

Installation and Setup Guide 1.0 for Fibre Channel Protocol on Linux®

Network Appliance, Inc.
495 East Java Drive
Sunnyvale, CA 94089 USA
Telephone: +1 (408) 822-6000
Fax: +1 (408) 822-4501
Support telephone: +1 (888) 4-NETAPP
Documentation comments: doccomments@netapp.com
Information Web: <http://www.netapp.com>

Part number 210-00499
June 2003

Copyright and trademark information

Copyright information

Copyright © 1994–2003 Network Appliance, Inc. All rights reserved. Printed in the U.S.A.

No part of this book covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Portions of this product are derived from the Berkeley Net2 release and the 4.4-Lite-2 release, which are copyrighted and publicly distributed by The Regents of the University of California.

Copyright © 1980–1995 The Regents of the University of California. All rights reserved.

Portions of this product are derived from NetBSD, which is copyrighted by Carnegie Mellon University.

Copyright © 1994, 1995 Carnegie Mellon University. All rights reserved. Author Chris G. Demetriou.

Permission to use, copy, modify, and distribute this software and its documentation is hereby granted, provided that both the copyright notice and its permission notice appear in all copies of the software, derivative works or modified versions, and any portions thereof, and that both notices appear in supporting documentation.

CARNEGIE MELLON ALLOWS FREE USE OF THIS SOFTWARE IN ITS “AS IS” CONDITION. CARNEGIE MELLON DISCLAIMS ANY LIABILITY OF ANY KIND FOR ANY DAMAGES WHATSOEVER RESULTING FROM THE USE OF THIS SOFTWARE.

Software derived from copyrighted material of The Regents of the University of California and Carnegie Mellon University is subject to the following license and disclaimer:

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notices, this list of conditions, and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notices, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment:
This product includes software developed by the University of California, Berkeley and its contributors.
4. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS

INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Software derived from copyrighted material of Network Appliance, Inc. is subject to the following license and disclaimer:

Network Appliance reserves the right to change any products described herein at any time, and without notice. Network Appliance assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by Network Appliance. The use and purchase of this product do not convey a license under any patent rights, trademark rights, or any other intellectual property rights of Network Appliance.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark information

NetApp and the Network Appliance design are registered trademarks of Network Appliance, Inc. in the United States, Canada, and the European Union. Network Appliance is a registered trademark of Network Appliance, Inc. in Monaco and a trademark of Network Appliance, Inc. in the United States and Canada. FAServer is a registered trademark of Network Appliance, Inc. in the United States and the European Union. NetCache is a registered trademark of Network Appliance, Inc. in the European Union and Japan, and a trademark of Network Appliance, Inc. in the United States. SnapCopy is a registered trademark of Network Appliance, Inc. in the European Union and a trademark of Network Appliance, Inc. in the United States. WAFL is a registered trademark of Network Appliance, Inc. in the United States, the European Union, and Canada. FilerView, SecureShare, SnapManager, SnapMirror and SnapRestore are registered trademarks of Network Appliance, Inc. in the United States. Data ONTAP is a trademark of Network Appliance, Inc. in the United States and Canada. Snapshot is a trademark of Network Appliance, Inc. in the United States and the European Union. NetApp—the Network Appliance Company is a registered trademark of Network Appliance, Inc. in the United States and other countries. ApplianceWatch, BareMetal, Center-to-Edge, ContentDirector, DataFabric, gFiler, MultiStore, NearStore, SecureAdmin, Serving Data by Design, Smart SAN, SnapCache, SnapDrive, SnapVault, vFiler, and Web Filer are trademarks of Network Appliance, Inc. in the United States.

Apple is a registered trademark and QuickTime is a trademark of Apple Computer, Inc. in the United States and/or other countries.

Microsoft is a registered trademark and Windows Media is a trademark of Microsoft Corporation in the United States and/or other countries.

RealAudio, RealNetworks, RealPlayer, RealSystem, RealText, and RealVideo are registered trademarks and RealMedia, RealProxy, and SureStream are trademarks of RealNetworks, Inc. in the United States and/or other countries.

Network Appliance is a licensee of the CompactFlash and CF Logo trademarks.

All other brands or products are trademarks or registered trademarks of their respective holders and should be treated as such.

Network Appliance NetCache is certified RealSystem compatible.

Table of Contents

	Preface	vii
Chapter 1	Overview of Installation and Setup	1
	Understanding host and filer communication and configurations	2
	Overview of the setup and installation process.	6
	Preparing for the installation	7
	Related documents	11
Chapter 2	Cabling the Host and Turning On the Power	13
	Cabling the host to a filer.	14
	Turning on the power to the hardware	17
Chapter 3	Setting Up the Driver	19
	Downloading and installing the driver	20
	Driver installation example.	29
Chapter 4	Installing the NetApp Software Package	41
	Preparing to install the NetApp software package	42
	Installing or uninstalling the NetApp software.	45
Chapter 5	Creating, Configuring, and Managing LUNs	49
	Creating LUNs on the filer	50
	Configuring the LUNs	63
	Displaying LUN and HBA Information	67
Chapter 6	Troubleshooting	71
	Troubleshooting issues related to the driver and HBA.	72
	Troubleshooting LUN management	76

Error messages during I/O 79

Checking the status of the link 80

General troubleshooting 81

Index 83

Preface

About this guide

This guide describes how to install and configure a Fibre Channel connection on a Linux® host running Red Hat® Enterprise Linux 2.1. The host accesses data on Network Appliance™ storage appliances (filers) that run Data ONTAP™ 6.4.1 software with the Fibre Channel Protocol (FCP) for SCSI licensed.

Note

This guide also applies to a Linux host running SuSE® Enterprise Server 8.

Audience

This guide is for system installers and administrators who are familiar with the Linux operating system on a host. It assumes that you are familiar with how to configure and administer a filer and use the filer-licensed SAN protocol, FCP, to store and retrieve data on a filer.

Terminology

This guide uses the following terms:

- ◆ *LUN* (Logical Unit Number) refers to a logical unit of storage identified by a number.
- ◆ *LUN ID* refers to the numerical identifier for a LUN.
- ◆ *Filer* refers to a NetApp® storage appliance that incorporates the CompactFlash™ unit and supports FCP.
- ◆ *Type* refers to pressing one or more keys on the keyboard.
- ◆ *Enter* refers to pressing one or more keys and then pressing the Enter key.

Command conventions

You can enter filer commands on either the system console or from any host system that can access the filer through a Telnet session.

Keyboard conventions

When describing key combinations, this guide uses the hyphen (-) to separate individual keys. For example, “Ctrl-D” means pressing the “Control” and “D” keys simultaneously. Also, this guide uses the term “Enter” to refer to the key that generates a carriage return, although the key is named “Return” on some keyboards.

Typographic conventions

The following table describes typographic conventions used in this guide.

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

Special messages

This guide contains special messages that are described as follows:

Note_____

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

Caution_____

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

WARNING_____

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

About this chapter

This chapter provides information about the following:

- ◆ A brief explanation of the host and filer communication and configurations
- ◆ An overview of the tasks you need to perform to set up FCP on Linux
- ◆ A list of tasks to perform before configuring the host bus adapter (HBA)
- ◆ A list of documents that might be useful

Topics covered in this chapter

The following topics are covered in this chapter:

- ◆ [“Understanding host and filer communication and configurations”](#) on page 2
- ◆ [“Overview of the setup and installation process”](#) on page 6
- ◆ [“Preparing for the installation”](#) on page 7
- ◆ [“Related documents”](#) on page 11

Understanding host and filer communication and configurations

About host and filer communication

You need to perform certain steps to set up a Linux host for Fibre Channel. The host then uses the Fibre Channel Protocol (FCP) for SCSI to access data on NetApp filers that run Data ONTAP software.

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

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

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

Types of supported configurations

The following types of configurations are supported:

- ◆ Fabric-attached storage area network (SAN)

One or more hosts are cabled to a Fibre Channel switch or a pair of redundant Fibre Channel switches that are cabled to redundant Fibre Channel ports on a filer cluster pair.

Note

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

The host in a fabric-attached configuration can be one of the following:

- ❖ A single-path host that has one HBA
- ❖ A multipath host that has two HBAs
- ◆ Direct-attached

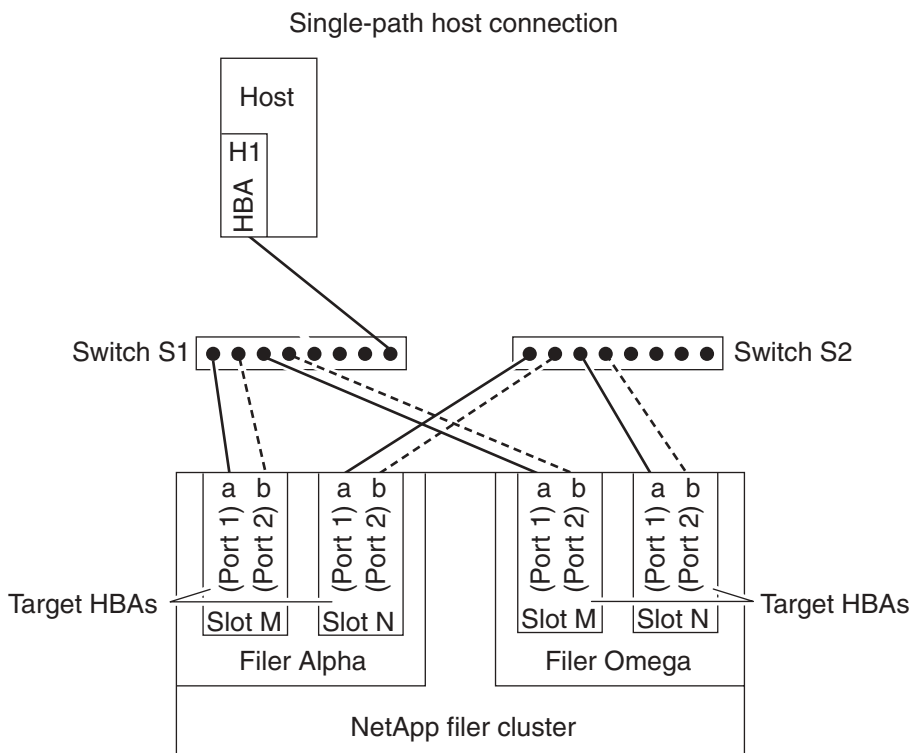
A direct-attached host connection is a host with a single HBA directly connected to a stand-alone filer.

