) in an IP network, that are given access to LUNs when they are mapped to those LUNs.</li><li>◆ <i>LUN</i> (Logical Unit Number) refers to a logical unit of storage identified by a number.</li><li>◆ <i>LUN ID</i> refers to the numerical identifier for a LUN.</li><li>◆ <i>Filer</i> refers to a NetApp® storage appliance that incorporates CompactFlash™ and supports FCP.</li><li>◆ <i>Initiator</i> refers to the system component that originates an I/O command over an I/O bus or network.</li><li>◆ <i>Target</i> refers to the system component that receives an FCP I/O request, such as a filer with the FCP license enabled and serving the data requested by the initiator.</li><li>◆ <i>Type</i> refers to pressing one or more keys on the keyboard.</li><li>◆ <i>Enter</i> refers to pressing one or more keys and then pressing the Enter key.</li></ul> |
| <b>Command conventions</b> | 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 font</i>           | Words or characters that require special attention.<br><br>Placeholders for information you must supply.<br>For example, if the guide says to enter the <code>arp -d hostname</code> command, you enter the characters <code>arp -d</code> followed by the actual name of the host.<br><br>Book titles in cross-references. |
| <code>monospaced font</code> | Command and daemon names.<br><br>Information displayed on the system console or other computer monitors.<br><br>The contents of files.                                                                                                                                                                                      |
| <b>Bold monospaced font</b>  | Words or characters you type. What you type is always shown in lowercase letters, unless you must type it in upper case.                                                                                                                                                                                                    |

**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 a brief explanation of the host and filer communication and configurations and also 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 configuration”](#) on page 2
- ◆ [“How target FCP ports process traffic for a cluster”](#) on page 4
- ◆ [“Where to go for more information”](#) on page 9

# Understanding host and filer communication and configuration

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## About host and filer communication

The Solaris host uses the SCSI protocol over Fibre Channel (FCP) to access data on NetApp filers that are target FCP storage appliances. You install and configure NetApp-approved Fibre Channel HBAs in the host. 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 physical and virtual port on the HBA. The host WWPNs are used when creating initiator groups (igroups) on a filer. An igroup permits host access to specific LUNs on a filer.

All active ports on a filer share the same World Wide Node Name (WWNN), which is also referred to as the FC node name. Each port logs into the fabric using its WWPN. The filer’s WWNN or WWPNs must be persistently bound on the Solaris host to a particular target ID. The Solaris host then accesses the filer using the bound target ID.

## Supported configurations

Network Appliance supports direct attached, single switch, and dual switch, and fully redundant connections in the following configurations.

| Data Requirements                                                              | Recommended Configuration                                            |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Highly critical data, critical data availability and/or production environment | Fully redundant configuration with two FCP switches                  |
| Less critical data and/or less critical business applications                  | Direct FCP connection or single switch (non-redundant) configuration |

**Note**\_\_\_\_\_

If your configuration includes storage from other vendors, you must configure Network Appliance storage in a separate zone.

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## Recommended production configurations

Network Appliance recommends the following configurations for production environments.

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### Note

For additional information about supported configurations, including topology and cabling examples, see the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at [http://now.netapp.com/NOW/knowledge/docs/san/fcp\\_iscsi\\_config/](http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/).

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**F8xx or FAS9xx series storage appliances:** Production configurations consist of a storage appliance cluster, one or more hosts, and redundant fabrics. Each host is multi-attached: it has one or more connections to each switch. Each storage appliance has two or more connections to each switch.

These configurations require that VERITAS® DMP (Dynamic Multipathing) software is installed on the host. VERITAS DMP is a component of the VERITAS Volume Manager™. For more information about VERITAS software see Appendix A, “[Installing Multipathing Software](#),” on page 131.

By combining multipathing, redundant fabrics, and filer clustering, these configurations create a no single point of failure solution between the host and the storage appliances.

**FAS270 storage appliances:** Production configurations consist of a FAS270 cluster, one or more multi-attached hosts, and two switches. A FAS270 cluster consists of two storage appliances integrated into a NetApp disk shelf. Each storage appliance has one connection to each switch. FAS270 cluster configurations also require that VERITAS DMP is installed on the host.

# How target FCP ports process traffic for a cluster

---

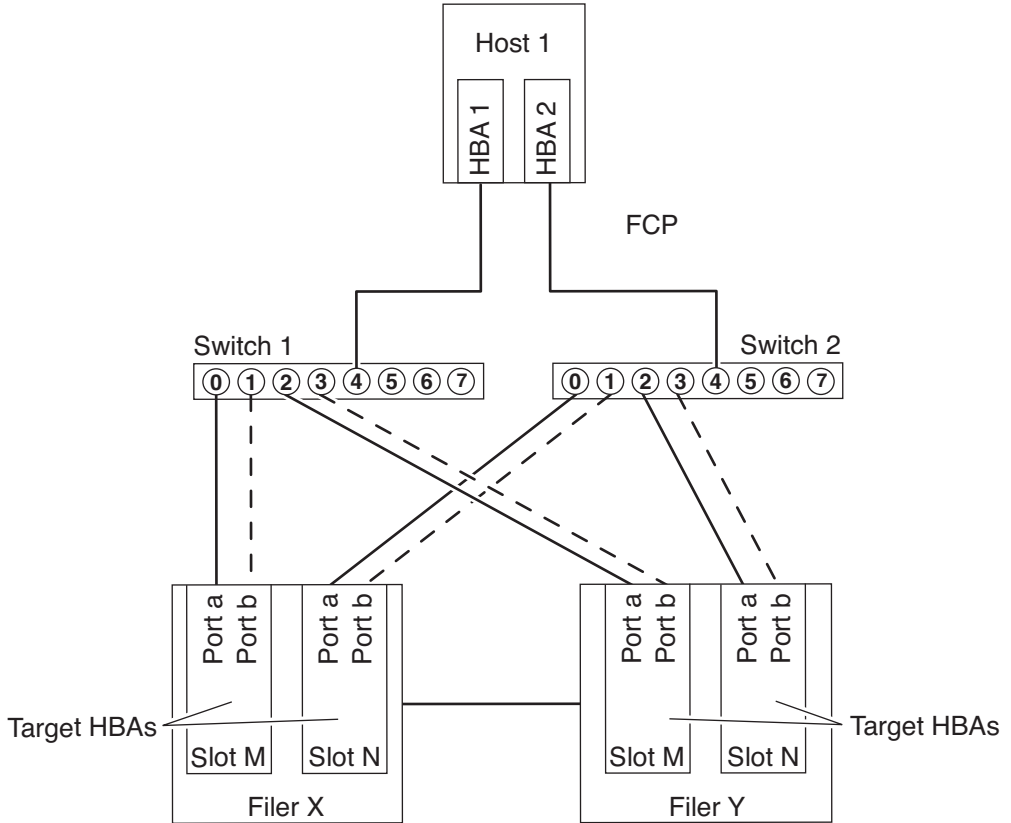
**Target Port settings**     *Target ports* are the FCP ports located on the NetApp Filer. The way the target FCP ports process traffic varies, and depends on whether your filer is an:

- ◆ F8xx or FAS9xx with Data ONTAP version 6.4
- ◆ F8xx or FAS9xx with Data ONTAP version 6.5 or greater
- ◆ FAS270 cluster version 6.5 or greater

**Target ports for  
F8xx and FAS9xx  
with ONTAP version  
6.4**

F8xx or FAS9xx filers with Data ONTAP version 6.4 create target ports in standby mode. If you upgrade to a later Data ONTAP version, Port B continues to operate as a standby port. When the cluster is in normal operation, Port A is the active port that provides access to local LUNs, and Port B is not available to the initiator. When the cluster is in a takeover state, Port B on the takeover filer becomes active and provides access to LUNs on the partner (failed) filer. These default settings enable you to upgrade existing SAN configurations with Solaris hosts without making any port configuration changes.

The following example shows a configuration in which Port B operates as a standby port. 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. The solid lines indicate active connections. The dotted lines indicate standby connections.



FAS 8xx or FAS9xx cluster

If Filer X fails, then Filer Y takes over and the following occurs:

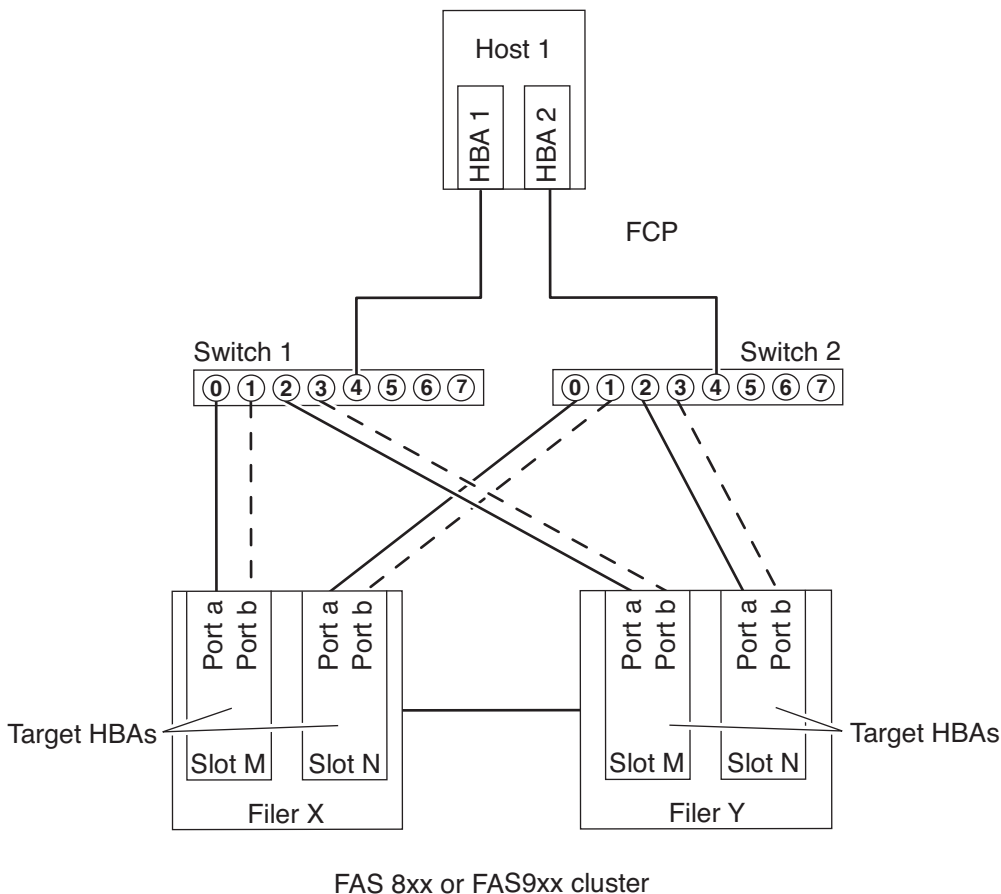
- ◆ Slot-M-port b on Filer Y takes over for slot-M-port a in Filer X
- ◆ Slot-N-port b on Filer Y takes over for slot-N-port a in Filer X

These actions enable the host to access the storage until Filer X is repaired and running.

## Target ports for F8xx and FAS9xx with ONTAP version 6.5 or greater

By default, F8xx or FAS9xx filers with Data ONTAP version 6.5 or greater create target ports in partner mode. When you create a new filer with Data ONTAP 6.5 or greater, Port A provides access to local LUNs, and Port B provides access to LUNs on the partner filer.

The following figure shows a sample configuration with a multi-attached host connected to a cluster. The solid lines represent paths to LUNs on the local filer, the dotted lines represent paths to partner LUNs.



Multipathing software must be installed on the host when the filer ports operate in this mode because each LUN is accessible over multiple paths. The multipathing software reports Port A as a primary path and Port B as a secondary path.

The table shows paths to a LUN on each filer in the configuration example.

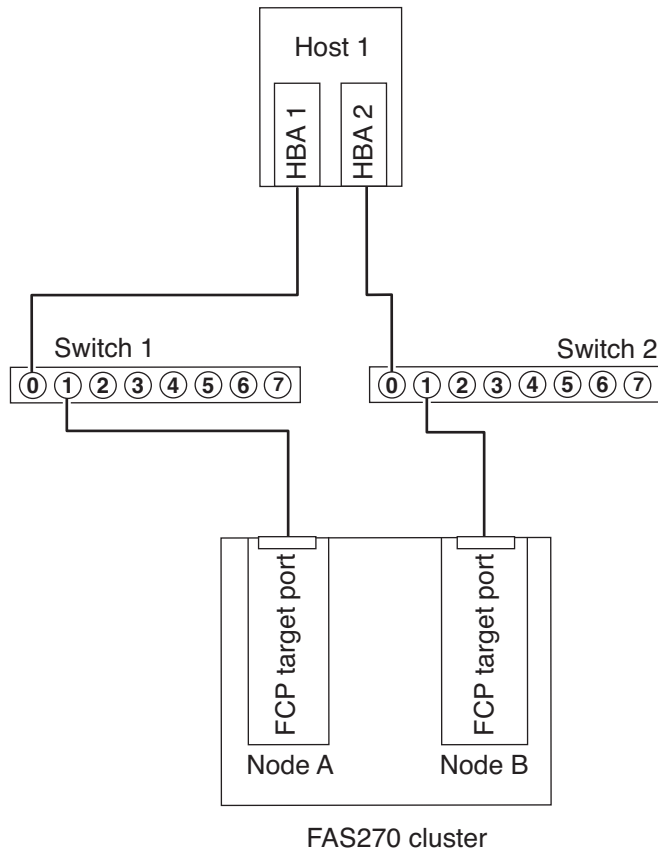
|             | Type of path      | Target FCP ports                                       |
|-------------|-------------------|--------------------------------------------------------|
| Filer X LUN | Local/Primary     | Port A, Slot M on Filer X<br>Port A, Slot N on Filer X |
|             | Partner/Secondary | Port B, Slot M on Filer Y<br>Port B, Slot N on Filer Y |
| Filer Y LUN | Local/Primary     | Port A, Slot M on Filer Y<br>Port A, Slot N on Filer Y |
|             | Partner/Secondary | Port B, Slot M on Filer X<br>Port B, Slot N on Filer X |

### Default target port settings for FAS270 clusters

An FAS270 cluster consists of two storage appliances integrated into a DS14 disk shelf. Each storage appliance has two Fibre Channel ports. FAS270 cluster ports operate as follows:

- ◆ The Fibre Channel port operates as a Fibre Channel target port after you license the FCP service and reboot the storage appliance.
- ◆ The other port connects additional disk shelves to the FAS270 cluster.

The following figure shows a configuration example, in which a multi-attached host accesses a FAS270 cluster.



On FAS270 clusters, the FCP target ports log into the fabric using loop topology. Each physical port supports a virtual local port, which provides access to local LUNs, and a virtual partner port, which provides access to LUNs on the partner node.

The virtual ports enable the FAS270, which has only one target FCP port, to support traffic for both nodes in the cluster. For example, if Switch 1 fails, the multipathing software on the host uses Switch 2 to access the partner port on Node B. When the cluster is in a takeover state, the virtual partner port on the takeover node provides access to LUNs on both nodes.

## Where to go for more information

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### Where to go for host and filer information

The following table describes the documents on NetApp on the Web (NOW) site at the time this Installation and Setup Guide was written. Use the links below to access information about host and filer system requirements, supported configurations, and cabling instructions.

| If you need information about...                                              | See the following NetApp product documentation...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The latest supported configurations                                           | <ul style="list-style-type: none"><li>◆ <i>Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/docs.shtml">http://now.netapp.com/NOW/knowledge/docs/docs.shtml</a></li><li>◆ <i>System Configuration Guide</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/docs.shtml">http://now.netapp.com/NOW/knowledge/docs/docs.shtml</a></li></ul>                                                                                                             |
| Configuring the storage appliance                                             | <ul style="list-style-type: none"><li>◆ <i>Best Practices for Reliability: New System Installation</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/other/best_practices/index.shtml">http://now.netapp.com/NOW/knowledge/docs/other/best_practices/index.shtml</a></li><li>◆ <i>Data ONTAP™ Software Setup Guide</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a></li></ul>                                                   |
| Managing SAN storage on the storage appliance                                 | <ul style="list-style-type: none"><li>◆ <i>Data ONTAP™ Block Access Management Guide for FCP</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a></li><li>◆ <i>Data ONTAP Release Notes</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a></li><li>◆ <i>FilerView® Online Help</i> - available from within the FilerView GUI</li></ul> |
| Verifying compatibility of storage appliances with environmental requirements | <ul style="list-style-type: none"><li>◆ <i>Site Requirements</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/docs.shtml">http://now.netapp.com/NOW/knowledge/docs/docs.shtml</a></li></ul>                                                                                                                                                                                                                                                                                                                                          |

| If you need information about... | See the following NetApp product documentation...                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Upgrading Data ONTAP             | <ul style="list-style-type: none"> <li>◆ <i>Data ONTAP 7.0 Upgrade Guide</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a></li> <li>◆ <i>FCP Solaris Attach Kit 2.0 Release Note</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/client_filer_index.shtml">http://now.netapp.com/NOW/knowledge/docs/client_filer_index.shtml</a></li> </ul> |

**About this chapter**

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

**Topics in this chapter**

This chapter discusses the following topics:

- ◆ [“Installation Prerequisites”](#) on page 12
- ◆ [“Verifying the Configuration”](#) on page 14
- ◆ [“Installing HBAs in the host”](#) on page 19
- ◆ [“Cabling the host”](#) on page 23

# Installation Prerequisites

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**Tasks to perform**      You should verify the contents of the installation kit before you begin to install.