For more information on possible configurations, go to the online *FCP/iSCSI Configuration Guide* at

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

Fabric-attached SAN configuration

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



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

Note

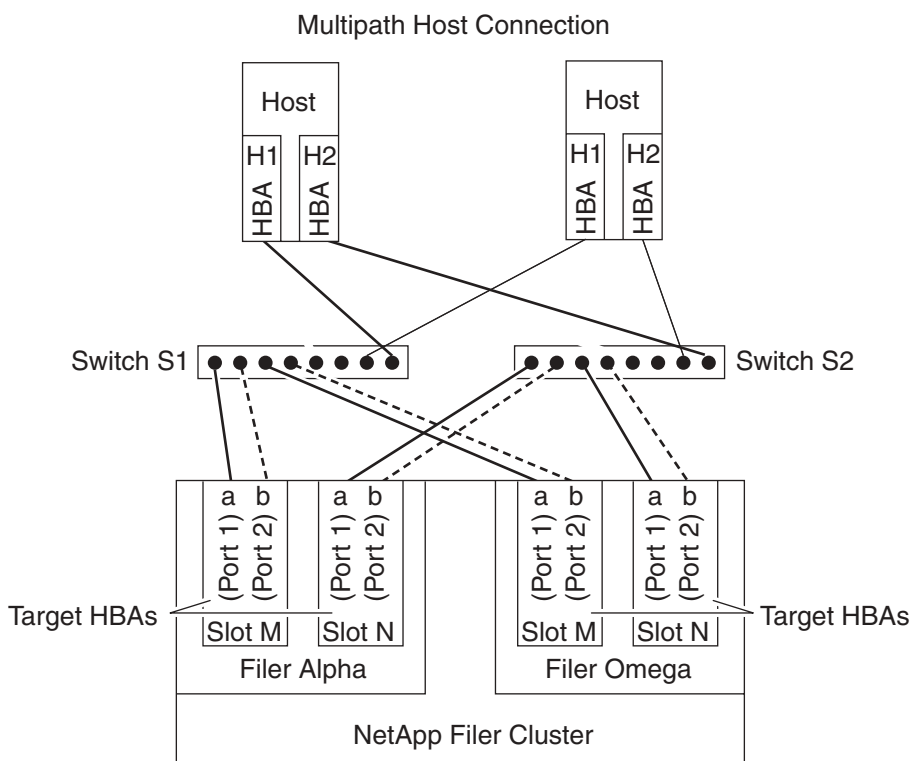
The second switch comes with the NetApp filer cluster. You can hook the HBA to it, if you like.

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

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

The following is an example of a multipath host connection with two hosts. You can also have a multipath connection with a single host.

By coupling multipathing and filer clustering, this configuration creates a no-single-point-of-failure solution between the host and your data.



Each host has two HBAs (H1 and H2), which are cabled to two switches. H1 is connected to switch S1. H2 is connected to switch S2. This configuration provides two hardware paths from each host to the filer and greater reliability through a path failover mechanism. If one connection is lost between the host and the filer, the host continues to access the data over the other, sound paths until the failed path is repaired.

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

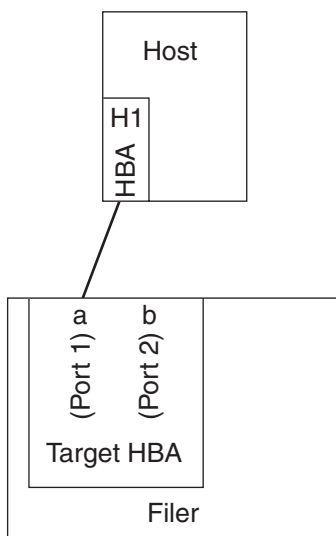
If one filer fails, the other filer can take over. For example, if Filer Alpha fails, the standby (or passive) port b becomes active and enables the host to access the storage until Filer Alpha is repaired and running. In Filer Omega the following occurs:

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

Direct-attached configuration

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

Direct-attached host connection



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

Overview of the setup and installation process

Setting up FCP on Linux

Setting up FCP involves a numerous steps that are performed on both the filer and the host. The table that follows provides a high-level overview with pointers to sections that provide more details.

Step	Action
1	Prepare for the installation: ◆ Get a copy of the host attach kit and review its contents. See “Verifying the contents of the host attach kit” on page 7. ◆ Review the <i>SAN Setup Overview for FCP</i>. See “Reviewing the SAN setup steps” on page 8. ◆ Verify that the filer is installed and configured properly. See “Verifying the filer setup” on page 8. ◆ Verify that the host can issue commands to the filer. See “Verifying that the host can issue commands” on page 9. ◆ Verify the system requirements. See “System requirements” on page 9. ◆ Confirm that the HBA is installed. <i>NetApp does not supply the HBA</i>. See “Required HBA for host” on page 10.
2	Cable the host to the filer. See “Cabling the host to a filer” on page 14.
3	Turn the power on to the switches, disk shelves, filers, and hosts. See “Turning on the power to the hardware” on page 17.
4	Download the driver from the QLogic® Web site. See “Downloading the driver and SANsurfer” on page 20.
5	Install the driver. See “Installing the driver” on page 21.
6	Create the LUNs. See “Creating LUNs on the filer” on page 50.
7	Configure the LUNs. See “Configuring the LUNs” on page 63.

Preparing for the installation

Before you begin the installation

There are several tasks you can perform that make the installation process go smoothly. This section explains those tasks.

Verifying the contents of the host attach kit

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

Step	Action
1	Open the host attach kit and check for these items: ◆ Open Me First envelope ❖ <i>SAN Setup Overview for FCP</i> ❖ <i>Installation and Setup Guide for Fibre Channel Protocol on Linux</i> (this guide) ◆ Media kit ❖ The netapp_linux_tools_1_0.tar.gz file that contains the sanlun utility and other scripts that NetApp supplies with this release ❖ License agreement for the attach kit ❖ <i>SAN Host Release Notes for Fibre Channel Protocol on Linux</i>

Reviewing the SAN setup steps

To review the general procedure involved in setting up a SAN, complete the following step.

Step	Action
1	Get the <i>SAN Setup Overview for FCP</i> from the <i>Open Me First</i> envelope and read it. Note_____ This document provides a high-level overview for setting up your NetApp SAN, including setting up the filer and host and connecting them. The steps in this document direct you to documentation with information to complete the tasks. _____

Verifying the filer setup

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

Step	Action
1	Check that the filer is set up and configured as outlined in the <i>SAN Setup Overview for FCP</i>. Caution_____ You must configure the filer before you configure the host HBA driver and create initiator groups and LUNs on the filer. _____

You must have completed the following steps:

- ◆ Installed the filer and target HBAs.
- ◆ Cabled the filer for a fabric-attached or direct-attached configuration.
- ◆ Downloaded and installed the driver.
- ◆ Set up and configured the filer.
- ◆ Licensed and enabled the FCP protocol and any other protocols appropriate for the filer.
- ◆ Created working filer volumes and qtrees (if desired) on the filer.

For more information, see the *Data ONTAP SAN System Administrator's Guide*.

Verifying that the host can issue commands

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

Step	Action
1	Issue a command from the host to the filer. There are two ways to do this: ◆ Use a remote login, such as the <code>telnet</code> command, to connect with the filer and enter a command at the command-line prompt. ◆ Go to the filer console and enter a command.

System requirements

A complete list of system requirements is contained in

- ◆ The *SAN Host Release Notes 1.0 for Fibre Channel Protocol on Linux*
This is a static document.
- ◆ The support matrix in the online *FCP/iSCSI Configuration Guide* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>
This is a dynamic, online document that is updated frequently to stay current with changes in products.

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.

For this release of FCP on Linux, NetApp does not supply the HBA or the driver. You must get a NetApp-supported HBA and driver for your host. In addition, you also need to download the QLogic SANsurfer utility for Linux. At the time this manual was printed, NetApp supported the following components.

Component	Requirement
HBA	QLogic QLA2342 for Linux

Component	Requirement
Driver	The failover version of QLogic's driver version 6.04.00 You can download the driver from the QLogic Web site. See "Downloading and installing the driver" on page 20 for information on getting the driver. Note This driver works with both Red Hat Enterprise Linux 2.1 and SuSE Enterprise Server 8.
SANsurfer	QLogic SANsurfer for Linux version 2.0.24 You can download this utility from the QLogic Web site. See "Downloading and installing the driver" on page 20 for information on getting SANsurfer.

Required HBA for host

You must have the QLogic SANblade series 2300 HBA for Linux installed in your host before performing any of the steps in this document. NetApp does not supply the HBA.

Related documents

Using this guide

This guide is one of several documents you use to set up FCP on Linux. It provides the information you need to get the NetApp filers working quickly and smoothly with a Linux host.

Documentation with information on filers and hosts

In setting up FCP on Linux, you might also want to consult the following documents:

- ◆ The *SAN Host Release Notes 1.0 for Fibre Channel Protocol on Linux*. This document contains system requirements and any last-minute information that you need. This document is part of the FCP Linux Attach Kit. You can also download it from the NOW site.
- ◆ The *SAN Setup Overview for FCP*. This is a high-level document that provides an overview of setting up your filers to work with your hosts. By following the order specified in this document, you can avoid problems that might occur if you perform steps out of order. This document is part of the FCP Linux Host Attach Kit.
- ◆ The *FCP/iSCSI Configuration Guide*. This is an online document that contains information about possible configurations as well as the most current details on filer and host platforms, cabling issues, and switch issues. This document is available at NetApp's NOW site.
- ◆ *System Configuration Guide* for Data ONTAP. This is an online document that contains information on the supported filer models for Data ONTAP licensed with FCP. It is available at the NetApp NOW site.
- ◆ The QLogic files that you get when you download the driver. These files provide detailed information about installing the driver. NetApp does not supply the driver.
- ◆ Host operating system and HBA information. NetApp does not provide these components. Consult the readme files and other documentation that you received when you got your Linux operating system and your QLogic HBA.

Using the online configuration guide

The following table points you to specific pages within the *FCP/iSCSI Configuration Guide* that might be useful when setting up FCP on Linux.

If you want...	Go to...
Supported configurations for filers and hosts	<i>FCP/iSCSI Configuration Guide</i> : http://now.netapp.com/NOW/knowledge/docs/docs.shtml
Cabling instructions for the filer and host	<i>Cable Support for FCP</i> page in the <i>FCP/iSCSI Configuration Guide</i>
Supported platforms and system requirements for hosts	<i>FCP/iSCSI Support Matrix</i> page in the <i>FCP/iSCSI Configuration Guide</i>
Supported filer models for Data ONTAP licensed with FCP	<i>FCP/iSCSI Support Matrix</i> page in the <i>FCP/iSCSI Configuration Guide</i>

About this chapter

This chapter describes the procedures for cabling the host to one or a pair of Fibre Channel switches (fabric-attached) or directly to a filer and then turning on the power to the different pieces of hardware.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Cabling the host to a filer”](#) on page 14
- ◆ [“Turning on the power to the hardware”](#) on page 17

Cabling the host to a filer

Methods of cabling

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

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

Cable requirements

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

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

Note

The *Cable Support for FCP* page in the *FCP/iSCSI Configuration Guide* on the NetApp NOW site contains the most up-to-date information on cabling specifications and requirements. It also contains information on ordering cables.

Cabling a fabric-attached host

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

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

Step	Action
3	Plug one end of the optical cable into one of the switches. Note_____ NetApp recommends that you reserve ports 0 through 3 on the switch for the filer. The remaining ports are available for the hosts. _____
4	Plug the other end of the cable into the HBA in the host.
5	Repeat Step 3 and Step 4 for all hosts with a single HBA. See “Fabric-attached SAN configuration” on page 3 for an illustration of a single-path host connection.

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

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

Cabling a direct-attached host

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

Step	Action
1	Plug one end of the optical cable into the first port of the dual-port HBA in the filer.
2	Plug the other end of the cable into the HBA in the host.

Turning on the power to the hardware

Order for turning on power

There is a specific order for turning on power to the hardware:

- 1. Switches
- 2. Disk shelves
- 3. Filers
- 4. Hosts

Caution—
Because the different pieces of hardware communicate with each other in a prescribed order, problems occur if you turn on the equipment in the specified order.

Turning on the power

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

Step	Action
1	Verify that the connections and cabling are correct.
2	Turn on the power to the configured Fibre Channel switches. Wait approximately five minutes for the switches to boot.
3	Turn on the power to the disk shelves.
4	Turn on the power to the filers.
5	Turn on the power to the host.

About this chapter

This chapter describes procedures for getting the NetApp-supported driver and installing it. It also provides an example of one way to install the driver and set it up to work with a NetApp filer.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Downloading and installing the driver”](#) on page 20
- ◆ [“Driver installation example”](#) on page 29

Downloading and installing the driver

Tasks in this section

This section describes the tasks you need to perform to set up and use your QLogic driver. It also provides instructions should you want to remove the driver.

Note_____

For more information about the commands you use in setting up the driver, see the man pages.

Downloading the driver and SANsurfer

In addition to downloading the QLogic driver, you should also download a copy of the QLogic SANsurfer utility. You use this utility to set up QLogic Multi-pathing.

To download the driver and SANsurfer utility, complete the following steps.

Step	Action
1	Go to the QLogic page (www.qlogic.com) and choose Downloads.
2	In the HBA section of the Downloads page, select the HBA. At the time this document was printed, that NetApp supported QLA2342. Note_____ The most up-to-date information on NetApp-supported HBAs and drivers is in the <i>FCP/iSCSI Configuration Guide</i> on the NetApp NOW site.
3	At the product page, choose Linux.
4	On the Linux download page, download the 6.04.00 driver. (For the QLA2342 driver, this is the <code>qla2x00-v6.04.00-fo-dist.tgz</code> file for “Redhat, Linux 7.2/7.3/8.0 and Advanced Server 2.1, Failover Driver.”) Note_____ This driver works with both Red Hat Enterprise Linux 2.1 and SuSE Enterprise Server 8.

Step	Action
5	From the same table, download the NetApp-supported version of SANsurfer for Linux. Note_____ At the time this document was printed, NetApp supported SANsurfer for Linux 2.0.24. QLogic supports this version of SANsurfer with the failover version of the Linux driver only. _____ Result: This downloads the sansurfer_linux_install.bin script. Follow the instructions in the Read Me file at the download site to install the SANsurfer.

Installing the driver

To install the driver you downloaded, follow the instructions in the QLogic documentation. The following procedure is a general overview of the steps you need to perform.

Note_____

All installation procedures require root privileges.

Step	Action
1	Verify that you have the NetApp-supported HBA installed on your host.
2	Use the <code>tar</code> command to unpack the file you downloaded from QLogic. Doing this unpacks several files, including a readme file and a source <code>.tgz</code> file.
3	Use the <code>tar</code> command to unpack the source file.

Step	Action
4	Follow the build instructions in the readme file that accompanies the source file. You have two options: ◆ Build a custom kernel that contains the QLogic driver. Only experienced Linux users should consider attempting this. Note _____ If you build a custom kernel, be sure to enable LUN probing with the CONFIG_MULTI_LUN command. ◆ Build a <driver_name>.o file that you must load each time you boot the system. For the QLA2342 HBA, the system creates a qla2300.o file. This is the option NetApp recommends. If you choose this option, you can use a RAMDISK image file to load the driver module automatically each time you reboot the host. You can also load the driver module manually using the modprobe command.

Creating the volumes and LUNs

As part of the driver installation, you must provide information about the LUNs on the filer. Complete the following steps on the filer to set up the volumes and LUNs.

Step	Action
1	At the filer, use the <code>lun setup</code> command to create the volumes and LUNs.
2	Create the igroups that contain the initiator World Wide Port Names (WWPNs). Note _____ If you don't have the WWPNs, you can get them by loading the driver. After you get the WWPNs, unload the driver and complete the configuration steps in "Finishing driver setup" on page 23.
3	Use the <code>lun setup</code> command to map the LUNs to the igroups.

Step	Action
4	Make sure the LUNs are online.
5	Start the FCP service, if it is not running, by entering the following command: fcp start

Finishing driver setup

After you have the LUN information, finish setting up the driver by going back to your Linux host and completing the following steps.

Note

If you are using a RAMDISK image file, you must re-create it each time you modify the configuration data. This is because the RAMDISK image file is a static file; it does not change automatically when you change configuration options.

Step	Action
1	At the Linux host, modify the /etc/modules.conf file. ◆ Add an alias for the driver for each active HBA port. ◆ Tell the SCSI mid-level driver that multiple LUNs are in use. The Linux kernel limits the maximum number of LUNs per device to 128. ◆ Specify the maximum queue depth. You can have a maximum queue depth of 255. See the “ Sample installation ” on page 29 for an example of modifying this file.
2	Use the <code>depmod -a</code> command to update any module dependencies.
3	Change the <boot_loader>.conf file to include a line specifying the maximum number of LUNs. You can have a maximum of 128 LUNs. See “ Sample installation ” on page 29 for an example of modifying a boot loader file.

Step	Action
4	If you created a module for the driver instead of building a custom kernel, use the <code>modprobe</code> command to load the module. The <code>modprobe</code> command is a wrapper around the Linux <code>insmod</code> command. Example: Here is an example of using the <code>modprobe</code> command: <pre>modprobe qla2300</pre> Note_____ By using the <code>modprobe</code> command in this situation, you can reload the driver without having to reboot your host. _____
5	If you are using QLogic Multipathing, make sure that the LUN is visible on both ports. Both the <code>cat</code> command and the <code>dmesg</code> command display this information. Example: The following example assumes the driver you installed is named <code>qla2300</code>. <pre>cat /proc/scsi/qla2300/[portnumber]</pre> <i>portnumber</i> is the number of the port that you are checking.

Step	Action
6	If you have multiple LUNs and multiple connections to the filer, configure the LUN paths to spread the I/O load across the connections. You use the SANsurfer SANblade Manager utility to set the preference path for the LUNs. See the instructions from QLogic about using this utility. Leave the first LUN path preference as the default. Reset the other LUN path preferences to use more than one path. You can use the SANsurfer's interface to perform persistent binding for the LUNs. The SANsurfer utility records these changes in the <code>/etc/modules.conf</code> file. Note_____ If you are using a RAMDISK image to load the driver automatically each time you reboot the host, you must re-create the <code>initrd</code> file each time you modify the <code>/etc/modules.conf</code> file.
7	Use the SANblade Manager utility to set the timeout value for each switch and to specify the value for the LUNs per Target option. You provide these values in the dialog that appears when you highlight an adapter and choose the Settings tab. In that dialog box, choose the Advanced Adapter Settings. Enter values for the Port Down Retry Count and LUNS per Target. ◆ For a Brocade 3200 or 3800 switch, set the value of the Port Down Retry Count to 60. ◆ For Brocade 3900 switch, set the value of the Port Down Retry Count to 90. ◆ For the LUNs per Target, set the value to the same value you entered in the <code>/etc/modules.conf</code> file as the maximum number of LUNs per device. You must set these values for each adapter.