**Kinds of Kits**      Network Appliance provides FCP Solaris Attach Kit components in the following kits:

- ◆ *Fibre Channel HBA Kit* - provides HBA hardware, mounting brackets, and upgrade instructions
- ◆ *FCP Solaris Attach Kit* - provides the FCP Solaris Attach Kit software, documentation, and license agreement

**Verifying the contents of the kits**      **Hardware Kit:** To verify the contents of the hardware attach kit, complete the following step.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                  |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Open the hardware attach kit and check for the following items: <ul style="list-style-type: none"><li>◆ In the <i>Fibre Channel HBA Kit</i>:<ul style="list-style-type: none"><li>❖ Emulex® LP10000 HBA(s) with standard PCI bracket, single port.</li><li>❖ One low-profile PCI mounting bracket</li><li>❖ Instructions for upgrading HBA firmware</li></ul></li></ul> |

**Software Kit:** To verify the contents of the software attach kit, complete the following step.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Open the software attach kit and check for the following items:</p> <ul style="list-style-type: none"><li>◆ Media kit<ul style="list-style-type: none"><li>❖ CD-ROM with ntap_solaris_fcp_2_0.tar.Z software and firmware package</li><li>❖ CD-ROM with NetApp-provided VERITAS Array Support Library (ASL)</li><li>❖ License agreement</li><li>❖ <i>FCP Solaris Attach Kit 2.0 Release Notes</i></li></ul></li><li>◆ Documentation package<ul style="list-style-type: none"><li>❖ <i>SAN Setup Overview</i></li><li>❖ <i>FCP Solaris Attach Kit 2.0 Installation and Setup Guide</i> (this Guide)</li><li>❖ <i>Installing and Managing VERITAS Array Support Library 4.0 for NetApp Filers</i></li></ul></li></ul> |

# Verifying the Configuration

---

## Tasks to perform

Verifying the configuration involves:

- ◆ Verifying the configuration of the cables, filer and switch
- ◆ Checking the host system for required hardware and software

### 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.

---

## Verifying that the filer is installed and configured

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

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Check that the filer is properly configured:</p> <p><b>Caution</b>_____</p> <p>The filer must be set up and configured before configuring the host HBA driver and creating igroups and LUNs on the filer.</p> <p>_____</p> <p>It is assumed that you completed the following steps:</p> <ul style="list-style-type: none"><li>◆ Installed the filer and target HBAs</li><li>◆ Cabled the filer according to your configuration topology</li><li>◆ Set up and configured Data ONTAP on the filer</li><li>◆ Licensed and enabled the FCP protocol and any other protocols appropriate for the filer</li><li>◆ Created working filer volumes and qtrees (if desired) on the filer</li></ul> <p><b>Note</b>_____</p> <p>NetApp highly recommends that you create volumes with space reservations enabled.</p> <p>_____</p> <p>For more information, see the <i>Data ONTAP Block Access Management Guide</i> for your release at <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a>.</p> |

## Verify that the switch is installed and configured

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

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Check that the switch is set up and configured as outlined in the <i>SAN Setup Overview</i> which is included with your kit. It is assumed that you completed the following steps:</p> <ul style="list-style-type: none"><li>◆ Installed the switch in a system cabinet or rack and connected the cables.</li><li>◆ Turned on power to the switch</li><li>◆ Configured the network parameters for the switch, including its serial parameters and IP address</li></ul> |

## Verify that the filer cluster is cabled to the fabric

If you have a fabric-attached configuration, verify that the filer cluster is cabled to the switches according to the topology requirements of your configuration. For detailed information about supported configurations, see the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

## Verify host system requirements

The following table lists the most recent hardware and software components for for FCP Solaris Attach Kit 2.0 that are available at the time this book is printed.

### Caution

Network Appliance provides support for existing components and adds support for new ones on an on-going basis. For a current and complete list of new and existing HBAs, platforms, and applications, refer to the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at [http://now.netapp.com/NOW/knowledge/docs/san/fcp\\_iscsi\\_config/](http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/).

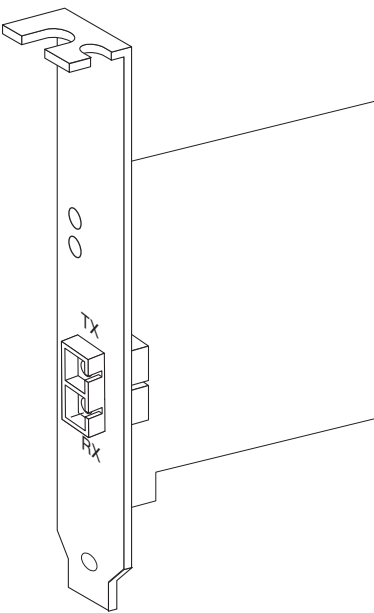
| Component          | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HBA                | <ul style="list-style-type: none"> <li>◆ Emulex LP10000 <ul style="list-style-type: none"> <li>❖ Firmware level: 1.90a4</li> <li>❖ Driver level: 6.01f</li> </ul> </li> <li>◆ Emulex LP9002L-F2 <ul style="list-style-type: none"> <li>❖ 3.90a7 (minimum) or 3.92a2 (strongly recommended)</li> <li>❖ Driver level: 6.01f</li> </ul> </li> </ul> <p><b>Note</b>_____</p> <p>If you are installing the FCP Solaris Attach Kit 2.0 with new or existing LP9002 HBA firmware, you should upgrade to 3.92a2. This firmware includes a variety of software fixes, and is also required to support Solaris Dynamic Reconfiguration features.</p> <hr/> |
| PCI slot for HBA   | <ul style="list-style-type: none"> <li>◆ One open 32-bit or 64-bit (recommended) PCI bus slot that can be either a 3.3V or a 5.0V signaling interface</li> <li>◆ PCI bus clock rate of 33 MHz or 66 MHz, (recommended).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               |
| Hardware platforms | <p>Sun SPARC PCI-based systems</p> <p><b>Note</b>_____</p> <p>The LP10000 HBA requires PCI slots providing 3.3V DC bus power. The Sun Ultra-2, Ultra-5, and Ultra-10 platforms do not provide the necessary voltages and are not supported.</p> <hr/>                                                                                                                                                                                                                                                                                                                                                                                            |

| Component                        | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating system and patch level | <ul style="list-style-type: none"> <li>◆ Solaris 8—Qualified with MU7 and the patch cluster dated 01/25/05</li> <li>◆ Solaris 9—Qualified with MU4 and the patch cluster dated 01/25/05</li> </ul> <p>You can obtain the Solaris patches from <a href="http://sunsolve.sun.com">http://sunsolve.sun.com</a>.</p> <p><b>Note</b>_____</p> <p>For the latest operating system patches, refer to <a href="http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/">http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/</a>.</p> |
| VERITAS application requirements | <p>VERITAS Volume Manager (VxVM) version 4.0 with MP1.</p> <p><b>Note</b>_____</p> <p>This kit also supports VERITAS Volume Manager (VxVM) version 3.5 with MP3</p>                                                                                                                                                                                                                                                                                                                                                                            |
| Array Support Library (ASL)      | <p>VERITAS® Array Support Library 4.0 for NetApp® Filers</p> <p><b>Note</b>_____</p> <p>The FCP Solaris Attach Kit 2.0 software package is backwardly comparable with VERITAS 3.5, but you must use NetApp ASL version 2.0 software. You cannot use NetApp ASL version 4.0 with VERITAS 3.5.</p> <p>_____</p> <p>For information about installing the ASL 4.0, see <i>Installing and Managing VERITAS® Array Support Library 4.0 for NetApp® Filers</i>. This document is included in the documentation package for the host attach kit.</p>   |

# Installing HBAs 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: <ul style="list-style-type: none"><li>◆ Boot partition</li><li>◆ Internal disks</li><li>◆ External disks that your host system might access</li></ul> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2    | Use the appropriate commands to shut down the host and its peripherals.                                                                                                                                                                                                                                                                                                                                                                                                       |
| 3    | Turn off the host and its peripherals.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4    | <p>Put on an antistatic wrist strap and attach the grounding leash to the host chassis.</p> <p><b>Caution</b>_____</p> <p>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.</p> <p>_____</p> |
| 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 HBAs. For best performance, select 66 MHZ slots.                                                                                                                                                                                                                                                                                                                                             |
| 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.<br><br><b>Note</b> _____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:<br/><br/><div>1. Remove the mounting bracket screws from the top of the HBA.</div><div>2. Remove the bracket and store it for future use.</div><div>3. Align the new mounting bracket tabs with the holes in the HBA.</div><div>4. Replace the screws that attach the HBA to the bracket.</div><div>5. Go to Step 9.</div></td></tr><tr><td>The removed faceplate is the same size as the bracket on the HBA</td><td>Go to Step 9.</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:<br><br><div>1. Remove the mounting bracket screws from the top of the HBA.</div> <div>2. Remove the bracket and store it for future use.</div> <div>3. Align the new mounting bracket tabs with the holes in the HBA.</div> <div>4. Replace the screws that attach the HBA to the bracket.</div> <div>5. Go to Step 9.</div> | The removed faceplate is the same size as the bracket on the HBA | Go to Step 9. |
|                                                                  | If...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Then...                                                                                                                                                                                                                                                                                                                                                                                    |         |                                                              |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                  |               |
|                                                                  | The removed faceplate is smaller than the bracket on the HBA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Change the HBA’s bracket to the low-profile mounting bracket:<br><br><div>1. Remove the mounting bracket screws from the top of the HBA.</div> <div>2. Remove the bracket and store it for future use.</div> <div>3. Align the new mounting bracket tabs with the holes in the HBA.</div> <div>4. Replace the screws that attach the HBA to the bracket.</div> <div>5. Go to Step 9.</div> |         |                                                              |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                  |               |
| The removed faceplate is the same size as the bracket on the HBA | Go to Step 9.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                            |         |                                                              |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                  |               |
| 9                                                                | Record the HBA’s IEEE address and serial number.<br><br><b>Note</b> _____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.<br><br>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   | <b>If...</b>                                                                                                                                                                                  | <b>Then...</b>                                     |
|      | You are installing a second HBA                                                                                                                                                               | Repeat Step 6 through Step 12, then go to Step 14. |
|      | You are not installing a second HBA                                                                                                                                                           | Go to Step 14.                                     |
| 14   | Replace the computer case and tighten the case screws.                                                                                                                                        |                                                    |
| 15   | Turn on the power to the host.                                                                                                                                                                |                                                    |
| 16   | Cable the host to the Fibre Channel switches or directly to the filer, according to requirements and topology for your configuration. Refer to <a href="#">“Cabling the host”</a> on page 23. |                                                    |

# Cabling the host

---

## Methods of cabling

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

- ◆ Fabric-attached, where a host is cabled to a filer cluster through a single or dual-fabric. The fabric-attached host can be one of the following:
  - ❖ A single-attached host that has one HBA
  - ❖ A multi-attached host that has more than one HBA
- ◆ Direct-attached, where a single-attached or multi-attached 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 *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at [http://now.netapp.com/NOW/knowledge/docs/san/fcp\\_iscsi\\_config/](http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/). This guide describes all supported host, filer, and switch configurations, including cabling specifications and requirements.



**About this chapter** This chapter describes procedures for installing the FCP Solaris Attach Kit software on the host.

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

- ◆ “[Preparing for the software package installation](#)” on page 26
  - ❖ “[Obtaining the software package](#)” on page 27
  - ❖ “[Uncompressing the software package](#)” on page 29
- ◆ “[Host software installation](#)” on page 30
  - ❖ “[Installing the host software for the first time](#)” on page 31
  - ❖ “[Upgrading the host software](#)” on page 36
  - ❖ “[Installing only NTAPsanlun software](#)” on page 42
- ◆ “[Adding the HBAnyware package](#)” on page 45
- ◆ “[Upgrading the HBA firmware](#)” on page 48

# Preparing for the software package installation

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## Preparation tasks

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

- ◆ Obtain the software package
- ◆ Uncompress the software package

Refer to [“Obtaining the software package”](#) on page 27 and [“Uncompressing the software package”](#) on page 29 for additional information.

## Contents of software package

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

- ◆ NetApp-customized HBA software driver
- ◆ HBA firmware:
  - ❖ NTAPfcfwlp10k - for the LP10000 HBA
  - ❖ NTAPfcfwlp9002 - for the LP90002L HBA
- ◆ lpfc utility for HBA
- ◆ create\_binding.pl script—This script helps you create persistent WWPN bindings between the host and the filer.
- ◆ Diagnostic scripts—You can run these scripts to obtain information about components in your configuration, including filers, switches, and hosts. You can send the output from these scripts to NetApp Customer Support to troubleshoot your configuration.
- ◆ sanlun utility (NTAPsanlun)—This utility (sanlun command) helps manage LUNs and host HBAs.
- ◆ HBAnyware package - This package provides an X-Window GUI interface that helps you view and modify parameters in the lpfc.conf file, and also displays HBA statistics and error messages.
- ◆ NetApp ASL 4.0 for VERITAS (on a separate CD-ROM).

## Obtaining the software package

---

### Locating the software package

To locate the software package, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | See the online <i>Compatibility and Configuration Guide</i> at <a href="http://now.netapp.com/NOW/knowledge/docs/docs.shtml">http://now.netapp.com/NOW/knowledge/docs/docs.shtml</a> to verify that you have the latest host software package. At the time this book was printed, the software package name was ntap_solaris_fcp_2_0.tar.Z.                                   |
| 2    | Obtain the software: <ul style="list-style-type: none"><li>◆ If you obtain the software CD-ROM from the media package in your FCP Solaris Attach Kit 2.0, go to “<a href="#">Host software installation</a>” on page 30.</li><li>◆ If you obtain the software package from the NetApp NOW site, go to “<a href="#">Obtaining the software from NOW</a>” on page 27.</li></ul> |

### 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 <a href="http://now.netapp.com">http://now.netapp.com</a> : <ul style="list-style-type: none"><li>◆ Type your user name and password.</li><li>◆ From the Select Start Page list box, click Service and Support.</li><li>◆ Click the Login button.</li></ul> |
| 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.                                                                                                                                                                                     |
| 4    | Click Go!                                                                                                                                                                                                                                                                                                  |

| Step | Action                                                                                                                             |
|------|------------------------------------------------------------------------------------------------------------------------------------|
| 5    | Follow the prompts to download the ntap_solaris_fcp_2_0.tar.Z software file to a local directory, for example, the /tmp directory. |
| 6    | Go to “ <a href="#">Uncompressing the software package</a> ” on page 29.                                                           |

## Uncompressing the software package

---

### Uncompressing and extracting the file

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.<br>For example, change to the /tmp directory:<br><code>cd /tmp</code>                                                                                      |
| 2    | Enter the following command to uncompress the file:<br><code>uncompress ntap_solaris_fcp_2_0.tar.Z</code>                                                                                                                    |
| 3    | Enter the following command to extract the software:<br><code>tar -xvf ntap_solaris_fcp_2_0.tar</code><br><br><b>Result:</b> The extracted software (package contents) is placed in the /tmp/ntap_solaris_fcp_2_0 directory. |

# Host software installation

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## Install, upgrade, or uninstall options

This section describes how to install new and existing host systems.

## For detailed information

For details about installation options, see the following topics:

- ◆ [“Installing the host software for the first time”](#) on page 31
- ◆ [“Upgrading the host software”](#) on page 36
- ◆ [“Installing only NTAPsanlun software”](#) on page 42
- ◆ [“Uninstalling NTAPsanlun software”](#) on page 42

## Installing the host software for the first time

---

### 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 FCP Solaris Attach Kit 2.0
- ◆ Using the extracted software, as described in “[Uncompressing the software package](#)” on page 29.

### Tasks for installing software

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

- ◆ Install any required Solaris patches, in the order recommended by Solaris, before installing the host software.

---

#### Note

For the latest patch and operating system information, see the *Compatibility and Configuration Guide* at

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

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- ◆ Install the SAN Host Attach Kit 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 <a href="http://sunsolve.sun.com">http://sunsolve.sun.com</a> . |

### Error and warning messages during installation

You might receive error messages or warnings during installation that are specific to your configuration. For more information about these messages, see “[Error messages or warnings during installation](#)” on page 119.

## 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    | <p>Change to the directory where the CD-ROM or extracted software resides:</p> <ul style="list-style-type: none"> <li>◆ If you are installing software from the CD-ROM, mount the CD-ROM on the host system and change to the directory where the CD-ROM is mounted (for example, to change to /cdrom/cdrom0, enter <code>cd /cdrom/cdrom0</code>).</li> <li>◆ If you extracted NetApp software from the NOW site, change to the <code>ntap_solaris_fcp_2_0</code> directory where you extracted the software (for example, <code>cd /tmp/ntap_solaris_fcp_2_0</code>).</li> </ul>                                                                                                                                              |
| 3    | <p>Enter the following command to install the software:</p> <pre>./install</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4    | <p>At the Continue with install? prompt, answer <b>y</b> to continue the installation.</p> <p><b>Result:</b> The install script verifies the status of Solaris and Veritas patches on your system, and prompts you for switch information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5    | <p>At the Is host connected to a Cisco SWITCHED fabric? prompt, enter <b>y</b> or <b>n</b>.</p> <p><b>Result:</b> If you answer <b>y</b>, the install script sets the FCP link topology to Point-to-Point in the <code>lpfc.conf</code> file.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 6    | <p>At the Will device be used in a switch configuration with Veritas DMP (Dynamic MultiPathing?) prompt, enter <b>y</b> or <b>n</b>.</p> <ul style="list-style-type: none"> <li>◆ If you answer yes, the system checks for ASL software, and asks if you want to exit the installation if the software is not installed. To exit the installation, enter <b>y</b>. Obtain the ASL 4.0 CD-ROM provided with your host attach kit and install ASL 4.0 according to the procedure described in <i>Installing and Managing VERITAS® Array Support Library 4.0 for NetApp® Filers</i>. To continue the installation, enter <b>n</b>.</li> </ul> <p>The system installs the software and exits when the installation is complete.</p> |

| Step | Action                                                                                                                                                                                                                                                         |                        |                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------|
| 7    | Verify the installation by observing LEDs for the Power-On Self-Test (POST) through the openings in the HBA's mounting bracket.<br><br>The following table displays normal LED patterns. Green indicates power and yellow indicates port activity.             |                        |                                     |
|      | <b>Green LED</b>                                                                                                                                                                                                                                               | <b>Yellow LED</b>      | <b>State</b>                        |
|      | 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:<br><ul style="list-style-type: none"> <li>◆ <a href="#">“HBA LEDs and specifications”</a> on page 142 for LP9002 HBAs</li> <li>◆ <a href="#">“HBA LEDs and specifications”</a> on page 158 for LP10000 HBAs</li> </ul> |                        |                                     |

### Sample output from the install script

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

**Successful installation without multipathing:** The following is an example of a first-time installation for a configuration that does not require VERITAS DMP software:

```
# ./install

Continue with install? [y,n,?,q]y
Checking for Solaris 9 Patches.

Solaris Patches are up to date.
No Solaris Patches required for Veritas 4.0.
Please check http://support.veritas.com for updates.

Is host connected to a Cisco SWITCHED fabric? [n] [y,n,?,q] n
```

```
Will device be used in a switch configuration with Veritas  
DMP(Dynamic MultiPathing)?[n] [y,n,?,q] n
```

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

```
lpfc install completed successfully.
```

```
Updating sd parameters in /etc/system
```

```
Installing NTAPfcfw10k now ...
```

```
NTAPfcfw10k install completed successfully.
```

```
Installing NTAPfcfw9002 now ...
```

```
NTAPfcfw9002 install completed successfully.
```

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

```
NTAPsanlun install completed successfully.
```

```
sanlun Installation complete. Log is in  
/tmp/sanlun_install_log.813.
```

**Successful installation with multipathing:** The following is an example of a first-time installation for a fabric-attached host that uses VERITAS DMP software. In this example, the NetApp ASL 4.0 for Veritas is not yet installed:

```
# ./install
```

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

```
Checking for Solaris 9 Patches.
```

```
Solaris Patches are up to date.
```

```
No Solaris Patches required for Veritas 4.0.
```

```
Please check http://support.veritas.com for updates.
```

```
Is host connected to a Cisco SWITCHED fabric?[n] [y,n,?,q] n
```

```
Will device be used in a switch configuration with Veritas  
DMP(Dynamic MultiPathing)?[n] [y,n,?,q] y
```

```
Warning: NetApp ASL is not installed. NTAPasl is required. See  
NetApp ASL CD.
```

```
Do you want to exit this installation and install NTAPasl package
now? [y] n

Installing Emulex driver lpfc now ...

lpfc install completed successfully.

Updating sd parameters in /etc/system

Installing NTAPfcfw10k now ...

NTAPfcfw10k install completed successfully.

Installing NTAPfcfw9002 now ...

NTAPfcfw9002 install completed successfully.

Installing NTAPsanlun now ...

NTAPsanlun install completed successfully.

sanlun Installation complete.  Log is in
/tmp/sanlun_install_log.813.
```

## Upgrading the host software

---

### Installation upgrade tasks

To upgrade a host system that has a previous version of the FCP Solaris Attach Kit 2.0 installed, you must:

1. *Uninstall* - remove the previous FCP Solaris Attach Kit software, and save HBA configuration information and persistent bindings.
2. *Install* - add the latest FCP Solaris Attach Kit components and restore HBA information and persistent bindings.