Step	Action
8	Set up the devices to receive and return data. Choose one of the following options: ◆ Create a partition table. Do this if you want to use the LUN through a file system instead of through raw access. ◆ Bind the raw device to the block device. To create a partition table, complete the following step. 1. Use <code>fdisk</code> to set up a partition table. The command <code>fdisk /dev/sd[char]</code> starts an interactive session for creating a partition. If you are using a file system, make sure you reserve the header information at the top of the disk device when you use FCP so that it is not overwritten. Having a partition accomplishes this. To use the LUN through raw access, complete the following step. 1. Use the <code>raw</code> command to bind the raw device to the block device. 2. Repeat this step for each LUN.
9	Reboot the host. Unless you have created a RAMDISK image, use the <code>modprobe</code> command to load the driver module.
10	Start the SANsurfer agent <code>qlremote</code> to verify that everything is working correctly. Note_____ Make sure that you use the failover version of the driver. This is the only version of the driver that QLogic supports for the SANblade Manager on Linux. _____

Step	Action
11	Create a RAMDISK image file that automatically loads the driver each time you reboot. This is a static file that contains configuration information. Each time you change configuration information (for example, by modifying the <code>/etc/modules.conf</code> file), you need to create a new RAMDISK image file. Use the <code>mkinitrd -f</code> command to create this file: <pre># mkinitrd -f ramdisk_file_name kernel_version</pre> <i>ramdisk_file_name</i> is the name you want to use for the RAMDISK image. Note_____ If you execute this step in the <code>/boot</code> directory, make sure that you use a unique file name. Otherwise, the command overwrites the original RAMDISK image file when it creates the new one. _____ <i>kernel_version</i> is the version of the kernel you're using. If your host is running SuSE Enterprise Server 8, you need to use only the following command: <pre># /sbin/mk_initrd</pre> This creates the <code>/boot/initrd.suse</code> file.
12	Place the RAMDISK image file in the <code>/boot</code> directory and configure the boot loader to use the new file by entering the following command: <pre># cp ramdisk_file_name /boot</pre>
13	Configure the boot loader with the new RAMDISK image. Edit the <code>/etc/<boot-loader>.conf</code> file to include the line <pre>initrd=/boot/initqla2300</pre> Place the line under one of the kernel entries.

Removing the driver If you need to remove the driver, complete the following step.

Step	Action
1	Execute the <code>modprobe -r</code> command from within the <code>/sbin</code> directory to remove the driver you set up. Example: If you are using a QLA2300 HBA, you would enter: <code>/sbin/modprobe -r qla2300</code> Note_____ The <code>modprobe -r</code> command does not work if one of the following situations is true: ◆ You execute it from the <code>proc qla2300</code> directory. Make sure you are in a different directory. ◆ The <code>/etc/init.d/qlremote</code> process is running. Make sure that this process is stopped before you execute the <code>modprobe</code> command. ◆ You have file systems mounted using LUN storage SCSI devices. See “You can’t remove the driver using modprobe -r” on page 73 for more information.

Reloading the driver module after rebooting the host

If you did not build a custom kernel, you must load the driver module each time you reboot the Linux host. Complete the following step.

Step	Action	
1	When you reboot the host, load the driver module.	
	If you...	Then...
	Created a RAMDISK image	The host automatically loads the driver when it reboots.
	Are using a manual process to load the driver	Enter the <code>modprobe</code> command. Example: <code>/sbin/modprobe qla2300</code>

Driver installation example

About the example

This section contains an example of installing a driver downloaded from QLogic and configuring it to work with a NetApp filer. This is an example of just one installation path that you can take. The actual path you follow depends on your system setup.

Note

For detailed information about installing the driver, see the QLogic documentation that comes with it.

Assumptions for this example

The following example assumes you are using the following items:

- ◆ Red Hat Enterprise Linux 2.1, kernel version 2.4.9-e.9
- ◆ The QLogic failover driver version 6.04.00
- ◆ The GRUB boot loader
- ◆ Two active SCSI host adapter ports
- ◆ A maximum of 128 LUNs
- ◆ A maximum queue depth of 128
- ◆ A Brocade 3900 switch

Sample installation

Here is an example of one installation path. This example creates a RAMDISK image that automatically loads the driver each time you reboot the host. It also uses the `modprobe` command to load and remove the driver when you need to make a change, but do not want to reboot the host.

Note

When you use a RAMDISK image, any time you modify a configuration setting, you must re-create the RAMDISK image file.

These instructions follow the steps specified in the README.qla2x00 file for a symmetric multiprocessor (SMP) and a RAMDISK image for a GRUB boot loader.

The instructions for SuSE Enterprise Server 8 and/or the LILO boot loader differ slightly from the instructions for Red Hat Linux shown in this example. See the README.qla2x00 file for information.

Note

All installation procedures require root privileges.

Step	Action
1	Download the following items: ◆ The QLogic failover driver version 6.04.00 for Linux: qla2x00-v6.04.00-fo-dist.tgz ◆ The Read Me file listed in the Description column. (This Read Me file is also included in the compressed .tgz file.) ◆ The SANsurfer for Linux utility, version 2.0.24. ◆ The SANsurfer Read Me file listed in the Description column.
2	Install the SANsurfer utility by following the instructions in its Read Me file.
3	Unpack the driver file by using the following <code>tar</code> command: <code>tar -xzf qla2x00-v6.04.00-fo-dist.tgz</code>
4	Change to the directory where you unpacked the driver, and use the driver setup command to unpack the source file: <code># cd qlogic</code> <code># sh ./drvsetup</code>

Step	Action
5	Create an SMP version of the driver. Note For more details about doing this, see the README.qla2x00 file. 1. If the kernel-headers and kernel-source RPM files are not installed, insert the first Red Hat CD-ROM and copy them: <pre># cd /mnt/cdrom/RedHat/RPMS # rpm -iv kernel-headers*.rpm # rpm -iv kernel-source*.rpm</pre> 2. Using the Linux directory name that appears in /usr/src, enter the following command: <pre># make all SMP=1 OSVER=<linux-directory-name></pre> 3. Confirm that this command placed the qla2200.o and qla2300.o driver files in the scsi directory: <pre># /lib/modules/<version-num>/kernel/drivers/scsi</pre> If it did not move the files, you need to manually move them. You can use either the copy (cp) command or the move (mv) command. The following command line copies these files into the scsi directory: <pre># cp qla2200.o qla2300.o /lib/modules/<version-num>/kernel/drivers/scsi</pre>

Step	Action
6	Get the WWPN for the initiator by loading the driver temporarily: - Enter the following command: <pre># /sbin/modprobe qla23000</pre> The system creates a /proc/scsi/qla2300 directory that contains a /proc/scsi/qla2300/<HBA-num> file for each QLogic HBA port. The file name is the HBA port number. - Get the WWPN from each /proc/scsi/qla2300/<HBA-num> file. To get the WWPN for port 2, look in the /proc/scsi/qla2300/2 file. Repeat this step for each file. - Unload the driver by entering the following command: <pre># /sbin/modprobe -r qla2300</pre> Note _____ The <code>modprobe -r</code> command does not work if you are in the <code>proc qla2300</code> directory.
7	Go to the filer and perform the following tasks: - Create the volumes and LUNs. - Create the igroups that contain the initiator WWPN. - Map the LUNs to the igroups. - Make sure the LUNs are online. - Start the FCP service, if it is not running. See “Creating, Configuring, and Managing LUNs” on page 49 for information about performing these steps.

Step	Action
8	Go to the Linux host and modify the /etc/modules.conf file: ◆ Add an alias for the driver for each active HBA port. This example uses two active HBA ports. <pre>alias scsi_hostadapter[2] qla2300 alias scsi_hostadapter[3] qla2300</pre> ◆ Tell the SCSI mid-level driver that multiple LUNs are in use. The Linux kernel limits the maximum number of LUNs per device to 128. This example uses 128 LUNs: <pre>options scsi_mod max_scsi_luns=128</pre> ◆ Specify the maximum queue depth. You can have a maximum queue depth of 255. This example uses a queue depth of 128. <pre>options qla2300 q12xmaxqdepth=128</pre>
9	Update any module dependencies by entering the following command: <pre># depmod -a</pre> Note_____ The modprobe command does not run properly unless you run the depmod -a command. _____
10	In the /boot/grub/grub.conf file, add information to the kernel line to specify the maximum number of LUNs: <pre>max_scsi_luns=128</pre> Note_____ This value must be the same as the value you entered in Step 8. _____
11	Load the module by entering the following command: <pre># /sbin/modprobe qla2300</pre>

Step	Action
12	If you are using QLogic Multipathing, make sure that the LUN is visible on both ports. You can do this with either a <code>cat</code> command or a <code>dmesg</code> command. Example: The following example assumes you installed the <code>qla2300</code> driver. <pre># cat /proc/scsi/qla2300/[portnumber]</pre> <i>portnumber</i> is the number of the port that you are checking.
13	Start the QLogic SANsurfer/SANblade Manager and use it to perform the following tasks: ◆ Spread I/O across the connections if you have multiple LUNs and multiple connections to the filer. You can also use it to set up persistent bindings. ◆ Set the timeout values for the switches. ◆ Set the value for the number of LUNs on each target. Note _____ After you set these values, you must reboot the host for the changes to take effect. The following steps explain how to perform these tasks. 1. If the <code>qlremote</code> (RPC) process did not automatically start when you booted the host, start it now by entering the following command: <pre># /etc/init.d/qlremote start</pre> The <code>qlremote</code> process runs in the background and sends messages to <code>/dev/null</code>. You can also run <code>qlremote</code> directly from another xterm window by entering the following command line: <pre># /usr/local/bin/qlremote</pre> Running <code>qlremote</code> this way enables you to view status and error messages.

Step	Action
	2. Execute SANsurfer by entering the following command from the directory where you installed SANsurfer: <pre># ./SANsurfer &</pre> The default location for this utility is /opt/QLogic_Corporation/SANsurfer Executing the <code>./SANsurfer</code> command brings up the SANblade Manager in a GUI window. To get the SANblade Manager window to appear on a Windows PC, execute the utility in an xterm window to the Linux host. 3. In the SANblade Manager window, click the Connect button. The Connect to Host dialog box appears. 4. Select your host and click OK. 5. Click the Configure button at the top of the window. ❖ If a pop-up box saying “An invalid configuration has been detected. Auto configure run automatically” appears, click OK. ❖ If a second pop-up box appears saying “Also configure LUN(s) automatically,” click Yes. The Fibre Channel Port Configuration dialog appears. 6. At the Fibre Channel Port Configuration dialog box, highlight a port in the Port Name column. 7. From the menu bar at the top of the window, choose Device > Configure LUN(s). A dialog box listing information about the LUNs and their preferred paths appears. Note _____ This menu option is grayed out if you did not select a port name. 8. In the Adapter column, select a LUN and right-click to display the options for setting the LUN Preferred Path. Note _____ Leave the first LUN path preference as the default. Reset the other LUN path preferences to use more than one path.

Step	Action
	9. Repeat Steps 6 through 8 until you set the values for all the LUNs on all the ports. 10. When you finish setting the values for the LUNs, click OK. This returns you to the Fibre Channel Port Configuration dialog box. 11. Click Save. 12. As a security measure, SANblade Manager asks you for a password before it makes the changes. Enter the password and click OK. The Fibre Channel Port Configuration window closes. Note _____ The default password is “config”. 13. To set the switch timeout value and the number of LUNs per target, highlight an adapter in the left pane of the SANblade Manager window. 14. Click the Settings tab in the right pane of the SANblade Manager window. A dialog box with information about that adapter’s settings appears in the right pane. 15. In the pull-down list next to Select Settings section, choose the Advanced Adapter Settings option. 16. Set the Port Down Retry Count value to 90 for the Brocade 3900 switch. Note _____ If you were using a Brocade 3200 or 3800 switch, you would set this value to 60. 17. Set the "LUNs per Target" to same value you entered in the /etc/modules.conf file (in this case, 128). 18. Click Save.

Step	Action
	19. The SANblade Manager asks you for a password before it makes the changes. Enter the password and click OK. Note _____ The default password is “config”. 20. Repeat Steps 13 through 19 for each adapter. 21. From the File menu, choose Exit to halt the SANblade Manager. 22. Check the /etc/modules.conf file to make sure that the long, cryptic line that the SANblade Manager writes to it for each LUN starts with the following words: <pre>options qla2300 ConfigRequired=1 ql2xopts=</pre> 23. To enable the changes to take effect, reboot the Linux host and enter the following command to load the driver module: <pre># modprobe qla2300</pre> 24. Verify that things are working correctly by starting the qlremote process. Note _____ This process should start automatically when you reboot the host. If it doesn't, you can start it by entering the /etc/init.d/qlremotestart command.

Step	Action
14	Set up the devices to receive and return data. If you have a newly created LUN, use <code>san lun</code> to display the available devices. After you have information about the devices, perform one of the following tasks: ❖ Use <code>fdisk</code> to set up a partition table if you plan to use the LUN through a file system instead of through raw access. Enter the following command: <code>fdisk /dev/sd[<i>char</i>]</code> <i>char</i> is the identifier for the SCSI device. This command line starts an interactive session for creating a partition. If you are using a file system, you must reserve the header information at the top of the disk device when you use FCP so that it is not overwritten. Having a partition accomplishes this. ❖ Use the following command to bind the raw device to the block device if you are using raw access: <code>raw /dev/raw /dev/sdb1</code> Note _____ If you are using raw access, you must execute the <code>raw</code> command after each reboot. _____

Step	Action
15	Create a RAMDISK image file so that each time the host reboots, the driver module is reloaded automatically. (Because this is a static file, you must re-create it each time you modify the configuration options; for example, the options in <code>/etc/modules.conf</code>.) Note For more details about creating a RAMDISK image file, see the <code>README.qla2x00</code> file. 1. Rename the older driver binary that came with the original distribution: <pre># cd /lib/modules/<kernel_version>/kernel/drivers/addon /qla2200 # mv qla2200.o qla2200_rh.o # mv qla2300.o qla2300_rh.o</pre> Note Renaming the older driver binary prevents it from interfering with the updated driver binary. 2. Copy the <code>qla2200.o</code> and <code>qla2300.o</code> driver files to <pre>/lib/modules/<kernel version>/kernel/drivers/scsi/</pre> 3. Modify the <code>/etc/modules.conf</code> file to include the following line: <pre>alias scsi_hostadapter0 qla2300</pre> You must add one entry for each HBA in your system. For example, if you had two QLA2300 HBAs installed, you would include the following lines in the <code>/etc/modules.conf</code> file: <pre>alias scsi_hostadapter0 qla2300 alias scsi_hostadapter1 qla2300</pre>

Step	Action
	4. Use the <code>mkinitrd -f</code> command to create a RAMDISK image file for your kernel. By default, this command creates the RAMDISK image file <code>/boot/initrd</code>. The <code>mkinitrd -f</code> command uses the format: <pre># mkinitrd -f <ramdisk_file_name> <kernel_version></pre> <i>ramdisk_file_name</i> is the name you want to use for the RAMDISK image. Note _____ If you execute this step in the <code>/boot</code> directory, make sure that you use a unique file name. Otherwise, the command overwrites the original RAMDISK image file when it creates the new one. _____ <i>kernel_version</i> is the version of the kernel you're using. Example: The following command line creates a RAMDISK image file called <code>initqla2300</code> using kernel version <code>2.4.9-e.9</code>: <pre># mkinitrd -f initqla2300 2.4.9-e.9</pre> 5. Copy the file to the <code>/boot</code> directory if you did not create it there: <pre># cp initqla2300 /boot</pre> 6. Configure the boot loader with the new RAMDISK image. Edit the <code>/etc/grub.conf</code> file to include the line <pre>initrd=/boot/initqla2300</pre> Place the line under one of the kernel entries. Note _____ NetApp recommends that you comment out the current RAMDISK image file. By commenting the file out instead of deleting or overwriting it, you can use it if a problem occurs with the new file. _____
16	Reboot your host. The RAMDISK image should load the driver automatically.

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

Topics in this chapter This chapter discusses the following topics:

- ◆ “[Preparing to install the NetApp software package](#)” on page 42
- ◆ “[Installing or uninstalling the NetApp software](#)” on page 45

Preparing to install the NetApp software package

- Preparation tasks

Preparing to install the NetApp software package involves the following tasks:
 - ◆ Locating the software package.
 - ◆ Obtaining the software package.
 - ◆ Uncompressing the software package and extracting the software.

Note

All installation procedures require root privileges. In addition, you must have the HBA and driver installed before you install the NetApp software package.

- Contents of software package

The software package is a .tar file that consists of these components:
 - ◆ san lun utility
This utility helps you manage LUNs and host HBAs.
 - ◆ NetApp diagnostic and troubleshooting scripts

Locating the software package

To locate the software package, complete the following steps.

Step	Action
1	See the FCP/iSCSI Matrix page in the online <i>FCP/iSCSI Configuration Guide</i> to verify that you have the latest NetApp software package. At the time this book was printed, the software package name was netapp_linux_tools_1_0.tar.gz. The <i>FCP/iSCSI Configuration Guide</i> is available at http://now.netapp.com/NOW/knowledge/docs/docs.shtml

Step	Action	
2	If you obtain the...	Then...
	Software package from the NetApp NOW site	Go to “ Obtaining the software from NOW ” on page 43.
	Software CD-ROM from the media package in your NetApp <i>SAN Host Attach Kit for Fibre Channel Protocol on Linux</i>	Go to “ Installing the software ” on page 45.

Obtaining the software from NOW

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

Step	Action
1	Log in to the NOW site at http://now.netapp.com . In the fields on the right side of the page ◆ Enter your user name and password. ◆ From the Select Start Page list box, click Service and Support. ◆ Click the Login button.
2	In the Software Download section, click Download Software.
3	Go to the SAN Host Attach Kit product row of the Software Download table and select Linux from the Select Platform drop-down list.
4	Click Go!
5	Follow the prompts to reach the Software Download page.
6	Download the <code>netapp_linux_tools_1_0.tar.gz</code> file to a local directory, for example, the <code>/tmp</code> directory.
7	Go to “ Uncompressing and extracting the software ” on page 43.

Uncompressing and extracting the software

When you get the file `netapp_linux_tools_1_0.tar.gz` file, it is in compressed format. To uncompress the file and extract the software, complete the following steps.

Step	Action
1	Change to the directory where you downloaded the compressed file. For example, change to the /tmp directory: <code>cd /tmp</code>
2	Enter the following command to uncompress the file: <code>gunzip netapp_linux_tools_1_0.tar.gz</code>
3	Enter the following command to extract the software: <code>tar -xvf netapp_linux_tools_1_0.tar</code> Result: The extracted software is placed in the /tmp/netapp_linux_tools_1_0 directory.

Installing or uninstalling the NetApp software

- Installation options

This section discusses the following installation options:

 - ◆ Install the host software for the first time. See “[Methods of installing the software](#)” on page 45.
 - ◆ Uninstall any existing version of the host software and utilities. See “[Uninstalling the NetApp software](#)” on page 47.
- Methods of installing the software

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

 - ◆ Using the extracted software, as described in “[Uncompressing and extracting the software](#)” on page 43.
 - ◆ Using the software CD-ROM from the media package in your NetApp SAN Host Attach Kit for Fibre Channel Protocol on Linux

Installing the software

To install the NetApp software on your Linux host, complete the following steps.