### Version of the uninstall script to use

You must use the `uninstall` script from the version 2.0 software you obtained in “[Obtaining the software package](#)” on page 27 to uninstall previous versions of the host software.

---

#### Caution

If you are upgrading from version 1.0 of this kit, do not use the `uninstall` script from your 1.0 software. The 1.0 `uninstall` script removes HBA configuration information, including persistent bindings. If you use 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. |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2    | <p>Change to the directory where the CD-ROM or extracted software resides:</p> <ul style="list-style-type: none"> <li>◆ If you are installing software from the CD-ROM, mount the CD-ROM on the host system and change to the directory where the CD-ROM is mounted (for example, to change to /cdrom/cdrom0, enter <code>cd /cdrom/cdrom0</code>).</li> <li>◆ If you extracted NetApp software from the NOW site, change to the <code>ntap_solaris_fcp_2_0</code> directory where you extracted the software (for example, <code>cd /tmp/ntap_solaris_fcp_2_0</code>).</li> </ul> |
| 3    | <p>Enter the following command to remove the existing software:</p> <pre>./uninstall</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4    | <p>At the Are you sure you want to uninstall lpfc and sanlun packages? enter <b>y</b>.</p> <p><b>Result:</b> The <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:</p> <ul style="list-style-type: none"> <li>◆ <code>lpfc.conf.save</code></li> <li>◆ <code>sd.conf.save</code></li> </ul> <p>If a backup copy already exists, the install script prompts you to overwrite the backup copy.</p>                                 |
| 5    | <p>On the command line, reboot the host by entering the following command:</p> <pre>reboot -- -r</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### Sample output for uninstalling the host software

The following example shows output from the `uninstall` script.

```
# ./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 HBAnyware...
HBAnyware successfully removed.
Removing lpfc ...
lpfc successfully removed.
Removing NTAPfcfw10k ...
NTAPfcfw10k successfully removed.
Removing NTAPfcfw9002 ...
NTAPfcfw9002 successfully removed.
Removing changes to /etc/system file ...
Removing NTAPsanlun ...
NTAPsanlun successfully removed.
Remove process complete. Log is in /tmp/sanlun_remove_log.1413

PLEASE REBOOT THE SYSTEM NOW

```

## 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    | <p>Change to the directory where the CD-ROM or extracted software resides:</p> <ul style="list-style-type: none"> <li>◆ If you are installing software from the CD-ROM, mount the CD-ROM on the host system and change to the directory where the CD-ROM is mounted (for example, to change to /cdrom/cdrom0, enter <code>cd /cdrom/cdrom0</code>).</li> <li>◆ If you extracted NetApp software from the NOW site, change to the <code>ntap_solaris_fcp_2_0</code> directory where you extracted the software (for example, <code>cd /tmp/ntap_solaris_fcp_2_0</code>).</li> </ul> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | Enter the following command to install the software:<br><code>./install</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 4    | At the Continue with the install? prompt, enter <b>y</b> .<br><br><b>Result:</b> The install script verifies the Solaris patches on your system and prompts you for switch information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5    | At the Is host connected to a Cisco SWITCHED fabric? prompt, enter <b>y</b> or <b>n</b> .<br><br><b>Result:</b> If you answer <b>y</b> , the install script sets the FCP link topology to Point-to-Point in the lpfc.conf file.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 6    | <p>At the Will device be used in a switch configuration with Veritas DMP (Dynamic MultiPathing? prompt, enter <b>y</b> or <b>n</b>.</p> <p>◆ If you answer yes, the system checks for ASL software, and asks if you want to exit the installation if the software is not installed. To exit the installation, enter <b>y</b>. Obtain the ASL 4.0 CD-ROM provided with your host attach kit and install ASL 4.0 according to the procedure described in <i>Installing and Managing VERITAS® Array Support Library 4.0 for NetApp® Filers</i>. To continue the installation, enter <b>n</b>.</p> <hr/> <p><b>Note</b>_____</p> <p>If you receive an error, go to “<a href="#">lpfc.conf file configuration error</a>” on page 120.</p> <hr/> <p>The system restores persistent bindings and settings in the sd.conf file, installs new software and exits when the installation is complete.</p> |

| Step | Action                                                                                                                                                                                                                                                         |                        |                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------|
| 7    | Verify the installation by observing LEDs for the Power-On Self-Test (POST) through the openings in the HBA's mounting bracket.<br><br>The following table displays normal LED patterns. Green indicates power and yellow indicates port activity.             |                        |                                     |
|      | <b>Green LED</b>                                                                                                                                                                                                                                               | <b>Yellow LED</b>      | <b>State</b>                        |
|      | 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:<br><ul style="list-style-type: none"> <li>◆ “<a href="#">HBA LEDs and specifications</a>” on page 142 for LP9002 HBAs</li> <li>◆ “<a href="#">HBA LEDs and specifications</a>” on page 158 for LP10000 HBAs</li> </ul> |                        |                                     |

**Successful upgrade:** The following is an example in which the install script restores persistent bindings and HBA parameters saved from a previous uninstall.

```
# ./install

Continue with the install? [y,n,?,q] y
Checking for Solaris 9 Patches.

Solaris Patches are up to date.
No Solaris Patches required for Veritas 4.0.
Please check http://support.veritas.com for updates.

Is host connected to a Cisco SWITCHED fabric? [n] [y,n,?,q] n

Will device be used in a switch configuration with Veritas
DMP (Dynamic MultiPathing)? [n] [y,n,?,q] y

Installing Emulex driver lpfc now ...
Saved persistent binding entries were found
```

```
WWPN bindings:
50a980010200ccfb:lpfc4t0
50a980030200ccfb:lpfc5t0
50a980030200cd08:lpfc0t0
50a980010200cd08:lpfc1t0
WWPN 50a980010200ccfb:lpfc4t0 Keep it? (y/n) [y]
WWPN 50a980030200ccfb:lpfc5t0 Keep it? (y/n) [y]
WWPN 50a980030200cd08:lpfc0t0 Keep it? (y/n) [y]
WWPN 50a980010200cd08:lpfc1t0 Keep it? (y/n) [y]

Installer has detected sd.conf.save file.

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

lpfc install completed successfully.

Updating sd parameters in /etc/system

Installing NTAPfcfw10k now ...

NTAPfcfw10k install completed successfully.

Installing NTAPfcfw9002 now ...

NTAPfcfw9002 install completed successfully.

Installing NTAPsanlun now ...

NTAPsanlun install completed successfully.

sanlun Installation complete. Log is in
/tmp/sanlun_install_log.688.

#
```

## Installing only NTAPsanlun software

---

### Why install only NTAPsanlun software?

NTAPsanlun software provides troubleshooting and monitoring commands that help you manage LUNs and host HBAs. Sites that want to upgrade to the latest NTAPsanlun tools without changing the existing SAN configuration or modifying the HBA driver can uninstall and install only the latest NTAPsanlun tools.

### Installation tasks

To install the latest sanlun tools you must enter:

- ◆ `uninstall -p` - to remove the current NTAPsanlun tools
- ◆ `install -p` - to install the latest NTAPsanlun tools

### Uninstalling NTAPsanlun software

To uninstall NTAPsanlun, complete the following steps:

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in as root.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2    | <p>Change to the directory where the CD-ROM or extracted software resides:</p> <ul style="list-style-type: none"><li>◆ If you are installing software from the CD-ROM, mount the CD-ROM on the host system and change to the directory where the CD-ROM is mounted (for example, to change to <code>/cdrom/cdrom0</code>, enter <code>cd /cdrom/cdrom0</code>).</li><li>◆ If you extracted NetApp software from the NOW site, change to the <code>ntap_solaris_fcp_2_0</code> directory where you extracted the software (for example, <code>cd /tmp/ntap_solaris_fcp_2_0</code>)</li></ul> |
| 3    | <p>Enter the following command to remove the existing software:</p> <pre>./uninstall -p</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 4    | <p>At the Are you sure you want to uninstall the sanlun package? enter <b>y</b>.</p> <p><b>Result:</b> The <code>uninstall</code> script removes the NTAPsanlun software</p>                                                                                                                                                                                                                                                                                                                                                                                                                |

Sample output for  
uninstalling the  
NTAPsanlun  
software

```
The following example shows output from the uninstall -p script.  
# ./uninstall -p  
Removing NTAPsanlun  
Are you sure you want to uninstall the sanlun package? [y,n,?,q]y  
NTAPsanlun successfully removed.  
Remove process complete. Log is in /tmp/sanlun_remove_log.1210  
#
```

Installing  
NTAPsanlun  
software

To install the latest NTAPsanlun software, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in as root.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2    | <div>Change to the directory where the CD-ROM or extracted software resides:</div> <div><ul style="list-style-type: none"><li>◆ If you are installing software from the CD-ROM, mount the CD-ROM on the host system and change to the directory where the CD-ROM is mounted (for example, to change to /cdrom/cdrom0, enter <code>cd /cdrom/cdrom0</code>).</li><li>◆ If you extracted NetApp software from the NOW site, change to the <code>ntap_solaris_fcp_2_0</code> directory where you extracted the software (for example, <code>cd /tmp/ntap_solaris_fcp_2_0</code>)</li></ul></div> |
| 3    | <div>Enter the following command to install the software:</div> <div><code>./install -p</code></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4    | <div>The install script checks the host for FCP Solaris Attach Kit software:</div> <div><ul style="list-style-type: none"><li>◆ If no software is detected, the install script installs NTAPsanlun software and exits.</li><li>◆ If a previous version of the FCP Solaris Attach Kit is detected, the system shows the list of installed components and displays the Continue with install? prompt. Answer <code>y</code> to complete the installation.</li></ul></div>                                                                                                                       |

## Sample output for installing the NTAPsanlun software

The following example shows output from the `install -P` script.

```
# ./install -p
```

Some components are already installed.

```
NTAPsanlun:      NOT INSTALLED -- NEEDED
lpfc:            6.01F
NTAPfcfw9002:    3.92a2 - for Emulex LP9002 only
NTAPfcfw10k:     1.90a4 - for Emulex LP10000 only
NTAPasl:         V2.0 - Check for latest NTAPasl
```

This script will install the following components:

```
NTAPsanlun:      2.0N20041217_1720(380705)
```

To upgrade from a previous version, first run the `uninstall` script, then run the `install` script again.

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

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

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

```
NTAPsanlun install completed successfully.
```

```
sanlun Installation complete.  Log is in
/tmp/sanlun_install_log.1223.
#
```

# Adding the HBAnyware package

---

**What is HBAnyware?**

HBAnyware is an optional software package that is part of the Emulex 6.01 driver. HBAnyware provides a GUI interface that runs on an X-Windows server. You can use HBAnyware to manage and troubleshoot HBAs attached to a SAN.  
  
HBAnyware is available on LP9002 and LP1000 HBAs that include Emulex 6.01 driver software.

- Installation tasks**
- Adding the HBAnyware package involves:
  - ◆ Adding HBAnyware software
  - ◆ Setting environment variables
  - ◆ Starting HBAnyware on the HBAnyware server

- Installation requirements**
- The HBAnyware package is included in the `ntap_solaris_fcp_2.0.tar.Z` file, and is moved to the `/ntap_solaris_fcp_2_0` directory when you install FCP Solaris Attach Kit 2.0. Before you add the HBAnyware package you must install:
  - ◆ FCP Solaris Attach Kit 2.0 software
  - ◆ Java Runtime Environment (JRE), version 1.4 or later

**Adding HBAnyware**

To add HBAnyware, complete the following steps:

| Step | Action                                                                                                                                                             |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in as <code>root</code> .                                                                                                               |
| 2    | Change to the <code>ntap_solaris_fcp_2_0</code> installation directory that contains the HBAnyware software.<br><br><code>cd ntap_solaris_fcp_2_0/hbanyware</code> |

| Step | Action                                                                                                                                                                                                                                                          |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>Enter the following command to add the software:</p> <pre>pkgadd -d .</pre> <p><b>Result:</b></p> <p>The system displays the packages that you can add.</p>                                                                                                  |
| 4    | <p>Enter 1 to select the HBAnyware package:</p> <pre>Select packages(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:1</pre> <p><b>Result:</b></p> <p>The system checks for files that are already installed or in use.</p>  |
| 5    | <p>Enter <b>n</b> at the prompt to save SAN Host files that are in use.</p> <p><b>Example:</b> Do you want to install these conflicting files? [y,n,?,q] <b>n</b></p>                                                                                           |
| 6    | <p>Enter <b>y</b> at the prompt to continue the installation.</p> <pre>Do you want to continue with the installation of &lt;HBAnyware&gt;[y,n,?]y</pre> <p><b>Result:</b></p> <p>The system executes an installation script and adds the HBAnyware package.</p> |
| 7    | <p>Enter q at the following prompt to exit the pkgadd utility:</p> <pre>Select packages(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:q</pre>                                                                              |

**Setting  
environment  
variables**

To set the environment variables follow this step:

| Step | Action                                                                                                                                                                                                                                                                                    |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Enter one of the following: <ul style="list-style-type: none"><li>◆ If you are using /bin/sh, enter <code>setenv DISPLAY &lt;hostname&gt;: 0</code></li><li>◆ If you are using /bin/csh, enter:<br/><code>set DISPLAY=&lt;hostname&gt;:0</code><br/><code>export DISPLAY</code></li></ul> |

**Starting  
HBAnyware**

To start HBAnyware, complete the following step.

| Step | Action                                                                                                                                                                                                                                                    |  |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1    | On the HBAnyware server, enter:<br><code>/usr/sbin/hbanyware/hbanyware &amp;</code><br><br><b>Result:</b> The HBAnyware interface displays on the host system.<br><br><b>Note</b> _____<br>HBAnyware starts automatically after a system reboot.<br>_____ |  |

**Additional  
information**

Refer to Emulex documentation for information about how to use HBAnyware software.

# Upgrading the HBA firmware

---

## When to upgrade firmware

The SAN Host 2.0 Attach Kit provides firmware for LP9002 and LP10000 HBAs.

Network Appliance recommends that you upgrade firmware if:

- ◆ You are installing the FCP Solaris Attach Kit 2.0 with new or existing LP9002 HBA- firmware provided with this release includes a variety of software fixes, and is also required to support Solaris Dynamic Reconfiguration features.
- ◆ The firmware you have does not match the level required by the HBA driver - this can occur if you download the wrong version, or if you purchase the HBA from a company other than Network Appliance. Refer to the online *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> to verify that you have the correct firmware revision.

If you are using an LP10000 HBA that was provided by Network Appliance you do not need to upgrade your firmware. This HBA is shipped with the required firmware version.

## Tasks for upgrading firmware

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

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

## Locating firmware files

The install command installs the firmware files in the following directories:

- ◆ /opt/NTAPfcfw9002/cd392a2.awc - for LP9002 firmware (single channel only)
- ◆ /opt/NTAPfcfw10k/td190a4.all -for LP10000 firmware (both single and dual channel)

At the time this book was written, the firmware installed is version 1.90a4 for the LP1000 HBA, and version 3.92a2 for the LP9002 HBA.

## Tools that upgrade firmware

You can use the `lputil` utility or the HBAnyware interface to upgrade Emulex HBA firmware for a Solaris host.

- ◆ The `lputil` utility is automatically loaded when the driver is installed.
- ◆ HBAnyware is an optional software package that is part of the Emulex 6.01 driver. The HBAnyware package is installed, but must be added to the host system. Refer to “[Adding the HBAnyware package](#)” on page 45 for information about adding this package.

## Checking the firmware version

To check the firmware version, complete the following step.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the host command line, enter the following command:</p> <pre>sanlun fcp show adapter -v all</pre> <p><b>Result:</b> The configuration information for each HBA is displayed, including the firmware version.</p> <p><b>Note</b>_____</p> <p>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.</p> _____ |

## 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 1.90a4 firmware version.

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

```
lpfc0                WWPN:10000000c9370428
WWNN:                20000000c9370428
driver name:         lpfc
model:               LP10000
model description:   Emulex LightPulse LP10000 2 Gigabit PCI Fibre
Channel Adapter
```

```

serial number:      0000c9370428
hardware version:   1001206d
driver version:     6.01f; HBAAPI(I) v2.0.d, 10-10-03
firmware version: 1.90A4 (T2D1.90A4)
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@8,700000/fibre-channel@2

```

## Obtaining the correct firmware

The HBA firmware is installed with the FCP Solaris Attach Kit 2.0 software.

If the correct firmware file is not installed in the /opt/NTAPfcfw9002 or /opt/NTAPfcfw9002 directory, complete the following steps to obtain the correct firmware.

| Step | Action                                                                                                                                                                                                                                                                              |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Obtain the correct host software package, as described in “ <a href="#">Obtaining the software package</a> ” on page 27.                                                                                                                                                            |
| 2    | <p>Install the host software.</p> <p>If you are installing for the first time, go to “<a href="#">Installing the host software for the first time</a>” on page 31</p> <p>If you are upgrading the host software, go to “<a href="#">Upgrading the host software</a>” on page 36</p> |
| 3    | <p>Install HBA firmware.</p> <p>Go to “<a href="#">Upgrading the HBA firmware</a>”, below.</p>                                                                                                                                                                                      |

## Upgrading the HBA firmware

To upgrade HBA firmware with the `lputil` utility, complete the following steps for each HBA you want to upgrade.

| Step | Action                                                                                                                                                                                                                                                                                                                                                        |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Change to the /usr/sbin/lpfc directory:<br><code>cd /usr/sbin/lpfc</code>                                                                                                                                                                                                                                                                                     |
| 2    | Enter the following command to start the lputil utility:<br><code>./lputil</code><br><b>Result:</b> The utility opens, displaying the Main menu.                                                                                                                                                                                                              |
| 3    | On the Main menu, enter the number 3 option for Firmware Maintenance.<br><b>Result:</b> The Firmware Maintenance menu is displayed.                                                                                                                                                                                                                           |
| 4    | On the Firmware Maintenance menu, enter the number 1 option for Load Firmware Image.                                                                                                                                                                                                                                                                          |
| 5    | Enter the firmware file name found in the /opt/NTAPfcfw<hba_type>/directory.<br><b>Example :</b><br><ul style="list-style-type: none"> <li>◆ /opt/NTAPfcfw9002/cd392a2.awc - for the LP9002 directory</li> <li>◆ /opt/NTAPfcfw10k/td190a4.all - for the LP10000 directory.</li> </ul> <b>Result:</b> 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.<br><b>Result:</b> 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:<br><code>reboot -- -r</code>                                                                                                                                                                                                                              |

| Step | Action                                                                                                                                                                                                                                                                                  |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11   | <p>On the host command line, enter the following command and verify that the new firmware revision level is displayed:</p> <pre>sanlun fcp show adapter -v all</pre> <p><b>Result:</b> The configuration information for each HBA is displayed, including the new firmware version.</p> |

**About this chapter**      This chapter describes how to persistently bind a filer's WWNN or WWPNS to a particular target ID on the host.