Step	Action
1	Log in as root.

Step	Action	
2	If you are installing...	Then...
	Extracted NetApp software obtained from the NOW site	Change to the directory where you uncompressed the netapp_linux_tools_1_0.tar.gz file. For example, if you extracted the software to /tmp/netapp_linux_tools_1_0, you would enter <pre>cd /tmp/netapp_linux_tools_1_0</pre>
	Software from the CD-ROM	1. Mount the CD-ROM on the host system. 2. Change to the directory where your CD-ROM is mounted. For example, change to /mnt/cdrom by entering the following command: <pre>cd /mnt/cdrom</pre>
3	Enter the following command to install the software: <pre>./install</pre>	

Sample output from the install script

The following example shows sample output from the `install` script.

Successful single-path host connection installation: The following example shows a first-time installation for a fabric-attached or direct-attached single-path host connection:

```
# ./install
opt/sanlun/bin/sanlun
opt/sanlun/bin/filer_info
opt/sanlun/bin/linux_info
opt/sanlun/bin/san_version
opt/sanlun/bin/brocade_info
opt/sanlun/bin/Telnet.pm
opt/sanlun/bin/SHsupport.pm
opt/sanlun/bin/libqlsdm.so
opt/sanlun/bin/uninstall
#
```

**Version of the
uninstall script to
use**

You must use the `uninstall` script from the version of software you obtained in “[Locating the software package](#)” on page 42 to uninstall previous versions of the host software.

**Uninstalling the
NetApp software**

To uninstall the NetApp software, complete the following steps.

Step	Action	
1	Log in as root.	
2	If...	Then...
	You are using software obtained from the NOW site	Change to the directory where you uncompressed the <code>netapp_linux_tools_1_0.tar.gz</code> file. For example, if you extracted the software to <code>/tmp/netapp_linux_tools_1_0</code> , you would enter <code>cd /tmp/netapp_linux_tools_1_0</code>
	You are using software obtained from a CD-ROM	1. Mount the CD-ROM on the host system. 2. Change to the directory where your CD-ROM is mounted. For example, change to <code>/mnt/cdrom</code> by entering the following command: <code>cd /mnt/cdrom</code>
3	Enter the following command to remove the existing software: <code>./uninstall</code> Note _____This command does not produce any output. It simply returns you to the command line prompt. _____	

About this chapter

This chapter provides the following information:

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

Topics in this chapter

This chapter discusses the following topics:

- ◆ “[Creating LUNs on the filer](#)” on page 50
- ◆ “[Configuring the LUNs](#)” on page 63
- ◆ “[Displaying LUN and HBA Information](#)” on page 67

Creating LUNs on the filer

- Rule for creating LUNs

You must ensure that the LUNs are in the filer’s qtree root or root of a volume.
- Best practices for creating LUNs

The best practices for creating LUNs are the following:

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

For more information about creating and managing LUNs, see *Data ONTAP SAN System Administrator’s Guide*.
- Tasks to create and map LUNs on the filer

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

- ◆ Find the WWPN for the host HBA port.
 - ◆ Create an initiator group on the filer.

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

The host can access only the LUNs mapped to an initiator group.
- Finding the WWPNs for the host HBA

To find the WWPN for the host HBA, complete the following steps.

Step	Action
1	Log in as root on the host.

Step	Action
2	Use the <code>modprobe</code> command to load the driver. Example: If your driver is called <code>qla23000</code>, you would enter the following command: <pre>/sbin/modprobe qla23000</pre> The system creates a <code>/proc/scsi/qla2300</code> directory that contains a file for each QLogic HBA port. The WWPN is in the file for that port.
3	Look in each <code>/proc/scsi/qla2300/HBA-num</code> file and get the WWPN. The filename is the HBA port number. Example: To get the WWPN for port 2, you would look in the file: <pre>/proc/scsi/qla2300/2</pre>
4	Repeat Step 3 for each file.

Creating an initiator group on the filer

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

Step	Action
1	Log in as root on the host.
2	Change to the <code>/usr/sbin</code> directory: <pre>cd /usr/sbin</pre>

Step	Action
3	Enter the following command: <pre>sanlun fcp show adapter -c</pre> -c tells san lun to display on the screen the command line you need to enter to create an initiator group. Result: An igroup create command with the host's WWPNs appears on the screen. The initiator group's name matches the name of the host. Example: <pre># sanlun fcp show adapter -c Enter this filer command to create an initiator group for this system: igroup create -f -t linux "netapp" 210000e08b0936a2 210100e08b2936a2 #</pre> In this example, the name of the host is "netapp," so the name of the initiator group with the WWPNs is "netapp."
4	Access the filer. You can do this from the host using a command such as telnet, or you can use the filer console.
5	At the filer command line, enter the igroup create information that you got in Step 3. Result: An initiator group is created on the filer. Example: On the filerX command line, enter the igroup create information from Step 3. <pre>filerX> igroup create -f -t linux "netapp" 210000e08b0936a2 210100e08b2936a2 filerX></pre> This command line creates an initiator group named netapp that uses two WWPNs.

Step	Action
6	On the filer's command line, enter the following command to verify the newly created initiator group: igroup show Result: The newly created initiator group with the host's WWPNs is displayed. Example: <pre>filerX> igroup show netapp (FCP) (ostype: linux): 21:00:00:e0:8b:09:7b:de (logged in on adapter 4a) 21:01:00:e0:8b:29:7b:de (logged in on adapter 5a) filerX></pre>

Step	Action
7	On the filer's command line, enter the command to show the FCP initiator port names: <pre>fcpx show initiator</pre> Result: The WWPNs for the FCP initiator HBAs and their initiator group are displayed. Example: The following example is for a fabric-attached SAN configuration with a clustered filer pair (adapter 4a and 5a): <pre>filerX> fcpx show initiator Initiators connected on adapter 4a: Portname Group 21:00:00:e0:8b:09:7b:de netapp Adapter 4b is running on behalf of the partner. Use the partner command to view this adapter when in takeover mode. Initiators connected on adapter 5a: Portname Group 21:01:00:e0:8b:29:7b:de netapp Adapter 5b is running on behalf of the partner. Use the partner command to view this adapter when in takeover mode. filerX></pre> Example: The following example is for a direct-attached configuration: <pre>filerY> fcpx show initiator Initiators connected on adapter 5a: Portname Group 21:00:00:e0:8b:0a:47:a6 hostB Initiators connected on adapter 5b: None connected. filerY></pre>

Creating LUNs with the lun setup command

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

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

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

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

Step	Action
1	On the filer's command line, enter the following command to start the LUN creation script: <pre>filerX> lun setup</pre> This setup will take you through the steps needed to create LUNs and to make them accessible by initiators. You can type ^C (Control-C) at any time to abort the setup and no unconfirmed changes will be made to the system. Result: The filer starts the LUN setup script, which prompts you for the information it needs to create the LUN.
2	Enter y in response to the prompt: <pre>filerX> Do you want to create a LUN? [y]: y</pre>
3	Enter linux in response to the prompt: <pre>filerX> OS type of LUN (default/solaris/windows/linux) [default]: linux</pre> Note— If you select “default,” Data ONTAP determines which operating system to use. Result: The LUN you are creating will use the Linux operating system.

Step	Action
4	Enter the path to the LUN in response to the next prompt: A LUN path must be absolute. A LUN can only reside in a volume or qtree root. For example, to create a LUN with the name "lun0" in the qtree root /vol/vol1/q0, specify the path as "/vol/vol1/q0/lun0" Enter LUN path: <i>lun_path</i> Example: An example of a <i>lun_path</i> is /vol/vol1/qtree1/lun_sdata or /vol/vol1/hostA_0. Caution_____ Do not create LUNs in /vol/vol0. _____ Result: The name of the LUN (the LUN path) is defined.
5	Enter y in response to the following prompt if you want to use space reservations (recommended) or n if you do not: A LUN can be created with or without space reservations being enabled. Space reservation guarantees that data writes to that LUN will never fail. Do you want the LUN to be space reserved? [y]: y Result: The LUN you are creating will use space reservations.
6	Enter the LUN size in response to the next prompt: Size for a LUN is specified in bytes. You can use single-character multiplier suffixes: b(sectors), k(KB), m(MB), g(GB) or t(TB). Enter LUN size: ____ Example: An example is 5g, meaning 5 GB of raw disk. Result: The LUN you are creating will have the specified size of raw disk. The quantity of usable disk space by the host varies depending on the host's operating system and the application using the LUN.

Step	Action
7	Enter a comment string, if desired, or press Enter in response to the next prompt: You can add a comment string to describe the contents of the LUN. Please type a string (without quotes), or hit ENTER if you don't want to supply a comment. Enter comment string:_____ Note_____ If you press Enter and do not add a comment, you can add a comment later with the <code>lun comment</code> command. If you are using the FilerView® interface, a LUN description is the same as a comment. For more information about the <code>lun comment</code> command, see the <code>na_lun (1)</code> man page on the filer.
8	To create an initiator group (igroup), enter the igroup name when prompted. The name can be for an ◆ Existing igroup. To see a list of the existing initiator groups, enter <code>?</code>. The setup script displays the names of any initiator groups you created in “Creating an initiator group on the filer” on page 51. ◆ Igroup you want to create. If you enter a name that does not exist, the setup script creates it. Note_____ To accept the default initiator group, press Enter without supplying a value here. _____ 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 <code>'?'</code> to see existing initiator group names. Name of initiator group [shows igroup name if exists]: <i>new_group_name</i> Result: The initiator group <i>new_group_name</i> is created. Instead of <i>new_group_name</i>, you could enter a value such as <code>linux_groupB</code> or <code>hostA</code>.