**Topics in this chapter**

This chapter discusses the following topics:

- ◆ [“Creating persistent bindings for the filer”](#) on page 54
  - ❖ [“Preparing the filer for persistent bindings”](#) on page 56
  - ❖ [“Creating WWNN bindings”](#) on page 58
  - ❖ [“Creating WWPNS bindings”](#) on page 62
- ◆ [“Checking host and filer connectivity”](#) on page 74

# Creating persistent bindings for the filer

---

## Reason to create persistent bindings for the filer

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.

The filer's WWNN or WWPNS are persistently bound to a particular target ID on the host. The host operating system then accesses the filer using the bound target ID.

## What WWNNs and WWPNS are

In the FCP environment, every node has a unique World Wide Node Name (WWNN). NetApp assigns a WWNN to a filer based on the serial number of its NVRAM card. The WWNN is stored on disk.

Each Fibre Channel device has one or more ports that are used to connect it to the SAN network. Each port has a unique WWPNS.

Both the WWNN and the WWPNS are a 64-bit address represented in the following format: *nn:nn:nn:nn:nn:nn:nn:nn*, where *n* represents a hexadecimal value. For both filers and hosts, each port of the HBA has a unique WWPNS.

## Types of persistent bindings

There are two types of persistent bindings:

- ◆ WWNN—The filer's WWNN is persistently bound to a target ID on the host. You can bind by WWNN only if all of the following conditions are true:
  - ❖ You have a F8xx or FAS9xx series filer.
  - ❖ You have no more than two target HBAs installed in the filer
  - ❖ The filer's cfmode setting is standby.
- ◆ WWPNS—The WWPNS of each active port on the filer is persistently bound to a target ID on the host. You must use WWPNS bindings in the following configurations:
  - ❖ The filer has more than two target HBAs.
  - ❖ You are connecting to a F8xx or FAS9xx filer cluster and the cfmode setting on the filers is partner or mixed.
  - ❖ You are connecting to a FAS270 filer.
  - ❖ You are using port level zoning on your switch.

## Methods for creating persistent bindings

You use the following methods for creating persistent bindings:

---

### Note

If you have other devices in your SAN environment follow the vendor's instructions for creating persistent bindings for those devices.

---

- ◆ `lputil` utility— you can use the `lputil` utility to create either WWNN or WWPN bindings.
- ◆ WWPN— You run the `create_binding.pl` script to create WWPN bindings only.
- ◆ Manually editing the `kernel/drv/lpfc.conf` file.  
Network Appliance recommends that you create a backup of the `lpfc.conf` file before you edit it manually.

## For detailed information

For detailed information about creating persistent bindings, see the following topics:

- ◆ [“Preparing the filer for persistent bindings”](#) on page 56
- ◆ [“Creating WWNN bindings”](#) on page 58
- ◆ [“Creating WWPN bindings”](#) on page 62

## Preparing the filer for persistent bindings

---

### Preparing the filer

Before you create persistent bindings, you must prepare the filer by completing the following tasks:

- ◆ Verifying that all cabling for your configuration is completed.
- ◆ Ensuring the FCP service is licensed and started. If the FCP service is not started, the filer's target FCP ports are not available to the initiator.

### Ensuring that the fcp service is licensed and started

To ensure that the FCP service is licensed and started on the filer, complete the following steps.

| Step | Action                                                                                                                                                      |                                                                                                                                                                                                     |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | On the filer console, enter the following command:<br><br><b>license</b><br><br><b>Result:</b> The filer console displays the codes for licensed protocols. |                                                                                                                                                                                                     |
| 2    | <b>If...</b>                                                                                                                                                | <b>Then...</b>                                                                                                                                                                                      |
|      | The console displays a license code for the FCP service                                                                                                     | Proceed to Step 3.                                                                                                                                                                                  |
|      | The console does not display a license code for the FCP service.                                                                                            | 1. Enter the following command to license the FCP service:<br><b>license add code</b><br><br><i>code</i> is the FCP license code provided to you by Network Appliance.<br><br>2. Proceed to Step 3. |

| Step | Action                                                                         |                                                                                                                                                            |
|------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <b>If...</b>                                                                   | <b>Then...</b>                                                                                                                                             |
|      | You have an F8xx or FAS9xx filer                                               | Proceed to <a href="#">Step 4</a> .                                                                                                                        |
|      | You have a FAS270 filer                                                        | 1. Reboot the filer.<br><br><b>Result:</b> The port labeled Fibre Channel 1 is enabled as a target FCP port.<br><br>2. Proceed to <a href="#">Step 4</a> . |
| 4    | Enter the following command to start the FCP service:<br><br><b>fcps start</b> |                                                                                                                                                            |

Creating persistent bindings for the filer

# Creating WWNN bindings

---

Tasks for creating WWNN bindings

To create persistent bindings using the filer’s WWNN, you must complete the following tasks.

- ◆ Verify that your filer has no more than two target HBAs
- ◆ Verify that the filer’s cfmode setting is standby
- ◆ Obtain the filer’s WWNN
- ◆ Create persistent bindings using the `lputil` utility

**Note**\_\_\_\_\_

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

---

Verifying that the filer’s cfmode setting is standby

To verify that the filer’s cfmode setting is standby, complete the following step.

| Step | Action                                                                                                                                                                                                                                           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer console, enter the following command:</p> <pre>fcpx show cfmode</pre> <p><b>Result:</b> The system displays the cfmode setting.</p> <p><b>Example:</b></p> <pre>filer_1&gt; fcpx show cfmode<br/>fcpx show cfmode: standby</pre> |

If your filer is in a state other than standby, you must configure WWPNNs because WWNNs are not supported. Call Customer Support if you need to change your mode and WWPNN bindings.

Obtaining the filer’s WWNN

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

| Step | Action                                                                                                                                                                                                                                                                                                                                                                               |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | On the host, use the <code>telnet</code> command or a serial console to access the filer.                                                                                                                                                                                                                                                                                            |
| 2    | <p>On the filer command line, enter the following command to show the filer's WWNN:</p> <pre>fcv nodename</pre> <p><b>Result:</b> The filer's WWNN (or Fibre Channel node name) is displayed in a format with colons and without colons.</p> <p><b>Example:</b></p> <pre>filerX&gt; fcv nodename Fibre Channel nodename: 50:a0:09:00:55:CC:66:DD (50a9800055CC66DD) filerX&gt;</pre> |
| 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    | <p>Change to the <code>/usr/sbin/lpfc</code> directory:</p> <pre>cd /usr/sbin/lpfc</pre>                                                                   |
| 3    | <p>Enter the following command to start the <code>lputil</code> utility:</p> <pre>./lputil</pre> <p><b>Result:</b> The utility displays the Main menu.</p> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                  |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>From the Main menu, enter the number <b>5</b> option for Persistent Bindings.</p> <p><b>Result:</b> The Persistent Bindings menu is displayed.</p>                                                                                                                                                                                                                   |
| 5    | <p>From the Persistent Bindings menu, enter the number <b>4</b> option for Bind Target Manually.</p> <p><b>Result:</b> A list of host HBAs is displayed.</p> <p><b>Example:</b><br/> Host Adapter 0 (lpfc0) is an LP10K (Ready Mode)<br/> Host Adapter 1 (lpfc1) is an LP10K (Ready Mode)<br/> Adapter (or X to Cancel) =&gt; 0</p>                                     |
| 6    | <p>Select the desired adapter number to create a persistent binding.</p> <p>For example, enter <b>0</b> for Host Adapter 0 (lpfc0).</p> <p><b>Result:</b> The Select Binding Method menu is displayed.</p>                                                                                                                                                              |
| 7    | <p>From the Select Binding Method menu, enter the number <b>1</b> option to bind by Node Name.</p>                                                                                                                                                                                                                                                                      |
| 8    | <p>Enter the 16 Character Node Name by copying and pasting the filer WWNN that you discovered in <a href="#">“Tasks for creating WWNN bindings”</a> on page 58.</p>                                                                                                                                                                                                     |
| 9    | <p>Enter the Target Number.</p> <p>You can choose any target number from 0 to 511.</p> <p><b>Best-practice guideline:</b> 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.</p> |
| 10   | <p>If you have a second host HBA, repeat Step 5 through Step 9 to create a persistent binding.</p>                                                                                                                                                                                                                                                                      |
| 11   | <p>Enter the <b>0</b> option to return to the Main menu.</p>                                                                                                                                                                                                                                                                                                            |
| 12   | <p>Enter <b>0</b> (again) to return to the Main menu.</p>                                                                                                                                                                                                                                                                                                               |
| 13   | <p>Enter <b>0</b> to exit the utility.</p>                                                                                                                                                                                                                                                                                                                              |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14   | <p>With a text editor, open the /kernel/drv/sd.conf file on the host and verify that the target ID you entered in <a href="#">Step 9</a> is listed in this file.</p> <p><b>Example:</b> The following line shows that the target ID mapped to the filer's WWNN is 10.</p> <pre>name="sd" parent="lpfc" target=10 lun=0;</pre> <p><b>Note</b>_____</p> <p>If you have multiple filers or clusters connected to this host you must enter the WWNN and target ID mappings for each additional filer or cluster.</p> <p>_____</p> |
| 15   | <p>On the command line, reboot the host with the reconfigure option by entering the following command:</p> <pre>reboot -- -r</pre>                                                                                                                                                                                                                                                                                                                                                                                            |

## Creating WWPN bindings

---

### Script for creating WWPN bindings

The NetApp-provided `create_binding.pl` script enables you to automatically bind the WWPNs of a single filer's active ports to a target ID and saves these bindings in the `/kernel/drv/lpfc.conf` file.

For new installations in which there are no existing WWNN bindings, the `create_binding.pl` script accesses the filer's WWPN list and automatically binds the WWPNs to target IDs and updates the `/kernel/drv/lpfc.conf` file.

If you are upgrading an existing installation from WWNN bindings to WWPN bindings, or if you want to redo your WWPN bindings, the `create_binding.pl` script saves the existing `lpfc.conf` file to `/kernel/drv/lpfc.conf.NTAP.[date-stamp]`. The script then deletes the WWNN or WWPN bindings in the `lpfc.conf` file and replaces them with WWPN bindings to the new target IDs. The previous WWNN or WWPN bindings remain in the `/kernel/drv/lpfc.conf` file but are commented out. You can refer to the commented out settings for information about your previous bindings.

### Rules the script uses for WWPN bindings

The script uses the following rules for creating WWPN bindings:

- ◆ Initiators bind to accessible targets only.
- ◆ For multipath configurations with VERITAS VxVM and DMP software, the script automatically creates bindings for all accessible paths to the filer.
- ◆ On non-multipathing hosts, an initiator cannot bind to more than one active port per filer. For these configurations, the script prompts you to select one binding for one accessible path to the filer for each HBA.
- ◆ When the filer's FCP cluster failover mode (`cfmode`) is set to `standby`, the script creates bindings for only the active A ports on the filers in a cluster. Standby mode means that the B ports are not available to the initiator until a takeover occurs.
- ◆ When the filer's FCP cluster failover mode is set to `mixed` or `dual_fabric`, the script creates bindings for all available A and B ports.
- ◆ The script has two options for configurations that have multiple paths to the filer.
  - d—enables you to configure bindings for all available paths when VERITAS VxVM with DMP is installed.

-D—enables you to configure bindings for all available paths when VERITAS VxVM with DMP is not yet installed.

---

**Caution**

All multipath configurations require VERITAS VxVM with DMP. If you use the -D option to create bindings and you do not have VERITAS software, you must install VERITAS software after you create bindings. You cannot create or use LUN data until VERITAS software is installed.

---

**Prerequisites for  
using the  
create\_binding.pl  
script**

To use the `create_binding.pl` script, your configuration must meet the following prerequisites:

- ◆ NetApp SAN Host software installation  
You must have installed the host software according to the procedures described in “[Installing the host software for the first time](#)” on page 31 and rebooted using the `reboot` command.
- ◆ Cabling  
The `create_binding.pl` script checks the availability of paths from the host to the filer. All cables must be connected correctly between the host system and the filer.
- ◆ Zoning  
If zoning is configured on your switches, the zones must be configured correctly and must be active. You can verify that zones are configured correctly in the following ways:
  - ❖ By checking the zoning information on the switch to verify that the filer ports and the host ports are visible to the switch.
  - ❖ By verifying that filer ports are visible to the host. You can run the `fcpx show initiator` command on the filer console to view the WWPNs of initiators connected to the filer’s target HBAs.
- ◆ Cluster configurations  
The `create_binding.pl` script configures WWPN bindings for both filers in a cluster configuration. If you have a cluster configuration, the cluster must be set up and configured before you run the script.

**Filer prerequisites**

To use the `create_binding.pl` script, your filer must meet the following prerequisites

- ◆ Remote Shell (`rsh`) service

The script uses the `rsh` service to access the filer. You enable the `rsh` service by entering the following command:

```
options rsh.enable.on
```

- ◆ The FCP service must be licensed and started on the filer.
- ◆ The SAN Solaris host must be a trusted host of the filer. You use the following filer command to make the SAN Solaris host a trusted host:

```
options trusted.hosts <hostname>
```

## Guidelines for using the script

Apply the following guidelines when using the `create_binding.pl` script for your configuration:

- ◆ Multiple hosts connected to the same filer  
If you have multiple hosts connected to the same filer or CFO pair, you must run the `create_binding.pl` script on each host.
- ◆ Path assignments for non-DMP configurations  
For non-DMP configurations with multiple hosts, you must run the `create_binding.pl` script on each host. The script enables you to choose one path from up to four possible paths from each HBA to the filer. If you do not choose a path, the script assigns one by default.  
If you accept the default path assignments, the script assigns the same path to each host by default. This overloads one path to the filer with all traffic from all hosts. Before you run the `create_binding.pl` script on each host, you must plan to balance the available paths assigned among your hosts.
- ◆ Converting from WWNN bindings to WWPN bindings  
Device files might be renamed when you convert from WWNN bindings to WWPN bindings. VERITAS DMP recognizes the renamed devices. If you do not have VERITAS DMP and you configured your application to access raw devices, you must reconfigure your application to use the new device names.
- ◆ Existing bindings in the `lpfc.conf` file  
If you already created persistent bindings by manually editing the `lpfc.conf` file, you must remove these bindings before you run the `create_binding.pl` script.  
The `create_binding.pl` script modifies the persistent bindings listed only under the following line in the `lpfc.conf` file:  

```
# BEGIN: LPUTIL-managed Persistent Bindings
```

  
If you manually created bindings in other sections of the `lpfc.conf` file and did not remove them, the `create_binding.pl` script does not update or remove

these bindings. If your manual bindings are at the end of the file and you did not remove them, these bindings will be loaded to your configuration, not the bindings updated by the `create_binding.pl` script.

### When the script does not automate bindings

The `create_binding.pl` script does not automatically update WWPN bindings if you already have existing WWPN bindings saved in the `/kernel/drv/lpfc.conf` file. The script instead provides information about the bindings that it finds. You might have existing bindings in the following situations:

- ◆ You have one host connected to multiple filers or clusters, and you already used the script to create bindings for one filer or one cluster.
- ◆ You replaced a failed HBA on the filer and installed a new HBA.
- ◆ You have WWPN bindings from a previous configuration.

In these situations, you can use the `create_binding.pl` script to obtain information about available paths from the host to the filer. The script detects which filer ports are connected to host HBA ports and displays the WWPN bindings for these paths on the host console. You can add these WWPN bindings to the `/kernel/drv/lpfc.conf` file yourself. You can edit the file manually or use the `lputil` utility to add these bindings.

#### Note

Network Appliance recommends that you create a backup of the `lpfc.conf` file before you edit it manually.

### Creating WWPN bindings

To create WWPN bindings, complete the following steps.

| Step | Action                                                                                       |
|------|----------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in to the host with root privileges.                              |
| 2    | Change to <code>/opt/NTAPsanlun/bin</code> directory:<br><code>cd /opt/NTAPsanlun/bin</code> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>Enter the following command:</p> <pre>create_binding.pl -l 'login:passwd, login:passwd' -n filer -d -D</pre> <p>-l <i>login:passwd</i> is the login name and password used to log on to the filer. Use a quoted, comma separated pair to specify two different login:passwd strings for a filer and it's partner.</p> <p>-n <i>filer</i> is the filer's host name.</p> <p>For cluster configurations, you specify one member of the cluster. The script detects and configures bindings for the partner filer.</p> <p>-d enables the script to process information for Veritas DMP configurations.</p> <p>Use the -d option if you have already installed VERITAS Volume Manager (VxVM) with DMP. If you use the -d option for DMP configurations, the script automatically configures WWPN bindings for all accessible paths to the filer.</p> <p>-D enables the script to create bindings for all accessible paths to the filer. Use this option if you have multiple paths to the filer, but have not yet installed VERITAS VxVM with DMP.</p> <hr/> <p><b>Caution</b></p> <p>The -D option enables you to configure persistent bindings even if you have not yet installed VERITAS software. If you have multiple paths to the filer, you must install VERITAS software after you configure persistent bindings. Multipathing software is required for configurations with multiple paths to the filer.</p> <hr/> <p><b>Example :</b></p> <pre>./create_binding.pl -l root -n filer_1</pre> |

| Step | Action                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <b>If...</b>                                                                                                       | <b>Then...</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|      | You have a single-attached or direct-attached configuration                                                        | <p>The script displays the new WWPN bindings and prompts you to save them to the lpfc.conf file.</p> <ol style="list-style-type: none"> <li>1. Enter <b>y</b> to save the new WWPN bindings.</li> <li>2. Proceed to <a href="#">Step 5</a>.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|      | You have VxVM with DMP and you did not use the -d option to the create_binding.pl script in <a href="#">Step 3</a> | <p>The script displays the following warning because if you do not use the -d option, the create_binding script will not discover multiple paths to the filer:</p> <pre>WARNING: You have Veritas VxVM installed but you have not specified the -d option to turn on DMP support.</pre> <pre>WARNING: Do you wish to continue with this configuration (y/n) [n]</pre> <ol style="list-style-type: none"> <li>1. Enter <b>n</b> to exit the script.</li> <li>2. Rerun the create_binding.pl script with the -d option.</li> <li>3. Enter <b>y</b> at the prompt to continue the script and bind by WWPN.</li> </ol> <p><b>Result:</b> The script displays the new WWPN bindings and prompts you to save them to the lpfc.conf file.</p> <ol style="list-style-type: none"> <li>4. Enter <b>y</b> to save the new WWPN bindings.</li> <li>5. Proceed to <a href="#">Step 5</a>.</li> </ol> |

| Step | Action                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <b>If...</b>                                                                                                                                                                                                                  | <b>Then...</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|      | <p>You have VxVM and DMP installed and:</p> <ul style="list-style-type: none"> <li>◆ You do not have a multipathing configuration</li> <li>◆ You did not use the -d option of the script in <a href="#">Step 3</a></li> </ul> | <p>The script displays the following warning. If you enter <b>y</b> to continue, the script allows you to choose only one path to the filer for each HBA.</p> <p>WARNING: You have Veritas VxVM installed but you have not specified the -d option to turn on DMP support.</p> <p>WARNING: Do you wish to continue with this configuration (y/n) [n]</p> <ol style="list-style-type: none"> <li>1. Enter <b>y</b> to continue.</li> <li>2. For each HBA, choose one of the available paths to the filer. Each path is a WWPN binding.</li> <li>3. When prompted, enter <b>y</b> to save the new WWPN bindings to the lpfc.conf file.</li> <li>4. Proceed to <a href="#">Step 5</a>.</li> </ol> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5    | <p>With a text editor, open the /kernel/drv/sd.conf file on the host and create an entry for the target ID mapped to the filer's WWPN.</p> <p><b>Example:</b> The <code>create_binding.pl</code> script adds the following entry to the /kernel/drv/lpfc.conf file:</p> <pre>fcg-bind-WWPN="50a980010300e073:lpfc0t0, where:</pre> <ul style="list-style-type: none"> <li>◆ <code>wwpn</code> - 50a980010300e073</li> <li>◆ <code>lpfc0</code> - the lpfc driver and instance</li> <li>◆ <code>t0</code> - the target number</li> </ul> <p>The corresponding entry in the /kernel/drv/sd.conf file is as follows:</p> <pre>name="sd" parent="lpfc" target=0 lun=0;</pre> <p><b>Note</b>_____</p> <p>If the host is connected to multiple filers or clusters, you must create entries in sd.conf for each additional filer or cluster, and for each LUN mapped to the host.</p> <p>_____</p> |
| 6    | <p>On the host console, reboot the host with the reconfigure option by entering the following command:</p> <pre>reboot -- -r</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### Sample create\_binding.pl outputs

**Converting from WWNN to WWPN:** The following lines show sample output for converting existing WWNN bindings to WWPN bindings for a multipath host with DMP software.

```
# ./create_binding.pl -l root -n filer_1 -d
Filer: <filer_1>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
Filer: <filer_2>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
NOTE: Gathering Filer configurations .....
NOTE: Backup /kernel/drv/lpfc.conf file saved
      to /kernel/drv/lpfc.conf.NTAP.0513_151917
NOTE: Existing Bindings#####
      fcg-bind-WWNN="2000123456789abc:lpfc1t0",
```

```

"20000020370c27f7:lpfc0t2";
WARNING: WNNN persistent bindings entries were found.
Delete these bindings? (y/n/q) [y]
NOTE: New lpfc.conf WWPN bindings#####
fcp-bind-WWPN="50a980050200c139:lpfc0t0",
               "50a980070200c139:lpfc0t1",
               "50a980010200c139:lpfc1t0",
               "50a980030200c139:lpfc1t1",
               "50a980050200c3ac:lpfc0t2",
               "50a980070200c3ac:lpfc0t3",
               "50a980010200c3ac:lpfc1t2",
               "50a980030200c3ac:lpfc1t3";
NOTE: Previous bindings will be saved in the /kernel/drv/lpfc.conf
file as comments below the new bindings.
Commit these changes to lpfc.conf file? (y/n/q) [y]

```

**New host installation—Cluster with multipathing:** The following lines show sample output for a multipathing host with DMP software. The host is connected to a cluster. There are no existing bindings.

```

# ./create_binding.pl -l root -n filer_1 -d
Filer: <filer_1>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
Filer: <filer_2>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
NOTE: Gathering Filer configurations .....
NOTE: Backup /kernel/drv/lpfc.conf file saved to
/kernel/drv/lpfc.conf.NTAP.0514_122228
NOTE: Existing Bindings#####
No bindings were found!
NOTE: New lpfc.conf WWPN bindings#####
fcp-bind-WWPN="50a980050200c139:lpfc0t0",
               "50a980070200c139:lpfc0t1",
               "50a980010200c139:lpfc1t0",
               "50a980030200c139:lpfc1t1",
               "50a980050200c3ac:lpfc0t2",
               "50a980070200c3ac:lpfc0t3",

```

```
"50a980010200c3ac:lpfc1t2",
```

```
"50a980030200c3ac:lpfc1t3";
```

NOTE: Previous bindings will be saved in the /kernel/drv/lpfc.conf file as comments below the new bindings.

NOTE: There are no difference between the Existing and New WWPN Bindings.

Commit these changes to lpfc.conf file? (y/n/q) [y]

**Non-DMP configuration with a cluster:** The following lines show sample output for non-DMP host connected to a cluster.

```
# ./create_binding.pl -l root -n filer_1 -d
```

```
Filer: <filer_1>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
```

```
Filer: <filer_2>: NetApp Release 6.5: Tue Jan  6 00:49:17 PST 2004
```

WARNING: You have Veritas VxVM installed but you have not specified the -d option to turn on DMP support

WARNING: Do you wish to continue with this configuration (y/n) [n]  
Y

NOTE: Gathering Filer configurations .....

NOTE: Backup /kernel/drv/lpfc.conf file saved to  
/kernel/drv/lpfc.conf.NTAP.0513\_145228

NOTE: Existing Bindings#####

```
fcv-bind-WWPN="50a980050200c139:lpfc0t0",
```

```
"50a980070200c139:lpfc0t1",
```

```
"50a980010200c139:lpfc1t0",
```

```
"50a980030200c139:lpfc1t1",
```

```
"50a980050200c3ac:lpfc0t2",
```

```
"50a980070200c3ac:lpfc0t3",
```

```
"50a980010200c3ac:lpfc1t2",
```

```
"50a980030200c3ac:lpfc1t3";
```

There are multiple paths possible for host adapter:lpfc0 to  
Filer:filer\_1. They are:

|  | Path | Filer | WWPN | Port |
|--|------|-------|------|------|
|--|------|-------|------|------|

|     |                  |      |
|-----|------------------|------|
| (1) | 50a980050200c139 | (6a) |
|-----|------------------|------|

|     |                  |      |
|-----|------------------|------|
| (2) | 50a980070200c139 | (7a) |
|-----|------------------|------|

Please choose a binding (1/2): [1]

Default 50a980050200c139 path selected.  
There are multiple paths possible for host adapter:lpfc1 to  
Filer:filer\_1. They are:

| Path | Filer | WWPN | Port |
|------|-------|------|------|
|------|-------|------|------|

|     |                  |      |
|-----|------------------|------|
| (1) | 50a980010200c139 | (4a) |
|-----|------------------|------|

|     |                  |      |
|-----|------------------|------|
| (2) | 50a980030200c139 | (5a) |
|-----|------------------|------|

Please choose a binding (1/2): [1]

Default 50a980010200c139 path selected.

There are multiple paths possible for host adapter:lpfc0 to  
Filer:filer\_1. They are:

| Path | Filer | WWPN | Port |
|------|-------|------|------|
|------|-------|------|------|

|     |                  |      |
|-----|------------------|------|
| (1) | 50a980050200c3ac | (6a) |
|-----|------------------|------|

|     |                  |      |
|-----|------------------|------|
| (2) | 50a980070200c3ac | (7a) |
|-----|------------------|------|

Please choose a binding (1/2): [1]

Default 50a980050200c3ac path selected.

There are multiple paths possible for host adapter:lpfc1 to  
Filer:filer\_1. They are:

| Path | Filer | WWPN | Port |
|------|-------|------|------|
|------|-------|------|------|

|     |                  |      |
|-----|------------------|------|
| (1) | 50a980010200c3ac | (4a) |
|-----|------------------|------|

|     |                  |      |
|-----|------------------|------|
| (2) | 50a980030200c3ac | (5a) |
|-----|------------------|------|

Please choose a binding (1/2): [1]

Default 50a980010200c3ac path selected.

NOTE: New lpfc.conf WWPN bindings#####

fcplib-WWPN="50a980050200c139:lpfc0t0",

"50a980010200c139:lpfc1t0",

"50a980050200c3ac:lpfc0t1",

"50a980010200c3ac:lpfc1t1";

NOTE: Previous bindings will be saved in the /kernel/drv/lpfc.conf  
file as comments below the new bindings.

NOTE: Existing WWPN bindings that are not already in

the New Binding list to be added #####

"50a980070200c139:lpfc0t1"

"50a980030200c139:lpfc1t1"

"50a980050200c3ac:lpfc0t2"

```
"50a980070200c3ac:lpfc0t3"
```

```
"50a980010200c3ac:lpfc1t2"
```

```
"50a980030200c3ac:lpfc1t3"
```

NOTE: These bindings must be merged manually into the  
/kernel/drv/lpfc.conf file.

Consult the release notes for more information.

Commit these changes to lpfc.conf file? (y/n/q) [y]

NOTE: Update your /kernel/drv/sd.conf file with new target\_IDs.

A "reboot -- -r" is now required.

# 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 59.

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

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5    | <p>Enter the number for the host adapter.</p> <p><b>Result:</b> The visible node information is displayed with the node state, target IDs, WWPNs, and WWNNs.</p> <p><b>Example:</b></p> <pre>Visible Nodes: 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 Mapped FCP Node     0    50-a9-80-03-55-CC-66-DD  50-a9-80-00-55-CC-66-DD</pre> <p>Press any key to continue:</p> |
| 6    | <p>For each HBA, verify that it has the correct target IDs and is persistently bound to the correct filer WWNN.</p> <p><b>Note</b>_____</p> <p>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.</p> <p>_____</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 7    | Upon completion, enter <b>0</b> to return to the Main menu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 8    | Enter <b>0</b> to exit the <code>lputil</code> utility.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



**About this chapter**      This chapter describes how to configure igroups and LUNs on the filer, as well as how to display LUN and HBA information

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

- ◆ “[Creating LUNs on the filer](#)” on page 78
- ◆ “[Setting adaptive throttles](#)” on page 90
- ◆ “[Configuring the LUNs](#)” on page 92
- ◆ “[Displaying LUN and HBA information](#)” on page 106
  - ❖ “[Displaying host LUN information](#)” on page 107
  - ❖ “[Displaying information about paths to the filer](#)” on page 109
  - ❖ “[Displaying host HBA information](#)” on page 111

# 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:

- ◆ Verify that the filer's FCP failover mode (cfmode) is set to a supported value.
- ◆ Create an igroup on the filer.  
An igroup is a collection of host WWPNs.
- ◆ Create one or more LUNs on the filer and map the LUNs to an igroup.
- ◆ Record the LUN IDs that you used to map the LUNs to the igroup.  
The host can access only the LUNs mapped to an igroup.

For additional information about cfmode and igroups, refer to the *Data ONTAP Block Access Management Guide* at [http://now.netapp.com/NOW/knowledge/docs/ontap/ontap\\_index.shtml](http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml)

## 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 the *Data ONTAP Block Access Management Guide for FCP* at [http://now.netapp.com/NOW/knowledge/docs/ontap/ontap\\_index.shtml](http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml).

## Verifying the filer's current cfmode

To verify that the filer's current cfmode setting is correct for your configuration, complete the following step:

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer console, enter the following command:</p> <pre>fcg show cfmode</pre> <p><b>Result:</b> The system displays the cfmode setting. The valid settings are as follows:</p> <ul style="list-style-type: none"> <li>◆ F8xx or FAS9xx filers: <ul style="list-style-type: none"> <li>❖ standby—This is the default setting if you upgraded to Data ONTAP version 6.5 from a previous version. The B ports on the filer are in standby mode and become active during a takeover.</li> <li>❖ partner—This is the default setting for new filers running Data ONTAP 6.5. This setting enables the B ports on a filer's target HBAs to provide access to LUNs on the partner.</li> <li>❖ mixed—Each physical port supports three virtual ports: a standby virtual port, a partner virtual port, and a local virtual port. In some cases, your filer's cfmode might be set to mixed by your NetApp Professional Services representative.</li> </ul> </li> <li>◆ FAS270 filers—The default and only valid setting is dual_fabric</li> </ul> <p>If the filer's cfmode is not one of the preceding default values, contact your NetApp Professional Services representative.</p> <p>The cfmode mode must be set to the same value for both filers in the cluster. If each filer has a different value, the filer's target FCP ports cannot process traffic for local or partner LUNs.</p> |

### Caution about changing the filer's cfmode

Do not change the filer's cfmode without the direction or assistance of your NetApp Professional Services representative. Changing the cfmode means that you also change the available paths between the host and filer LUNs. If you change the cfmode the host loses connections to LUNs. You must reconfigure the host to discover the changes to available target ports.

## Creating an igroup on the filer

To create an igroup on the filer, complete the following steps on each filer or filer cluster connected to the host.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in as root on the host.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2    | On the host, change to the /usr/sbin directory:<br><code>cd /usr/sbin</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3    | <p>Enter the following command to print a command to be run on the filer that creates an igroup containing all the HBAs on your host:</p> <pre>./sanlun fcp show adapter -c</pre> <p>-c option prints the initiator-group-creation command on the screen.</p> <p><b>Result:</b> An igroup create command with the host's WWPNs appears on the screen. The igroup's name matches the name of the host.</p> <p><b>Example:</b></p> <p>Enter this filer command to create an initiator group for this system:</p> <pre>igroup create -f -t solaris "hostA" 10000000AA11BB22<br/>10000000AA11EE33</pre> <p>In this example, the name of the host is "hostA," so the name of the igroup with the two WWPNs is "hostA."</p> |
| 4    | On the host in a different session, use the telnet command to access the filer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 5    | <p>Copy the igroup create command from Step 2, paste the command on the filer's command line, and press Enter to run the igroup command on the filer.</p> <p><b>Result:</b> An igroup is created on the filer.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6    | <p>On the filer's command line, enter the following command to verify the newly created igroup:</p> <pre>igroup show</pre> <p><b>Result:</b> The newly created igroup with the host's WWPNs is displayed.</p> <p><b>Example:</b></p> <pre>filerX&gt; igroup show    orca-sun9-qla (FCP) (ostype: solaris):        21:00:00:e0:8b:17:a1:1b (logged in on: 4a)        21:01:00:e0:8b:37:a1:1b (logged in on: 5a)    marlin (FCP) (ostype: solaris):        10:00:00:00:c9:37:04:28 (not logged in)        10:00:00:00:c9:37:04:29 (not logged in) filerX&gt;</pre> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7    | <p>On the filer's command line, enter the following command to show the FCP initiator port names:</p> <pre><b>fcpx show initiator</b></pre> <p><b>Result:</b> The WWPNs for the FCP initiator HBAs and their igrp are displayed.</p> <p><b>Example:</b> The following example is for a fabric-attached SAN configuration with a clustered filer pair. The filers' cmode setting is partner and the target HBAs are installed in slots 9 and 11:</p> <pre>filerX&gt; <b>fcpx show initiator</b> Initiators connected on adapter 9a: Portname                               Group 10:00:00:00:c9:2d:60:db                 solaris-2 10:00:00:00:c9:2d:61:45                 solaris-1 10:00:00:00:c9:2b:8f:1b                 solaris-2  Initiators connected on adapter 9b: Portname                               Group 10:00:00:00:c9:2d:60:db                 solaris-2 10:00:00:00:c9:2d:61:45                 solaris-1 10:00:00:00:c9:2b:8f:1b                 solaris-2  Initiators connected on adapter 11a: Portname                               Group 10:00:00:00:c9:2d:60:db                 solaris-2 10:00:00:00:c9:2d:60:c4                 solaris-1  Initiators connected on adapter 11b: Portname                               Group 10:00:00:00:c9:2d:60:db                 solaris-2 10:00:00:00:c9:2d:60:c4                 solaris-1</pre> <p><b>Example:</b> The following example is for a direct-attached configuration:</p> <pre>filerY&gt; <b>fcpx show initiator</b> Initiators connected on adapter 9a: Portname                               Group 10:00:00:00:AA:88:CC:11                 solaris-1  Initiators connected on adapter 9b: None connected.</pre> |

**Creating LUNs with the lun setup command**

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

You can create an igroup and add the WWPNs to it when prompted. If you already created an igroup, you can use an existing igroup 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 using the `lun setup` command, complete the following steps on each filer or filer cluster connected to the host.

| Step | Action                                                                                                                                                                                                                                                                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | On the filer’s command line, enter the following command to create a LUN:<br><br><code>lun setup</code>                                                                                                                                                                  |
| 2    | Enter <b>y</b> in response to the prompt:<br><br>Do you want to create a LUN? [y]: <b>y</b>                                                                                                                                                                              |
| 3    | Enter <b>solaris</b> in response to the next prompt:<br><br>Multiprotocol type of LUN<br>(image/solaris/windows/hpux/aix/linux) [image]: <b>solaris</b><br><br><b>Note</b> _____<br>If you select “image,” Data ONTAP determines which operating system to use.<br>_____ |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>Enter the appropriate LUN path in response to the next prompt:</p> <p>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<br/> "/vol/vol1/q0/lun0"<br/> Enter LUN path: <i>lun_path</i></p> <p><b>Example:</b> An example of a <i>lun_path</i> is /vol/vol1/qtree1/lun_sdata or /vol/vol1/hostA_0.</p> <p><b>Caution</b>_____</p> <p>Do not create LUNs in /vol/vol0.</p> <p>_____</p> <p><b>Result:</b> The name of the LUN (the LUN path) is defined.</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 5    | <p>Specify whether the new LUN is space reservation-enabled.</p> <p>A LUN can be created with or without space reservations being enabled.<br/> Space reservation guarantees that data writes to that LUN will never fail.<br/> Do you want the LUN to be space reserved? [y]:</p> <p><b>Note</b>_____</p> <p>Network Appliance recommends that you always enable space reservation for LUNs. This causes Data ONTAP to reserve enough space in the volume so that writes to the LUN do not fail due to a lack of disk space. See the <i>Data ONTAP Block Access Administration Guide</i> at<br/> <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a><br/> and the <i>Data ONTAP Release Notes</i> at<br/> <a href="http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a><br/> for more information about space reservations.</p> <p>_____</p> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6    | <p>Enter the LUN size in response to the next prompt:</p> <p>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).</p> <p>Enter LUN size: ____</p> <p><b>Example:</b> An example is 5g, meaning 5 GB of raw disk.</p> <p><b>Result:</b> 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.</p>                                                                                        |
| 7    | <p>Enter a comment string, if desired, or press Enter in response to the next prompt:</p> <p>You can add a comment string to describe the contents of the LUN.</p> <p>Please type a string (without quotes), or hit ENTER if you don't want to supply a comment.</p> <p>Enter comment string:_____</p> <p><b>Note</b>_____</p> <p>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.</p> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8    | <p>When prompted, enter the name of the igroup you created in <a href="#">“Creating an igroup on the filer”</a> on page 80.</p> <hr/> <p><b>Note</b>—<br/> Entering ? shows you a list of existing igroups. You can accept the previously created igroup (for example, hostA) or create a new igroup (for example, <i>new_group_name</i>).</p> <hr/> <p>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.<br/> Name of initiator group [shows igroup name if exists]:<br/> <i>new_group_name</i></p> |
| 9    | <p>Respond to the next prompt by pressing Enter to accept FCP:</p> <p>Type of initiator group <i>new_group_name</i> (FCP/iSCSI) [FCP]:</p> <p><b>Result:</b> Choosing FCP means that the initiator WWPNs in this igroup are using FCP for SCSI protocol.</p>                                                                                                                                                                                                                                                                                                                                                                                    |

| Step                    | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |       |                         |  |                         |  |                         |  |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|-------------------------|--|-------------------------|--|-------------------------|--|
| 10                      | <p>Enter comma-separated port names in response to the next prompt:</p> <p>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.</p> <p>Enter comma separated portnames:</p> <p><b>Note</b>_____</p> <p>Enter ? to see the list of initiator WWPNs connected to the target HBAs and associated igroups (if they exist). The <code>sanlun fcp show adapter</code> command run on the host lists the initiator HBAs and their WWPNs specific to that host.</p> <p>_____</p> <p><b>Example:</b></p> <p>Enter comma separated portnames:?</p> <p>Initiators connected on adapter 5a:</p> <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> <p>Initiators connected on adapter 5b:</p> <p>None connected.</p> <p>Initiators connected on adapter 7a:</p> <p>None connected.</p> <p>Initiators connected on adapter 7b:</p> <p>None connected.</p> <p>Enter comma separated portnames:10:00:00:00:AA:55:BB:66</p> <p>Enter comma separated portnames:</p> <p>In this example, the initiator HBA with WWPN 10:00:00:00:AA:55:BB:66 is added to <i>new_group_name</i>.</p> <p><b>Result:</b> The initiator WWPNs are added to a previously specified igroup.</p> | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11   | <p>Enter <b>solaris</b> in response to the next prompt:</p> <pre>OS type of initiator group "new_group_name" (image/solaris/windows/linux/hpux/aix):<b>solaris</b></pre> <p><b>Result:</b> The operating system for the igroup is defined.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 12   | <p>Enter the LUN ID for the LUN that is mapped to the igroup in response to the next prompt. You can also enter <b>?</b> to display the LUNs already in use by one or more initiators in the specified igroup.</p> <p><b>Note</b>_____</p> <p>This is where you record the LUN ID associated with the <i>lun_path</i> and the igroup name (<i>new_group_name</i>). The program supplies the next available LUN ID.</p> <p>_____</p> <p>The LUN will be accessible to all the initiators in the initiator group. Enter '<b>?</b>' 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</i>" [0]:</p> <p><b>Example:</b> In this example, 0 is the next available LUN ID (as shown in the brackets). Pressing Enter creates a LUN 0.</p> <p><b>Result:</b> The LUN ID is assigned to the LUN (LUN path) and mapped to the igroup.</p> |
| 13   | <p>Respond to the next prompt by entering <b>y</b> to accept the configuration or <b>n</b> to discard the configuration:</p> <pre>Do you want to accept this configuration? [y]:</pre> <p><b>Result:</b> If you enter <b>y</b>, the LUN is mapped to the specified igroup and all changes to the system are committed. At this point, Ctrl-C cannot undo the changes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 14   | <p>Terminate or continue creating LUNs by responding to the final prompt:</p> <pre>Do you want to create another LUN? [n]:</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Verifying the mapped LUN