Step	Action
9	Press Enter at the next prompt to accept FCP as the protocol for the initiator group: Type of initiator group <i>new_group_name</i> (FCP/iSCSI) [FCP]: Result: Choosing FCP means that the initiator WWPNs in this initiator group are using FCP for SCSI protocol.

Step	Action												
10	Enter the port names you want to use with this initiator group in response to the next prompt. When you have multiple port names, separate them with commas. You can determine the available port names by performing the following tasks: ◆ To see a list of initiator WWPNs connected to the target HBAs and associated initiator groups (if they exist), enter ?. ◆ To get a list of initiator HBAs and their WWPNs specific to a certain host, run the sanlun fcp show adapter command run on the host. A Fibre Channel Protocol (FCP) initiator group is a collection of initiator port names. Each port name (WWPN) is 16 hexadecimal digits, separated (only) by optional colon (:) characters. You can separate port names by commas. Enter '?' to display a list of connected initiators. Hit ENTER when you are done adding port names to this group. Enter comma separated portnames:<portname>,<portname> <i>portname</i> is the WWPN associated with an initiator HBA. Example: This example checks to see which portnames are available and then adds the initiator HBA with WWPN 12:01:00:e0:8b:2a:47:a6 to the igroup <i>new_group_name</i>. Enter comma separated portnames: ? Initiators connected on adapter 4a: <table> <tr> <td>Portname</td><td>Group</td></tr> <tr> <td>21:00:00:e0:8b:09:7b:de</td><td>netapp</td></tr> <tr> <td>21:00:00:e0:8b:0a:47:a6</td><td>netapp2; netapp2-1a</td></tr> </table> Adapter 4b is running on behalf of the partner. Initiators connected on adapter 5a: <table> <tr> <td>Portname</td><td>Group</td></tr> <tr> <td>21:01:00:e0:8b:29:7b:de</td><td>netapp</td></tr> <tr> <td>21:01:00:e0:8b:2a:47:a6</td><td>netapp2</td></tr> </table> Adapter 5b is running on behalf of the partner. Enter comma separated portnames: 12:01:00:e0:8b:2a:47:a6 Result: The initiator WWPN is added to the igroup <i>new_group_name</i>.	Portname	Group	21:00:00:e0:8b:09:7b:de	netapp	21:00:00:e0:8b:0a:47:a6	netapp2; netapp2-1a	Portname	Group	21:01:00:e0:8b:29:7b:de	netapp	21:01:00:e0:8b:2a:47:a6	netapp2
Portname	Group												
21:00:00:e0:8b:09:7b:de	netapp												
21:00:00:e0:8b:0a:47:a6	netapp2; netapp2-1a												
Portname	Group												
21:01:00:e0:8b:29:7b:de	netapp												
21:01:00:e0:8b:2a:47:a6	netapp2												

Step	Action
11	Enter linux in response to the next prompt: The initiator group has an associated OS type. The following are currently supported: solaris, windows, linux or default. OS type of initiator group "<i>new_group_name</i>" [default]: linux Result: The operating system for the initiator group is defined as Linux.
12	Press Enter at the next prompt to accept the next available LUN ID for the LUN that is mapped to the initiator group. You can also enter an unused LUN ID. To see which LUNs are in use by one or more initiators in the specified initiator group, enter ? at the prompt. Note_____ This LUN ID is associated with the <i>lun_path</i> and the initiator group name (<i>new_group_name</i>). _____ The LUN will be accessible to all the initiators in the initiator group. Enter '?' to display LUNs already in use by one or more initiators in group "<i>new_group_name</i>". LUN ID at which initiator group "<i>new_group_name</i>" sees "/vol/vol1/netapp" [1]: ? Example: In this example, 1 is the next available LUN ID (as shown in the brackets). Pressing Enter creates a LUN 1.

Step	Action
13	The program displays information about this configuration and asks if you want to accept it. At the prompt, enter ◆ y to accept the configuration. ◆ n to discard the configuration. <pre> LUN Path : /vol/vol1/netapp OS Type : linux Size : 5g (5368709120) Initiator Group : netapp1 Initiator Group Type : FCP Initiator Group Members : 21:01:00:e0:8b:2a:47:a6 : 21:01:00:e0:8b:29:7b:de Mapped to LUN-ID : 3 Do you want to accept this configuration? [y]: </pre> Result: If you enter y, the LUN is mapped to the specified initiator group and all changes to the system are committed. At this point, Ctrl-C cannot undo the changes.
14	End the program or continue creating LUNs by responding to the final prompt: <pre> Do you want to create another LUN? [n]: </pre>

Verifying the mapped LUN

To verify the mapped LUN, complete the following step.

Step	Action
1	On the filer's command line, enter the following command to show the mapped LUN: <pre>lun show -v <lun-path></pre> <i>lun-path</i> is the name of a specific LUN. Result: The information for the specified LUN is displayed. Example: <pre>filerX> lun show -v /vol/vol1/netapp /vol/vol1/netapp 5g (5368709120) (r/w, online, mapped) Serial#: 0dGg0Iiy9-pj Share: none Space Reservation: enabled Multiprotocol Type: image Maps: netapp=3 filerX></pre>

Configuring the LUNs

Tasks for configuring the LUNs

You need to perform the following tasks to configure the LUNs:

- ◆ Configure the host to find the LUNs.
- ◆ Verify that the new LUNs are visible to the host and displayed correctly.
- ◆ Enable the host to discover any new LUNs you add.
- ◆ Label the new LUNs as Linux disks with one of the following:
 - ❖ Create a standard partition table and with the format command, labeling the new LUNs as Linux disks.
 - ❖ Use raw access.
- ◆ Reboot the host system.

Configuring the host to find LUNs

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

Note_____

You must log in as root.

Step	Action	
1	Reboot the host. When the driver module is reloaded, it should find the LUNs.	
	If you...	Then...
	Created a RAMDISK image	The host automatically loads the driver when it reboots.
	Are using a manual process to load the driver	Enter the modprobe command. Example: /sbin/modprobe qla2300

Enabling the host to discover the new LUNs

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

Step	Action
1	Log in as root on the host.
2	Unload the driver. You can use the <code>modprobe -r</code> command to do this. Example: <code>/sbin/modprobe -r qla2300</code>
3	Restart the driver. You can use the <code>modprobe</code> command to do this. Example: <code>/sbin/modprobe qla2300</code>

Verifying LUN visibility

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

Step	Action
1	Log in as root on the host.

Step	Action
2	To verify that the LUNs are now visible, use the <code>sanlun lun show</code> command to display the mapped LUN. To check for a specific LUN, include the filer and LUN path on the command line. <pre>sanlun lun show <i>filer_name:path_name</i></pre> <i>filer_name</i> is the filer's name. <i>path_name</i> is the name of the LUN. Result: The command displays the filer name, LUN path name, device name, HBA name, protocol, LUN size, and LUN state. Result: The information for the specified LUN is displayed. Example: <pre>[root@netapp]# sanlun lun show filerX:/vol/vol1/ha1 filer: lun-pathname device filename adapter protocol lun size lun state filerX: /vol/vol1/ha1 /dev/sdc qlaQLA23122 FCP 4g (4294967296) GOOD</pre> Example: The following is an example of the type of information you would see if you executed the <code>sanlun lun show</code> command without specifying a LUN path: <pre>filer: lun-pathname device filename adapter protocol lun size lun state filerX: /vol/vol1/rawio0 /dev/sdj qlaQLA23122 FCP 150g (161061273600)GOOD filerX: /vol/vol1/rawio1 /dev/sdk qlaQLA23122 FCP 150g (161061273600)GOOD filerX: /vol/vol1/fs0 /dev/sdl qlaQLA23122 FCP 100m (104857600) GOOD filerX: /vol/vol1/ha0 /dev/sdb qlaQLA23122 FCP 3g (3221225472) GOOD filerX: /vol/vol1/ha1 /dev/sdc qlaQLA23122 FCP 4g (4294967296) GOOD filerX: /vol/vol1/ha2 /dev/sdd qlaQLA23122 FCP 5g (5368709120) GOOD</pre>

Labeling the new LUNs as disks

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

Step	Action
1	Log in as root on the host.

Step	Action	
2	If...	Then...
	You plan to use the LUN through a file system and you want to set up a partition table	Enter the following command: <pre>fdisk /dev/sd[char]</pre> <code>char</code> is the identifier for the SCSI device. Result: This command line starts an interactive session for creating a partition. Make sure you reserve the header information at the top of the disk device when you use FCP so that it is not overwritten. Having a partition will accomplish this.
	You are using raw access	Use the <code>raw</code> command to bind the raw device to the block device.

Partition table for LUNs for multiprotocol access

You can access the data in a LUN both as a raw character device (for example, `/dev/raw/raw1`) 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.

Displaying LUN and HBA Information

Utility for displaying information

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

For detailed information

For detailed information, see the following topics:

- ◆ “[Displaying host LUN information](#)” on page 67
- ◆ “[Displaying host HBA information](#)” on page 68

Displaying host LUN information

To display host LUN information, complete the following steps.