To verify the mapped LUN, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer's command line, enter the following command to show the mapped LUN.</p> <pre>lun show -v &lt;lun-path&gt;</pre> <p><i>lun-path</i> is the name of a specific LUN.</p> <p><b>Result:</b> The information for the specified LUN is displayed.</p> <p><b>Example:</b></p> <pre>filerX&gt; lun show -v /vol/voll/hostA /vol/voll/hostA          100g (107374182400) (r/w, online, mapped)     Serial#: Vqj4Cnmhgq-W     Share: none     Space Reservation: enabled     Multiprotocol Type: solaris     Maps: hostA=0</pre> |
| 2    | <p>Enter the following command to verify the lun is mapped to a host igroup.</p> <pre>lun show - m</pre> <p><b>Example:</b></p> <pre>filerX&gt; lun show -m LUN path          Mapped to      LUN ID  Protocol ----- /vol/voll/hostA   hostA          0       FCP</pre>                                                                                                                                                                                                                                                                 |

# Setting adaptive throttles

---

## What adaptive throttles do

Adaptive throttles enable you to guarantee that a particular host running a high-priority application can always access the filer. Each target port on the filer has a limited number of command slots for incoming SCSI commands. If a host exceeds the number of available command slots, the filer returns a message indicating that the command queue is full. Without the adaptive throttle, a single host might use the number of available slots and prevent other hosts from accessing the filer.

You can also set adaptive throttles to ensure that a single host does not monopolize filer resources and prevent other hosts from accessing the filer.

## How adaptive throttles are enabled on the Solaris host

The NetApp provided host attach kit installation script modifies the default Emulex adaptive throttle settings in host's `lpfc.conf` file. The following lines show the NetApp settings:

```
# Set to 1 to decrement lun throttle on a queue full condition.
dqfull-throttle=1;

#Use dqfull-throttle-up-time to specify when to increment the
current Q depth.
# This variable is in seconds.
dqfull-throttle-up-time=4;

# Increment the current Q depth by dqfull-throttle-up-inc
dqfull-throttle-up-inc=2;
```

## Setting adaptive throttles on the filer

To set adaptive throttles on the filer, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer console, enter the following command to assign a percentage of filer resources to a host:</p> <pre><b>igroup set <i>igroup</i> throttle_reserve <i>percentage</i></b></pre> <p><i>igroup</i> is the name of the host's igroup.</p> <p><i>percentage</i> is the percentage of filer resources assigned to the igroup. Enter a value from 1 through 99.</p>                                                                                                       |
| 2    | <p>Enter the following command to set whether the igroup can borrow filer resources if it exceeds its throttle reserve:</p> <pre><b>igroup set <i>igroup</i> throttle_borrow <i>yes no</i></b></pre> <p><i>igroup</i> is the name of the host's igroup</p> <p><i>yes</i> indicates that a host in the igroup can borrow resources if it exceeds its throttle reserve</p> <p><i>no</i> indicates that the igroup cannot borrow resources if it exceeds its throttle reserve.</p> |

## Disabling adaptive throttles

To disable adaptive throttles, complete the following step.

| Step | Action                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer console, enter the following command:</p> <pre><b>igroup set <i>igroup</i> throttle_reserve 0</b></pre> <p><i>igroup</i> is the name of the host's igroup</p> |

## For detailed information

For detailed information about managing adaptive throttles, see the *Data ONTAP Block Access Management Guide for FCP* at [http://now.netapp.com/NOW/knowledge/docs/ontap/ontap\\_index.shtml](http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml).

# Configuring the LUNs

---

## About configuring the LUNs

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

- ◆ Ensure the host is configured 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 `sanlun 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

Partitioning a LUN for multiprotocol access 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 *FCP Solaris Attach Kit 2.0 Release Notes*, included in this attach kit.
- ◆ 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 host 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    | <div>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:<br/>name="sd" parent="lpfc" target=0 lun=0;</div> <div><b>Note</b>_____</div> <div>These lines are typically near the end of the file.</div> <div>_____</div> <div>The following comment precedes the desired lines:</div> <div><pre># 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.</pre></div> |
| 3    | <div>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 or WWPNS.</div> <div><b>Example:</b></div> <div>name="sd" parent="lpfc" target=9 lun=0;</div> <div>In this example, the target ID that you mapped to the filer’s WWNN is 9. Look for the line with “target=9.”</div>                                                                                                                                                                                                                                                                                                                                                                                 |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>Edit the lines and add the LUN IDs that you created on the filer and made available to the igroup for the host.</p> <p><b>Planning to map additional LUNs:</b> If you anticipate mapping additional LUNs to this host, add all the entries for these to the sd.conf file during one editing session. This means that later on a reboot is not required when you need to create these LUNs.</p> <p>If you add LUN IDs to sd.conf before you create the LUNs, the host takes more time during reboot to scan each additional entry and probe for a disk that does not yet exist.</p> <p><b>Note</b>_____</p> <p>If no sd.conf edits are required, for example, the LUN IDs were already in the sd.conf file, the devfsadm command can be run without requiring a reboot (as in Step 6).</p> <p>_____</p> <p><b>Example:</b> If you added LUN 0, LUN 1, LUN 5, and LUN 19 on a filer to the igroup 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:</p> <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    | <p>After you edit all the target IDs with the newly created LUN IDs, save the sd.conf file.</p> <p><b>Result:</b> The host is now configured to find the LUN IDs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 6    | <p>On the command line, reboot the host by entering the following command:</p> <p><b>reboot</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 2    | Change to the <code>/usr/sbin</code> directory:<br><code>cd /usr/sbin</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3    | <p>Enter the following command to discover the new LUNs:</p> <pre>./devfsadm</pre> <p><b>Result:</b> 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.</p> <p><b>Note</b>—This warning implies that the host discovered the new LUNs and they need to be labeled as Solaris disks by using the <code>format</code> command, as described in “<a href="#">Labeling the new LUNs as Solaris disks</a>” on page 97.</p> <p><b>Example:</b></p> <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:<br><code>cd /usr/sbin</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3    | <p>On the host's command line, enter the following command to verify that the new LUNs are visible:</p> <pre>./sanlun lun show filer_name:path_name</pre> <p><i>filer_name</i> is the filer's name.</p> <p><i>path_name</i> is the name of the LUN.</p> <p><b>Result:</b> The command displays the filer name, LUN path name, device name, HBA name, LUN size, and LUN state.</p> <p><b>Example:</b></p> <pre># sanlun lun show filerX:/vol/vol2/testlun filer:   lun-pathname   device filename      adapter   lun size      lun state filerX:  /vol/vol2/testlun /dev/rdsk/c2t1d2s2 lpfc0 7.0g (7516192256)  GOOD #</pre> |

## Installing support for LUNs greater than 1 terabyte

Solaris version 9 supports USF type LUNs that are 1 terabyte and greater.

- ◆ If your configuration requires LUN's 1 terabyte or greater, complete the steps below to ensure you have the correct Solaris versions and patches
- ◆ If your configuration does not require LUNs greater than 1 terabyte, go to [“Labeling the new LUNs as Solaris disks”](#) on page 97.

**Important:** Solaris version 8 and VERITAS cds disk format do not support LUNs that are 1 terabyte or greater.

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

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2    | <p>Enter the following to determine if your Solaris 9 version supports LUNs greater than 1 terabyte.</p> <pre>showrev -p   grep 11372</pre> <ul style="list-style-type: none"> <li>◆ If the command returns patch information, your system supports LUNs greater than 1 terabyte.</li> <li>◆ If the command does not return patch information, you must obtain and install the correct patches. Contact your Solaris provider or <a href="http://sunsolve.sun.com">http://sunsolve.sun.com</a> for patch information.</li> </ul> |

## Labeling the new LUNs as Solaris disks

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

| Step | Action                                                                                                                                                                                                                                                                                                                                               |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Ensure that you are logged in as root on the host.                                                                                                                                                                                                                                                                                                   |
| 2    | <p>Determine your LUN configuration:</p> <ul style="list-style-type: none"> <li>◆ If you want to partition the LUNs for multiprotocol access, go to “<a href="#">Partitioning LUNs for multiprotocol access</a>” on page 98</li> </ul> <p><b>Important:</b> VERITAS Volume Manager cds disk format does not support LUN’s 1 terabyte or greater.</p> |
| 3    | <p>Change to the /usr/sbin directory:</p> <pre>cd /usr/sbin</pre>                                                                                                                                                                                                                                                                                    |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>Enter the following command to label the new LUNs as Solaris disks:</p> <pre>./format</pre> <p>You must also:</p> <ol style="list-style-type: none"> <li>1. Specify a disk by entering its number.</li> <li>2. Label the disk now by entering <b>y</b>.</li> </ol> <p><b>Result:</b> The <code>format</code> command displays configured disks, prompts you for a disk and label, and labels the disk.</p> <p><b>Example:</b></p> <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 &lt;ST315320A cyl 29649 alt 2 hd 16 sec 63&gt;     /pci@1f,0/ide@d/dad@0,0   1. c1t3d0 &lt;NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128&gt;     /pci@1f,0/pci@5/fibre-channel@0/sd@3,0   2. c1t3d1 &lt;NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128&gt;     /pci@1f,0/pci@5/fibre-channel@0/sd@3,1   3. c2t3d0 &lt;NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128&gt;     /pci@1f,0/pci@5/fibre-channel@1/sd@3,0   4. c2t3d1 &lt;NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128&gt;     /pci@1f,0/pci@5/fibre-channel@1/sd@3,1 Specify disk (enter its number):3     selecting c2t3d0     [disk formatted]     Disk not labeled. Label it now? Y</pre> |
| 5    | <p>Label additional LUNs, if desired:</p> <p>At the format prompt, enter <b>disk</b> and repeat step 4.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6    | <p>Quit the <code>format</code> utility.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Partitioning LUNs for multiprotocol access

You can access the data in a LUN both as a raw character device (for example, `/dev/rdsd/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:<br><code>cd /usr/sbin</code> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>Enter the following command to partition your LUNs (or disks):</p> <pre>./format</pre> <p><b>Result:</b> 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.</p> <p><b>Example:</b></p> <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 &lt;ST315320A cyl 29649 alt 2 hd 16 sec 63&gt;        /pci@1f,0/ide@d/dad@0,0     1. c1t3d0 &lt;NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128&gt;        /pci@1f,0/pci@5/fibre-channel@0/sd@3,0     2. c1t3d1 &lt;NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128&gt;        /pci@1f,0/pci@5/fibre-channel@0/sd@3,1     3. c2t3d0 &lt;NETAPP-LUN-0.2 cyl 10238 alt 2 hd 16 sec 128&gt;        /pci@1f,0/pci@5/fibre-channel@1/sd@3,0     4. c2t3d1 &lt;NETAPP-LUN-0.2 cyl 20478 alt 2 hd 16 sec 128&gt;        /pci@1f,0/pci@5/fibre-channel@1/sd@3,1</pre> |
| 4    | <p>Enter the disk's number in the available disk selections list in response to the next prompt:</p> <pre>Specify disk (enter its number):</pre> <p><b>Result:</b> The available disk is specified.</p> <p><b>Example:</b></p> <pre>Specify disk (enter its number): 3</pre> <p>In this example, item 3 in the Available Disk Selections list is c2t3d0.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Step | Action                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                      |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5    | <p>Enter <b>n</b> to not label the disk in response to the next prompt:</p> <p>Disk not labeled. Label it now? <b>n</b></p> <p><b>Result:</b> The disk is not labeled and the Format menu (or the format prompt) is displayed.</p> <p><b>Example:</b></p> <pre>selecting c2t3d0 [disk formatted] Disk not labeled. Label it now? <b>n</b></pre> |                                                                                                                                                                                                                                      |
| 6    | If...                                                                                                                                                                                                                                                                                                                                           | Then...                                                                                                                                                                                                                              |
|      | You do not have VxVM                                                                                                                                                                                                                                                                                                                            | <p>At the format prompt, enter <b>partition</b> to select (or define) a partition table:</p> <pre>format&gt; <b>partition</b></pre> <p><b>Result:</b> The Partition menu is displayed.</p> <p>Proceed to <a href="#">Step 7</a>.</p> |
|      | You have VxVM                                                                                                                                                                                                                                                                                                                                   | <p>Use VxVM tools to initialize the disk.</p> <p>Proceed to “<a href="#">Displaying LUN and HBA information</a>” on page 106.</p>                                                                                                    |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7    | <p>At the partition prompt, enter <b>modify</b> to change a predefined table:</p> <pre> 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 !&lt;cmd&gt;    - execute &lt;cmd&gt;, then return quit partition&gt; <b>modify</b> </pre> <p><b>Result:</b> The utility prompts you to select the partitioning base.</p> |
| 8    | <p>Enter <b>1</b> to select the All Free Hog partitioning base in response to the next prompt:</p> <pre> Select partitioning base:     0. Current partition table (default)     1. All Free Hog Choose base (enter number) [0]? <b>1</b> </pre> <p><b>Result:</b> A partition table is displayed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9    | <p>Enter <b>yes</b> in response to the next prompt to continue creating a new partition table based on the displayed table:</p> <pre> 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 </pre> <p>Do you wish to continue creating a new partition table based on above table[yes]? <b>yes</b></p> <p><b>Result:</b> The utility asks which partition should be the Free Hog partition.</p> |
| 10   | <p>Enter <b>6</b> to designate partition 6 as the Free Hog partition in response to the next prompt:</p> <pre>Free Hog partition[6]? <b>6</b></pre> <p><b>Result:</b> The utility prompts you to define the partition size for each of the other partitions (0, 1, 3, 4, 5, and 7).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 11   | <p>Enter <b>1c</b> as the size of partition 0 in response to the next prompt:</p> <pre>Enter size of partition '0' [0b, 0c, 0.00mb, 0.00gb]: <b>1c</b></pre> <p><b>Note</b>_____</p> <p>It is mandatory that the size is one cylinder (1c) for partition 0.</p> <p>_____</p> <p><b>Result:</b> The utility prompts you to define the partition size for each of the other partitions (1, 3, 4, 5, and 7).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |           |         |              |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|---------|--------------|------|--------|---|------|----|-------|--------|--------------|---|------|----|---|---|-----------|---|--------|----|-----------|---------|-------------|---|------------|----|---|---|-----------|---|------------|----|---|---|-----------|---|------------|----|---|---|-----------|---|-----|----|-----------|---------|-------------|---|------------|----|---|---|-----------|
| 12   | <p>For each prompt after the partition 0, press Enter to designate that the other partitions have no size (zero):</p> <p>Enter size of partition '0' [0b, 0c, 0.00mb, 0.00gb]: <b>1c</b></p> <p>Enter size of partition '1' [0b, 0c, 0.00mb, 0.00gb]:</p> <p>Enter size of partition '3' [0b, 0c, 0.00mb, 0.00gb]:</p> <p>Enter size of partition '4' [0b, 0c, 0.00mb, 0.00gb]:</p> <p>Enter size of partition '5' [0b, 0c, 0.00mb, 0.00gb]:</p> <p>Enter size of partition '7' [0b, 0c, 0.00mb, 0.00gb]:</p> <p><b>Result:</b> A new partition table is displayed. The utility prompts for whether it is OK to make this the current partition table.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |           |         |              |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |
| 13   | <p>Enter <b>yes</b> to make the table the current partition table in response to the next prompt:</p> <table><thead><tr><th>Part</th><th>Tag</th><th>Flag</th><th>Cylinders</th><th>Size</th><th>Blocks</th></tr></thead><tbody><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)</td></tr></tbody></table> <p>20967424</p> <table><tbody><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)</td></tr></tbody></table> <p>20965376</p> <table><tbody><tr><td>7</td><td>unassigned</td><td>wm</td><td>0</td><td>0</td><td>(0/0/0) 0</td></tr></tbody></table> <p>Okay to make this the current partition table[yes]? <b>yes</b></p> <p><b>Result:</b> The utility prompts you to enter the table name with surrounding quotes.</p> | 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) | 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) | 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)  |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |
| 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)  |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |
| 7    | unassigned                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | wm   | 0         | 0       | (0/0/0) 0    |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |
| 14   | <p>Enter your table name (surrounded with quotes) in response to the next prompt:</p> <p>Enter table name (remember quotes):</p> <p><b>Result:</b> The utility prompts for whether you are ready to label the disk.</p> <p><b>Example:</b></p> <p>Enter table name (remember quotes): <b>"my_part_table"</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |           |         |              |      |        |   |      |    |       |        |              |   |      |    |   |   |           |   |        |    |           |         |             |   |            |    |   |   |           |   |            |    |   |   |           |   |            |    |   |   |           |   |     |    |           |         |             |   |            |    |   |   |           |

| Step      | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|------|-------------------------------|-----------|-------------------------------------|---------|-----------------------------|--------|-------------------------------|--------|-----------------------------|------|----------------------------|-------|---------------------------|---------|--------------------|--------|--------------------------|--------|----------------------------|--------|---------------------------|------|---------------------------------------|---------|-------------------------------|--------|------------------------------|------|--|
| 15        | <p>Enter <b>y</b> to label the disk in response to the next prompt:<br/>Ready to label disk, continue? <b>y</b></p> <p><b>Result:</b> The disk is labeled and the Partition menu (or prompt) for the disk is displayed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |
| 16        | <p>Enter <b>quit</b> to quit the Partition menu (or prompt):<br/>partition&gt;<b>quit</b></p> <p><b>Result:</b> The Format menu (or prompt) is displayed.</p> <p><b>Example:</b><br/>FORMAT MENU:</p> <table> <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>!&lt;cmd&gt;</td><td>- execute &lt;cmd&gt;, then return</td></tr> <tr> <td>quit</td><td></td></tr> </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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |
| 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      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |
| 17        | <p>Label additional LUNs, if desired:</p> <p>At the format prompt, enter <b>disk</b> and repeat step 4 to step 16.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |
| 18        | <p>Enter <b>q</b> to quit the format utility.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                 |      |                               |           |                                     |         |                             |        |                               |        |                             |      |                            |       |                           |         |                    |        |                          |        |                            |        |                           |      |                                       |         |                               |        |                              |      |  |

## Displaying LUN and HBA information

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### Utility for displaying information

The `sanlun` 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 `sanlun` 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 107
- ◆ [“Displaying information about paths to the filer”](#) on page 109
- ◆ [“Displaying host HBA information”](#) on page 111

# Displaying host LUN information

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**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 /opt/NTAPsanlun/bin directory:<br><code>cd /opt/NTAPsanlun/bin</code> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>At the host command line, enter the following command to display LUN information:</p> <pre>./sanlun lun show [-v] [-d <i>host device filename</i>   <i>all</i>   <i>filer name</i>   <i>filer name:filer pathname</i>] -p</pre> <p>-v produces verbose output.</p> <p>-d is the device option and can be one of the following:</p> <ul style="list-style-type: none"> <li>◆ <i>host device filename</i> is the special device file name for the disk on Solaris (which might represent a filer LUN).</li> <li>◆ <i>all</i> lists all filer LUNs under /dev/rdisk.</li> <li>◆ <i>filer name</i> lists all filer LUNs under /dev/rdisk on a specified filer.</li> <li>◆ <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.</li> </ul> <p>-p provides information about the primary and secondary paths available to the LUN when you are using multipathing.</p> <p><b>Result:</b> The requested LUN information is displayed.</p> <p><b>Example:</b></p> <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 information about paths to the filer

Displaying information about paths

To display information about paths to the filer, complete the following steps.

| Step          | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |              |                    |                 |                     |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------|--------------------|-----------------|---------------------|-----------------|---------------------|---------|---------|--------------------|-------|----|--|--------|---------|---------|--------------------|-------|-----|--|--------|---------|-----------|--------------------|-------|--|----|--------|---------|-----------|--------------------|-------|--|-----|--------|
| 1             | Ensure that you are logged in as root on the host.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |              |                    |                 |                     |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| 2             | Change to the /opt/NTAPsanlun/bin directory:<br><br>cd /opt/NTAPsanlun/bin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |              |                    |                 |                     |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| 3             | <p>At the host command line, enter the following command to display LUN information:</p> <pre>sanlun lun show -p all</pre> <p>-p provides information about the primary and secondary paths available to the LUN when you are using multipathing.</p> <p>all lists all filer LUNs under /dev/rdsk.</p> <p><b>Example:</b></p> <pre># sanlun lun show -p all filer1:/vol/solaris/lun0 (LUN 0)  /dev/rdsk/c3t0d0s2 (c3t0d0s2)     300g (322122547200)   lun state: GOOD</pre> <pre>-----</pre> <table><tr><th>path<br/>state</th><th>path<br/>type</th><th>device<br/>filename</th><th>host HBA</th><th>target<br/>port</th><th>partner<br/>port</th><th>Multipath<br/>policy</th></tr><tr><td>enabled</td><td>primary</td><td>/dev/rdsk/c3t0d0s2</td><td>lpfc0</td><td>9a</td><td></td><td>A/PG-C</td></tr><tr><td>enabled</td><td>primary</td><td>/dev/rdsk/c4t0d0s2</td><td>lpfc1</td><td>11a</td><td></td><td>A/PG-C</td></tr><tr><td>enabled</td><td>secondary</td><td>/dev/rdsk/c3t2d0s2</td><td>lpfc0</td><td></td><td>9b</td><td>A/PG-C</td></tr><tr><td>enabled</td><td>secondary</td><td>/dev/rdsk/c4t2d0s2</td><td>lpfc1</td><td></td><td>11b</td><td>A/PG-C</td></tr></table> | path<br>state      | path<br>type | device<br>filename | host HBA        | target<br>port      | partner<br>port | Multipath<br>policy | enabled | primary | /dev/rdsk/c3t0d0s2 | lpfc0 | 9a |  | A/PG-C | enabled | primary | /dev/rdsk/c4t0d0s2 | lpfc1 | 11a |  | A/PG-C | enabled | secondary | /dev/rdsk/c3t2d0s2 | lpfc0 |  | 9b | A/PG-C | enabled | secondary | /dev/rdsk/c4t2d0s2 | lpfc1 |  | 11b | A/PG-C |
| path<br>state | path<br>type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | device<br>filename | host HBA     | target<br>port     | partner<br>port | Multipath<br>policy |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| enabled       | primary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | /dev/rdsk/c3t0d0s2 | lpfc0        | 9a                 |                 | A/PG-C              |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| enabled       | primary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | /dev/rdsk/c4t0d0s2 | lpfc1        | 11a                |                 | A/PG-C              |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| enabled       | secondary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | /dev/rdsk/c3t2d0s2 | lpfc0        |                    | 9b              | A/PG-C              |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |
| enabled       | secondary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | /dev/rdsk/c4t2d0s2 | lpfc1        |                    | 11b             | A/PG-C              |                 |                     |         |         |                    |       |    |  |        |         |         |                    |       |     |  |        |         |           |                    |       |  |    |        |         |           |                    |       |  |     |        |

## Interpreting `sanlun -p` output

The `sanlun -p` command provides the following information:

- ◆ path state—Whether the path is enabled or disabled.
- ◆ path type—Whether the path to the LUN is primary, secondary, or standby.
  - ❖ Primary paths communicate directly using the adapter on the local filer.
  - ❖ Secondary paths are proxied to the partner filer over the cluster interconnect.
  - ❖ Standby occurs if the `cfmode` is either mixed or standby and the path is being serviced by a partner filer in takeover mode. Note that this case occurs only when VERITAS assumes the array policy is Active/Active. If the array policy is Active/Passive and the path is being served by the partner file in the takeover mode, that path state displays as secondary.
- ◆ device filename—The special device file name for the disk on Solaris that represents the LUN.
- ◆ host HBA—The name of the initiator HBA on the host.
- ◆ local filer port - The port that provides direct access to a LUN. This port appears as the `Xa` for `F8xx`, `gF8xx`, `FAS9xx` or `gFAS9xx` filers and `X_C` for `FAS270` filers, where `X` is the slot number of the HBA. This is always a primary path.
- ◆ partner filer port—The port that provides passive path failover. This port appears as `Xb` for `F8xx` or `FAS9xx` filers and `X_C` for `FAS270` filers, where `X` is the slot number of the HBA. This is always a secondary path.

After the failover of a filer cluster, the `sanlun lun show -p` command reports secondary paths as secondary but enabled, because these are now the active paths.

- ◆ multipathing policy—The multipathing policy is one of the following:
  - ❖ A/A (Active/Active)—DMP uses more than one path concurrently for traffic. The A/A policy indicates that the B ports on the filer HBAs are in standby mode and become active only during a takeover. This means that there are two active paths to the cluster at any given time.
  - ❖ A/PG-C (Active/Passive Group Concurrent)—Groups of LUNs connected to a single controller failover as a single failover entity. Failover occurs at the controller level and not at the LUN level.

The primary and secondary controllers are each connected to a separate group of LUNS. If a single LUN in the primary controller's LUN group fails, all LUN's in that group fail over to the secondary controller's passive LUN group. This array type, introduced VxVM 4.0, allows load balancing of I/O across multiple primary paths. Refer to VERITAS documentation for details about load balancing.

# 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 /opt/NTAPsanlun/bin directory:<br><code>cd /opt/NTAPsanlun/bin</code> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>At the host command line, enter the following command to display host HBA information:</p> <pre>sanlun fcp show adapter[-c] [-v] [adapter name   all]</pre> <p>-c option produces configuration instructions.<br/> -v option produces verbose output.<br/> all lists information for all FCP adapters.<br/> <i>adapter name</i> lists information for a specified adapter.</p> <p><b>Result:</b> The FCP adapter information is displayed.</p> <p><b>Example:</b></p> <pre># sanlun fcp show adapter -v</pre> <pre>lpfc0                WWPN:10000000c56da100 WWNN:                20000000c56da100 driver name:         lpfc model:               LP9002 model description:   Emulex LightPulse LP9002 2 Gigabit PCI Fibre Channel Adapter serial number:       0000c56da100 hardware version:    2002606d driver version:      5.01e; HBAAPI v1.6.a, 10-8-02 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/ssm@0,0/pci@19,700000/fibre-channel@1</pre> <pre>lpfc1                WWPN:10000000c56da0cb WWNN:                20000000c56da0cb driver name:         lpfc model:               LP9002 model description:   Emulex LightPulse LP9002 2 Gigabit PCI Fibre Channel Adapter serial number:       0000c56da0cb hardware version:    2002606d driver version:      5.01e; HBAAPI v1.6.a, 10-8-02 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/ssm@0,0/pci@19,600000/fibre-channel@1</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:

- ◆ [“Using NetApp’s diagnostic utilities”](#) on page 114
- ◆ [“Error messages or warnings during installation”](#) on page 119
- ◆ [“Troubleshooting LUN management”](#) on page 124
- ◆ [“Error messages during I/O”](#) on page 126
- ◆ [“Checking the status of the link”](#) on page 127

# Using NetApp's diagnostic utilities

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## NetApp's diagnostic utilities

NetApp provides several command-line utilities that provide diagnostic information you can use for troubleshooting.

When you run these utilities, they gather configuration information about different aspects of your system. They automatically collect information and place it in a directory. Then they create a compressed tar file of that directory. You can send this file to NetApp.

Normally, you only use these utilities when requested to do so by NetApp's Customer Support. The utilities are:

- ◆ `filer_info`. See “[Collecting filer information](#)” on page 115 for more information.
- ◆ `solaris_info`. See “[Using the Solaris data-collection tool](#)” on page 115.
- ◆ `<switch>_info`, where `<switch>` is the brand of switch you are using (for example, `brocade_info`). See “[Collecting switch information](#)” on page 117.

## General steps for executing the programs

Although some of the scripts have arguments that you may want to use, the general steps for executing these scripts are the same.

| Step | Action                                                                                                                                                                                                                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Change to the <code>/opt/NTAPsanlun/bin</code> directory.<br><code>cd /opt/NTAPsanlun/bin</code>                                                                                                                         |
| 2    | Enter the utility name.<br><br>If the utility you are using includes arguments, you can enter them as well.<br><br><b>Result:</b> The configuration information that the utility gathers is placed in a compressed file. |

## Collecting filer information

If you are having a problem, NetApp Customer Support might ask you to run `filer_info` to collect filer configuration information. You should only run this utility when requested to do so by NetApp. To execute `filer_info`, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Go to the directory <code>/opt/NTAPsanlun/bin</code> :<br><pre>cd /opt/NTAPsanlun/bin</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2    | <p>At the host command prompt, enter the following command:</p> <pre>filer_info [-d path_and_file_name] [-l passwd] -n &lt;filer_name&gt; -f</pre> <p><code>-d</code> enables you to specify a different path in which to place the resulting output. The default path is <code>/tmp/netapp/ntap_filer_&lt;filer_name&gt;</code>.</p> <p><code>-l passwd</code> allows you to specify a password to access the filer.</p> <p><code>-n &lt;filer_name&gt;</code> specifies the target of the command, where <i>filer_name</i> is the name of IP address of the filer accessed.</p> <p><code>-f</code> automatically overwrites an existing <code>ntap_filer_&lt;filer_name&gt;</code> file in the default output directory <code>/tmp/netapp/ntap_filer_&lt;filer_name&gt;</code>. You might have an existing file in this directory if you previously ran the script. If you do not use the <code>-f</code> option, and you have an existing file, the <code>filer_info</code> script tells you to delete or rename the file.</p> <p><b>Result:</b> The output of various status commands are placed in the output directory <code>tmp/netapp/ntap_filer_&lt;filer_name&gt;</code>, where <i>filer_name</i> is replaced by the filer name or IP address.</p> <p>The contents of this directory are placed in a tarred and compressed file named <code>filer_&lt;filer_name&gt;.tar.Z</code>.</p> |
| 3    | Send the resulting compressed file to NetApp for analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Using the Solaris data-collection tool

If you are having a problem, NetApp Customer Support might ask you to run `solaris_info` to collect configuration information about your host. You should only run this utility when requested to do so by NetApp.

To execute `solaris_info`, complete the following steps:

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Change to the /opt/NTAPsanlun/bin directory:<br><code>cd /opt/NTAPsanlun/bin</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2    | <p>At the command prompt, enter the following command:</p> <pre>solaris_info [-d &lt;directory&gt;] [-n &lt;file_name&gt;] -f</pre> <p>-d &lt;directory&gt; specifies the location for the file that solaris_info creates. The default location is /tmp/netapp.</p> <p>-n &lt;file_name&gt; specifies the name for the output file and directory names. The default pathname is /tmp/netapp/ntap_solaris_info.tar.Z</p> <p>-f automatically overwrites an existing ntap_solaris_info.tar.Z file in the default output directory /tmp/netapp. You might have an existing file in this directory if you previously ran the script. If you do not use the -f option, and you have an existing file, the script tells you to delete or rename the file.</p> <p><b>Result:</b> When you run solaris_info, the utility gathers information about your Solaris configuration and places it in a .tar.Z file. It also creates a directory and populates it with files containing output from numerous commands run on the Solaris system and contents of the /var/adm/message file.</p> |
| 3    | Send the resulting file to NetApp for analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Collecting switch information

If you are having a problem, NetApp Customer Support might ask you to run the switch utility NetApp supplies when you install the FCP Solaris AttachKit software. NetApp provides a utility for each switch it supports for this Host Attach Kit. The utility name is `<switch>_info`, where *switch* is the brand of the switch (for example, if you have a McDATA switch, the file name would be `mcdata_info`). This utility collects switch configuration information. You should only run this utility when requested to do so by NetApp.

To execute the utility, complete the following steps.

| Step | Action                                                                                            |
|------|---------------------------------------------------------------------------------------------------|
| 1    | Go to the directory <code>/opt/NTAPsanlun/bin</code> :<br><br><code>cd /opt/NTAPsanlun/bin</code> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2    | <p>At the host command prompt, enter the following command:</p> <pre>&lt;switch_brand&gt;_info [-d path_and_file_name] [-l user:password] -n &lt;switchname&gt; -f</pre> <p>&lt;switch_brand&gt; is the type of the switch you are using; for example, brocade for a Brocade switch.</p> <p>The -d path_and_file_name option enables you to specify a different path in which to place the resulting output. The default path is /tmp/netapp/&lt;switch_brand&gt;_switch_&lt;switch_name&gt;.</p> <p>The -l user:password option allows the choice of a user name and password on the switch. If this option is not specified, the Brocade default settings of admin:password are used for Brocade switches.</p> <p>The target of the command is specified by -n switchname, where switchname is the name or IP address of the switch to be interrogated.</p> <p>-f automatically overwrites an existing output file in the default output directory /tmp/netapp. You might have an existing file in this directory if you previously ran the script. If you do not use the -f option, and you have an existing file, the script tells you to delete or rename the file.</p> <p><b>Result:</b> The output of various status commands on the switch are placed in a directory named /tmp/netapp/&lt;switch_brand&gt;_switch_switchname, where switch_brand is the brand of the switch, such as Brocade, and switchname is replaced by the switch name or IP address.</p> <p>The contents of this directory are placed in a file named &lt;switch_brand&gt;_switch_switchname.tar.Z.</p> <p><b>Example:</b> This example uses the brocade_info tool. The switch brcd1 is connected with the user “john”, who has the password “smith”.</p> <pre>host1&gt; brocade_info -d /opt/NTAPsanlun -l john:smith -n brcd1</pre> <p>The information from the Emulexswitch is placed in a file that has the pathname /tmp/netapp/brocade_switch_brcd1.tar.Z.</p> |
| 3    | Send the resulting file to NetApp for analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# Error messages or warnings during installation

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## About this section

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

## SunFire 280R, V480, 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 Emulex HBAs and the video adapter card. The two cards cannot share the same PCI bus. If they do, the system does not boot until the Emulex card is removed.

**What to do:** Install the Emulex card 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 Emulex HBAs, move the video adapter to the first PCI slot, and move the HBAs to slots 2 through 4.

If you have one Emulex HBA, either the video card or the HBA 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 LP10000 or LP9002L-F2 HBA and NetApp software on a Sun Ultra-2, Ultra-5, or Ultra-10 platform. The 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 *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* online version at <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 131.

## 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.                                                  |
| dqfull-throttle         | 1                      | 1                                   | 1                                | Decrement LUN throttle when the target sends queue full messages. The queue depth is decremented down to a minimum of 1. |
| dqfull-throttle-up-time | 1                      | 4                                   | 4                                | The time, in seconds, that indicates when to increment the current queue depth.                                          |
| dqfull-throttle-up-inc  | 1                      | 2                                   | 2                                | Amount to increment LUN queue depth each time.                                                                           |

## **/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 `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    | <p>Modify the /kernel/drv/sd.conf to scan for the new LUN numbers.</p> <p>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.</p> <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    | <p>Enter the following command to reboot the host:</p> <pre>reboot</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.

## 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 step.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the host console, enter the following command:</p> <pre># sanlun fcp show adapter -v</pre> <p><b>Result:</b> The sanlun command shows the status of the HBA. The following text shows example output:</p> <pre>lpfc0                WWPN:10000000c938c7d5 WWNN:                20000000c938c7d5 driver name:         lpfc model:               LP10000 model description:   Emulex LightPulse LP10000 2 Gigabit PCI Fibre Channel Adapter serial number:       0000c938c7d5 hardware version:    1001206d driver version:      6.01f; HBAAPI(I) v2.0.d, 10-10-03 firmware version:    1.90A4 (T2D1.90A4) 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  lpfc1 WWPN:          10000000c938c7d9 WWNN:                20000000c938c7d9 driver name:         lpfc model:               LP10000 model description:   Emulex LightPulse LP10000 2 Gigabit PCI Fibre Channel Adapter serial number:       0000c938c7d9 hardware version:    1001206d driver version:      6.01f; HBAAPI(I) v2.0.d, 10-10-03 firmware version:    1.90A4 (T2D1.90A4) 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@</pre> |

## Interpreting 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.

## Displaying active HBAs

To display host HBA's that are currently logged into the target port, complete the following step.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>On the filer, enter the following command:</p> <pre># fcp show initiator</pre> <p><b>Result:</b> The <code>fcp show initiator</code> command displays any HBA that is currently logged into target ports:</p> <pre>Initiators connected on adapter 4a: Portname Group 50:06:0b:00:00:21:ca:a2 sgtest Initiators connected on adapter 4b: Portname Group 50:06:0b:00:00:21:ca:a2 sgtest Initiators connected on adapter 5a: Portname Group 50:06:0b:00:00:25:9f:68 sgtest Initiators connected on adapter 5b: Portname Group 50:06:0b:00:00:25:9f:68 sgtest</pre> |



**About this appendix** This appendix describes how to install VERITAS Volume Manager 3.5 and 4.0 software on the Solaris host.

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**Note**

The VERITAS software must be purchased from VERITAS.

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**Note**

This appendix describes VERITAS software 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 FCP Solaris Attach Kit and you want to upgrade, see the *VERITAS Volume Manager Installation Guide*

The FCP Solaris Attach Kit 2.0 supports:

- ◆ VxVM version 3.5 with ASL 2.0
- ◆ VxVM version 4.0 with ASL 4.0 (recommended)

## Topics in this appendix

This chapter discusses the following topics:

- ◆ “[Preparing to install VERITAS multipathing software](#)” on page 132
- ◆ “[Installing VERITAS multipathing software](#)” on page 134
- ◆ “[Taking VERITAS software offline before scheduled filer maintenance](#)” on page 138

# Preparing to install VERITAS multipathing software

## Required 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    | Insert and mount the VERITAS Foundation Suite CD-ROM on the host.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 4    | Change to the pkgs directory on the CD-ROM:<br><code>cd /cdrom/cdrom0/pkgs</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5    | Verify that you have your VERITAS license key.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6    | <p>Install the VERITAS Volume Manager (VxVM) packages. The packages installed depend on the version of the VxVM software:</p> <p><b>VERITAS 3.5:</b> To install VERITAS 3.5, enter the following:</p> <pre>pkgadd -d `pwd` VRTSvlic VRTSvxvm VRTSob VRTSobgui<br/>VRTSfspro VRTSvmpro VRTSvmdoc VRTSvmman</pre> <p><b>VERITAS 4.0:</b></p> <ul style="list-style-type: none"><li>◆ To install VERITAS Volume Manager, use the VERITAS <code>installvm</code> script.</li><li>◆ To install multiple VERITAS components, use the VERITAS <code>installer</code> script.</li></ul> <p>Refer to VERITAS documentation for additional information.</p> |

**Adding the root disk controller number to the VERITAS exclude list**

Refer to VERITAS documentation for information about how to add the controller number of the root disk to the VERITAS exclude list.

**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 Solaris disks”](#) on page 97.

**Using VxVM with the NetApp ASL 4.0**

The NetApp ASL 4.0 provides information about storage array attributes and multipathing configuration to the Device Discovery Layer (DDL) and Dynamic Multipathing (DMP) components of VERITAS Volume Manager (VxVM). The ASL provides specific information to DMP and VxVM about NetApp SAN attached filers, instead of referring to them as JBOD devices or raw devices. The ASL is a required component of the FCP Solaris Attach Kit.

NetApp ASL 4.0 is recommended for VxVM version 4.0. For detailed information about installing ASL 4.0 and obtaining filer and multipathing information, see *Installing and Managing the Array Support Library 4.0 for NetApp Filers*. This document is included in the media package of the FCP Solaris Attach Kit 2.0.

# Installing VERITAS multipathing software

## Installing the software

To install the VERITAS software, complete the following steps.

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p>Install the VERITAS software:</p> <p><b>VERITAS 3.5:</b> Enter the following to install VERITAS 3.5 software:</p> <pre>vxinstall</pre> <p><b>VERITAS 4.0:</b></p> <ul style="list-style-type: none"><li>◆ To install VERITAS Volume Manager, use the VERITAS installvm script.</li><li>◆ To install multiple VERITAS components, use the VERITAS installer script.</li></ul> <p>Refer to VERITAS documentation for additional information.</p> <p><b>Note</b>_____</p> <p>The install script dialog asks you questions that pertain to your configuration and system administrator’s preferences. For more information, see the following documents:<br/><i>VERITAS Volume Manager 3.5 Installation Guide for Solaris</i>, N08835F and <i>VERITAS Volume Manager 4.0 Administrator Guide for Solaris</i> N10007F</p> <p>_____</p> <p><b>Result:</b> The VERITAS software is installed.</p> |
| 2    | <p>Reboot the host by entering the following command:</p> <pre>reboot</pre> <p><b>Result:</b> The VERITAS software installation becomes effective.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Step     | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |        |        |       |        |          |        |   |   |       |          |        |          |        |        |          |        |          |        |        |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|--------|-------|--------|----------|--------|---|---|-------|----------|--------|----------|--------|--------|----------|--------|----------|--------|--------|
| 3        | <p>Enter the following command to verify that the filer LUNs you selected are under VERITAS Volume Manager control:</p> <pre><b>vxdisk list</b></pre> <p><b>Result:</b> A list of devices, type, disk, group, and status is displayed.</p> <p><b>Example:</b></p> <pre># <b>vxdisk list</b></pre> <table><tr><th>DEVICE</th><th>TYPE</th><th>DISK</th><th>GROUP</th><th>STATUS</th></tr><tr><td>c0t0d0s2</td><td>sliced</td><td>-</td><td>-</td><td>error</td></tr><tr><td>c1t0d0s2</td><td>sliced</td><td>c1t0d0s2</td><td>rootdg</td><td>online</td></tr><tr><td>c1t1d0s2</td><td>sliced</td><td>c1t1d0s2</td><td>rootdg</td><td>online</td></tr></table> | DEVICE   | TYPE   | DISK   | GROUP | STATUS | c0t0d0s2 | sliced | - | - | error | c1t0d0s2 | sliced | c1t0d0s2 | rootdg | online | c1t1d0s2 | sliced | c1t1d0s2 | rootdg | online |
| DEVICE   | TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DISK     | GROUP  | STATUS |       |        |          |        |   |   |       |          |        |          |        |        |          |        |          |        |        |
| c0t0d0s2 | sliced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -        | -      | error  |       |        |          |        |   |   |       |          |        |          |        |        |          |        |          |        |        |
| c1t0d0s2 | sliced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | c1t0d0s2 | rootdg | online |       |        |          |        |   |   |       |          |        |          |        |        |          |        |          |        |        |
| c1t1d0s2 | sliced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | c1t1d0s2 | rootdg | online |       |        |          |        |   |   |       |          |        |          |        |        |          |        |          |        |        |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>Enter the following command for a multipath device to verify that the multipathing information is correct:</p> <pre><b>vxdisk list <i>disk_name</i></b></pre> <p><i>disk_name</i> is the name of the disk.</p> <p><b>Result:</b> A list of disk details is displayed, including the multipathing information at the end of the list.</p> <p><b>Example:</b></p> <pre># <b>vxdisk list c1t0d0s2</b> 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/rmp/c1t0d0s4 privpaths:   block=/dev/vx/dmp/c1t0d0s3 char=/dev/vx/rmp/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    | <p>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).</p> <p><b>Result:</b> The multipathing software is set up and functioning properly.</p> |

# 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 volumes associated with LUNs on the filer.                                                   |
| 2    | In the VxFS, use the following command to unmount the file systems that are in use:<br><br><code>umount /mountpoint</code><br><br><b>Result:</b> The file system is unmounted. |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>In VxVM, perform the following operations.</p> <p><b>Note</b>_____</p> <p>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.</p> <hr/> <ol style="list-style-type: none"> <li>1. Stop the volume by first checking the status of volumes with the following command:<br/> <code>vxdisk list</code></li> <li>2. Select a single volume from the list of volumes.</li> <li>3. Enter the following command<br/> <code>vxvol stop vol_name</code></li> </ol> <p><b>Result:</b> The volume is stopped.</p> <p><b>Note</b>_____</p> <p>To stop all volumes, use the <code>vxvol stop all</code> command.</p> <hr/> <ol style="list-style-type: none"> <li>4. Enter the following command to deport the disk group:<br/> <code>vxvg deport diskgroup</code></li> </ol> <p><b>Note</b>_____</p> <p>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.</p> <hr/> <ol style="list-style-type: none"> <li>5. Enter the following command to import the disk group:<br/> <code>vxvg import diskgroup</code></li> <li>6. Perform the normal start/mount operations to remount and start the volumes.</li> </ol> |

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4    | <p>In the VERITAS Cluster Services, complete the following steps. You can complete these steps through the command-line interface or the GUI:</p> <ol style="list-style-type: none"> <li>1. Enter the following command to check the status of the cluster:<br/><code>hastatus -sum</code></li> <li>2. Enter the following command to shut down all service groups (maintenance):<br/><code>hastop -all</code></li> <li>3. Enter the following command to stop the application services and the cluster:<br/><code>hastop -force</code></li> </ol> <p><b>Note</b>—<br/>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.</p> |

**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 142
- ◆ [“FCC and regulatory notices”](#) on page 144
- ◆ [“Declaration of conformity”](#) on page 148
- ◆ [“Laser safety”](#) on page 150

# HBA LEDs and specifications

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## 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                     | <ul style="list-style-type: none"> <li>◆ Operating: 32° to 113° F (0° to 45° C)</li> <li>◆ Storage: -40° to 158° F (-40° to 70° C)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                               |
| Humidity                        | 5% to 95% noncondensing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Agency approvals for LP9002L-F2 | <ul style="list-style-type: none"> <li>◆ Class 1 Laser Product per DHHS 21CFR (J) &amp; EN60825</li> <li>◆ UL recognized to UL1950</li> <li>◆ CUR recognized to CSA22.2, No.950</li> <li>◆ TUV certified to EN60950</li> <li>◆ FCC Rules, Part 15, Class A</li> <li>◆ Industry Canada, ICES-003, Class A</li> <li>◆ EMC Directive 89/336/EEC (CE Mark)</li> <li>◆ EN55022, Class A</li> <li>◆ EN55024</li> <li>◆ Australian EMC Framework (C-Tick Mark)</li> <li>◆ AS/NZS 3548: Class A</li> <li>◆ VCCI, Class A</li> </ul> |

## FCC and regulatory notices

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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.

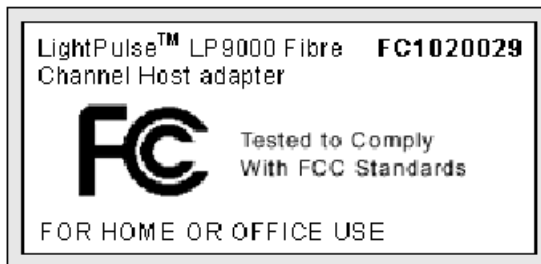
Model LP9002 / LP9002L / LP952L / LP9002S / LP9002DC / LP9002C /  
LP9402DC (2x5 SFF Models)

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 numérique de la Classe A respecte toutes les exigences du règlement sur le matériel 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

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

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### **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.

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### **WARNING**

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

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**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

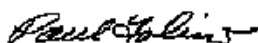
**to which this declaration relates is in conformity with the following standards or other documents for Information Technology Equipment (ITE):**

**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.



**About this appendix** This appendix provides additional information about the LP10000SC HBA.

**Topics in this appendix**

This appendix discusses the following topics:

- ◆ [“HBA LEDs and specifications”](#) on page 158
- ◆ [“FCC and regulatory notices”](#) on page 161
- ◆ [“Declaration of conformity”](#) on page 164
- ◆ [“Laser safety”](#) on page 166

## HBA LEDs and specifications

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### Complete HBA LEDs

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

| Yellow LED           | Green LED  | State                                                                                                                                                 |
|----------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF                  | OFF        | Wake-up failure (dead board). Check the 3.3V LED near the top edge of the HBA (component side).* If this LED is lit, the slot is providing 3.3V power |
| ON                   | OFF        | POST failure (dead board)                                                                                                                             |
| Slow blink (1 Hz)    | OFF        | Wake-up failure (dead board)                                                                                                                          |
| Fast blink (4 Hz)    | OFF        | Failure in POST (dead board)                                                                                                                          |
| Flashing (irregular) | OFF        | POST processing in progress                                                                                                                           |
| OFF                  | ON         | Failure while functioning                                                                                                                             |
| ON                   | ON         | Failure while functioning                                                                                                                             |
| Slow blink           | ON         | Normal—1 GHz link rate                                                                                                                                |
| Fast blink           | ON         | Normal—2 GHz link rate                                                                                                                                |
| OFF                  | Slow blink | Normal — link down or not yet started                                                                                                                 |
| Slow blink           | Slow blink | Offline for download.                                                                                                                                 |
| Fast blink           | Slow blink | Restricted offline mode, waiting for restart                                                                                                          |
| Flashing             | Slow blink | Restricted offline mode, test active.                                                                                                                 |

## LP10000SC HBA specifications

The following table describes the HBA specifications.

| Parameter           | Range                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Media interface     | The Thor controller interfaces to the physical media through an FC-0 Media Interface (FC-PH compliant transceiver), and then connects through dual optical fiber LC connectors.                                                                                                                                                                                                                      |
| Physical dimensions | Low-profile MD2 form factor, 6.600 inches by 2.536 inches, and accommodates both the full-height and low-profile bracket.                                                                                                                                                                                                                                                                            |
| Power requirements  | <p>In a PCI/PCI-X, 66-MHz host:</p> <ul style="list-style-type: none"><li>❖ 1.6 watts (typical) @ +3.3 VDC</li><li>❖ 5.5 watts (typical) @ +5.0 VDC</li><li>❖ 7.1 watts (total typical)</li></ul> <p>In a PCI-X, 100/133-MHz host:</p> <ul style="list-style-type: none"><li>❖ 1.7 watts (typical) @ +3.3 VDC</li><li>❖ 5.8 watts (typical) @ +5.0 VDC</li><li>❖ 7.5 watts (total typical)</li></ul> |
| Airflow             | 100 lf/min (minimum)                                                                                                                                                                                                                                                                                                                                                                                 |
| Temperature         | <p>Operating: 32° to 113° F (0° to 45° C)</p> <p>Storage: -40° to 158° F (-40° to 70° C)</p>                                                                                                                                                                                                                                                                                                         |
| Humidity            | 5% to 95% noncondensing                                                                                                                                                                                                                                                                                                                                                                              |

| Parameter                   | Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agency approvals for LP1000 | <p>Class 1 Laser Product per DHHS 21CFR (J) &amp; EN60825-1</p> <p>UL recognized to UL1950</p> <p>CUR recognized to CSA 22.2, No. 950</p> <p>Baurt-certified by TUV to EN60950</p> <p>FCC Rules, Part 15, Class A</p> <p>Industry Canada, ICES-003, Class A</p> <p>EMC Directive 89/336/EEC (CE Mark)</p> <ul style="list-style-type: none"> <li>❖ EN55022, Class A</li> <li>❖ EN55024</li> </ul> <p>Australian EMC Framework (C-Tick Mark)</p> <ul style="list-style-type: none"> <li>❖ AS/NZS 3548:1995 Class A</li> </ul> <p>Japan VCCI, Class A</p> <p>Taiwan BSMI, Class A</p> <p>Korea MIC, Class A</p> |

## FCC and regulatory notices

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

**LP10000ExDC-M2, LP1050Ex-F2, LP10000DC-M2, LP10000-M2,  
LP1050DC-F2 and LP1050-F2 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, Chief Executive Officer  
Emulex Corporation (714) 662-5600  
3333 Susan Street, Costa Mesa, CA  
Corporation 92626 USA

**Note:**

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.

## Notice for Japan and Translations (VCCI)

### Product Label

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

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  
と電波妨害をう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。 **VCCI—A**

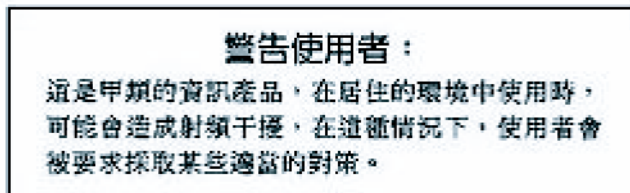
### Manual Notice

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.

この装置は、情報処理装置等電波障害自主規制協議会（V C C I）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。

## Notice for Taiwan and Translations (BSMI)



Translation:

This equipment is a Class A ITE, and operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense

## Notice for South Korea and Translations (MIC).

### 사용자 안내문 (A급 기기)

본 기기는 업무용으로 전자파적합등록을 받은 기기이오니, 만약 잘못 구입하셨을 때에는 구  
입한 곳에서 비업무용으로 교환하시기 바랍니다.

Translation:

Class A Equipment: Please note that this equipment has been approved for business purposes with regards to electromagnetic interference. If purchased in error for use in a residential area, you may wish to exchange the equipment where you purchased it.

## Declaration of conformity

---

LP10000DC-M2, LP10000-M2, LP1050DC-F2 and LP1050-F2 Models

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.**

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---

### **Note**

Changes or modifications not expressly approved by Emulex Corporation could void the user's authority to operate this equipment.

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## DECLARATION OF CONFORMITY

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

***declares under sole responsibility that the product:***

Product Name: LightPulse™ Fibre Channel PCI-X Host Bus Adapter  
Models: LP10000DC-M2, LP10000-M2, LP1050DC-F2, LP1050-F2  
Assembly Numbers: FC1020055-XX (FC1010493-XX), FC10200059-XX (FC1010496-XX)

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

**Product Safety:** UL Recognized to UL1950  
CUR Recognized to CSA22.2, No. 950  
IEC 950 (1991) + Amendments 1,2,3,4, and 11  
EN 60950 (1992) + Amendments 1,2,3,4, and 11  
EN 60825-1 (1994) + Amendment 11  
EN 60825-2 (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 3548:1995, Class A  
VCCI, Class A

***Supplementary Information:***

1. The Product was tested in a typical configuration.
2. The product complies with the requirements of the following directives:
  - European Union Low Voltage Directive 73/23/EEC
  - 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)

July 1, 2003  
Costa Mesa, CA.

  
Paul Folino, Chief Executive Officer

**European Contact:** Emulex Corporation  
7 & 8 Forest Court  
Oaklands Park  
Fishponds Road  
Wokingham, Berkshire

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

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, LP9402DC, LP9802, LP982, LP9802DC, LP10000, LP10000DC, LP10000ExDC, LP1050Ex, LP1050DC and LP1050 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 appropriate PCI/PCI-X/PCI-Express/cPCI/SBus expansion slot.

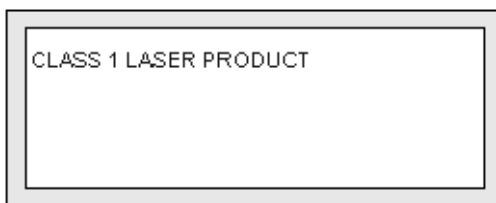
In the United States, all optical GLMs, GBICs, 1x9 and small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated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



### **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.

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**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 other HBA models.

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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