Step	Action
1	Log in as root on the host.
2	Change to the directory where you installed the NetApp <code>san lun</code> utility. Example: Depending on your installation directory, you might enter the following command line: <code>cd /tmp/netapp_linux_tools_1_0</code>

Step	Action
3	At the host command line, use the <code>sanlun lun show</code> command to display LUN information: <pre>sanlun lun show [-v] [-d <i>host device filename</i> <i>all</i> <i>filer name</i> <i>filer name:filer pathname</i>]</pre> <code>-v</code> option produces verbose output. <code>-d</code> is the device option and can be one of the following: ◆ <i>host device filename</i> is the special device file name for the disk on Linux (which might represent a filer LUN). ◆ <i>all</i> lists the filer LUNs. ◆ <i>filer name</i> lists the filer LUNs under on a specified filer. ◆ <i>filer name: filer pathname</i> lists all filer LUNs under <code>/dev/rdisk</code> that are connected to the filer path name LUN on a specified filer. Result: The requested LUN information is displayed. Example: <pre>[netapp]# sanlun lun show -v -d /dev/sdc filer: lun-pathname device filename adapter protocol lun size lun state laski: /vol/vol1/rawio0 /dev/sdc qlaQLA23123 FCP 150g (161061273600) GOOD Serial number: 0dFsLIiMnliw Filer FCP nodename:50a980000200db21 Filer FCP portname:50a980010200db21 Filer adapter name: 4a Filer IP address: 10.60.139.19 16.00.00.24 Filer volume name:vol1 FSID:0x400db21 Filer qtree name:/vol/vol1 ID:0x0 Filer snapshot name: ID:0x0 [netapp]# #</pre>

Displaying host HBA information

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

Step	Action
1	Log in as root on the host.

Step	Action
2	Change to the directory where you installed the NetApp sanlun utility. Example: Depending on you installation directory, you might enter the following command line: <pre>cd /tmp/netapp_linux_tools_1_0</pre>

Step	Action
3	At the host command line, use the <code>sanlun fcp show adapter</code> command to display host HBA information: <pre>sanlun fcp show adapter[-c] [-v] [adapter name all]</pre> -c option produces configuration instructions. -v option produces verbose output. all lists information for all FCP adapters. <i>adapter name</i> lists information for a specified adapter. Result: The FCP adapter information is displayed. Example: <pre># sanlun fcp show adapter -v qlaQLA23123 WPN:210000e08b0a47a6 WWNN: 200000e08b0a47a6 driver name: qlaQLA2312 model: QLA2312 model description: QLogic QLA2312 serial number: G97927 hardware version: FC5010409-10 x driver version: v.6.04.00 firmware version: v. 3.01.18 Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /proc/scsi/qla2300/3 qlaQLA23124 WPN:210100e08b2a47a6 WWNN: 200100e08b2a47a6 driver name: qlaQLA2312 model: QLA2312 model description: QLogic QLA2312 serial number: \95079 hardware version: FC5010409-10 driver version: v.6.04.00 firmware version: v. 3.01.18 Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /proc/scsi/qla2300/4 #</pre>

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

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

- ◆ [“Troubleshooting issues related to the driver and HBA”](#) on page 72
- ◆ [“Troubleshooting LUN management”](#) on page 76
- ◆ [“Error messages during I/O”](#) on page 79
- ◆ [“Checking the status of the link”](#) on page 80
- ◆ [“General troubleshooting”](#) on page 81

Troubleshooting issues related to the driver and HBA

Determining whether the driver loaded

Problem: You want to confirm that the driver loaded.

Explanation: Unless you rebuilt the kernel to include this driver, you must load it each time you reboot the host. You can do this by creating a RAMDISK image to load the driver automatically when the host reboots or by using the `modprobe` command to load the driver manually.

What to do: To confirm that the driver loaded, use the `lsmod` command. You should see a display similar to the following one:

```
root@netapp bin]# lsmod | grep qla2300
Module      Size      Used by      Not tainted
qla2300     249728        1
scsi_mod    125884        4      [iscsi qla2300 aic7xxx sd_mod]
```

The host hangs when you start the SANsurfer agent

Problem: You try to start the SANsurfer agent `qlremote`, but the machine hangs.

Explanation: You are not using the failover version of the driver. QLogic supports the SANblade Manager on Linux with the failover version of the driver only.

What to do: Complete the following steps.

Step	Action
1	Delete the options for the <code>qla23xx</code> driver in the <code>/etc/modules.conf</code> file.
2	Download the failover version of the driver.
3	Install and configure the driver according to the instructions in <i>Chapter 3: Setting Up the Driver</i> .
4	Start the SANsurfer agent <code>qlremote</code> .

You can't remove the driver using modprobe -r

Problem: You use the `modprobe -r` command to remove the driver, but the command fails with an error message similar to

```
[root@netapp bin]# modprobe -r qla2300
qla2300: Device or resource busy
```

Explanation: The `modprobe -r` command fails when

- ◆ You execute it from the `proc qla2300` directory.
- ◆ The `/etc/init.d/qlremote` process is running.
- ◆ A file system is loaded.

What to do: When you execute the command, make sure

- ◆ You are not executing it from the `\proc qla2300` directory.
- ◆ The SANsurfer agent `qlremote` is not running. To halt the `qlremote` agent, enter

```
[root@netapp bin]# /etc/init.d/qlremote stop
Stopping qlremote agent services
Terminated
```

- ◆ There are no file systems mounted.

The file systems are unmounted, but modprobe -r fails

Problem: You unmounted all file systems that were created on top of the filer LUNs, but the `modprobe -r` command still fails.

Explanation: This problem can occur when the driver has dependencies, such as the `qlremote` agent running.

What to do: Execute the `lsmod` command and check the “Use” column in the output. If there is a value greater than 0 in that column, the driver has dependencies that you must remove. In the following example, the `lsmod` command shows that there is still a dependency related to the driver. By looking further, it becomes clear that the `qlremote` demon is running.

```
[root@netapp bin]# lsmod | grep qla2300
Module      Size      Used by      Not tainted
qla2300     249728        1
scsi_mod    125884        4          [iscsi qla2300 aic7xxx sd_mod]
[root@netapp bin]# ps -ef | grep ql
root 18 1 0 May06 ? 00:00:00 [qla2300_dpc2]
root 19 1 0 May06 ? 00:00:00 [qla2300_dpc3]
root 20 1 0 May06 ? 00:00:00 [qla2300_dpc4]
root 21 1 0 May06 ? 00:00:00 [qla2300_dpc5]
root 17468 1306 0 10:00 pts/0 00:00:00 grep ql
```

You must stop the qlremote daemon before the driver can be unloaded:

```
[root@netapp bin]# /etc/init.d/qlremote stop
Stopping qlremote agent services
Terminated
[root@netapp bin]# lsmod | grep qla2300
Module      Size      Used by      Not tainted
qla2300    249728         0
scsi_mod  125884         4      [iscsi qla2300 aic7xxx sd_mod]
```

You can now remove the driver.

The wrong values appear for options

Problem: You modified the /etc/modules.conf file to change the value of some options, but when you reboot the host, the new values don't take effect.

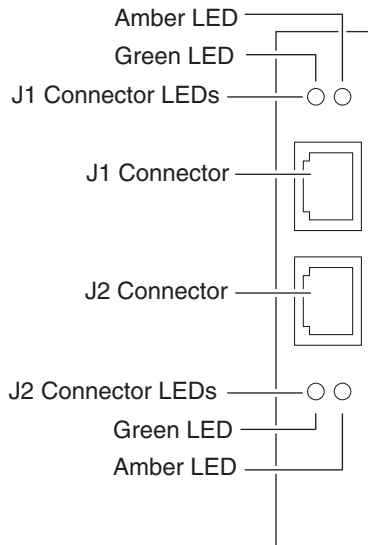
Explanation: This problem can occur when you use RAMDISK image file to start the driver automatically each time you reboot. The RAMDISK image is a static file, so anytime you modify the configuration values you must rebuild the file.

What to do: Rebuild the RAMDISK image file. Information on doing this is in *Chapter 3: Setting Up the Driver*.

Not all the LEDs are lit on the HBA

Problem: Some of the LEDs on the QLogic HBA are not lit or are flashing.

Explanation: In normal use, not all the LEDs are always lit. If an LED is flashing it can indicate a problem with either the synchronization or the firmware. The following graphic shows the different LEDs



What to do: The following table explains the activities indicated by the LEDs. Check the QLogic documentation if you have a problem with synchronization or the firmware.

Green LED	Amber LED	Activity
On	On	Power
On	Off	Online
Off	On	Signal acquired
Off	Flashing	Loss of synchronization
Flashing	Flashing	Firmware error

Troubleshooting LUN management

The `sanlun` command shows deleted LUNs

Problem: The `sanlun` command reports a LUN that was deleted.

Explanation: The `sanlun` commands reports this entry because there is still a `/dev/sd` 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.

LUNs are not visible to the host

Problem: LUNs are not visible to the host. These can be

- ◆ New LUNs that you created on the filer and mapped to an initiator group.
- ◆ LUNs that were visible but disappeared after the host was rebooted.

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

Step	Action
1	Log in as root on the host.
2	Unload the driver. You can use the <code>modprobe -r</code> command to do this. Example: <code>/sbin/modprobe -r qla2300</code>
3	Restart the driver. You can use the <code>modprobe</code> command to do this. Example: <code>/sbin/modprobe qla2300</code>
4	Check to see if the LUNs are now visible. If the LUNs are not visible, continue with Step 5.

Step	Action
5	Enter the following command line: <pre>echo "scsi add-single-device \$h \$c \$t \$l" >/proc/scsi/scsi</pre> <i>\$h</i> is the adapter index (small integer). <i>\$c</i> is the channel index on the adaptor (small integer). <i>\$t</i> is the SCSI target ID. <i>\$l</i> is the LUN ID. See the <code>proc</code> man page for more information.

Only one LUN is visible per target

Problem: Only one LUN is visible per target filer. The LUN has a map ID of 0.

Explanation: The value in the `/etc/modules.conf` file might not be correct.

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

Step	Action
1	Log in as root on the host.
2	In the <code>/etc/modules.conf</code> file, increase the maximum number of LUNs to 128. The line should now read <pre>options scsi_mod max_scsi_luns=128</pre>
3	If you are using a RAMDISK image file to restart the driver automatically when the host reboots, rebuild the <code>initrd</code> file as described in the “Setting Up the Driver” chapter and the QLogic documentation.
4	Restart the driver. You can use the <code>modprobe</code> command to do this.
5	Check to see if the LUNs are now visible. If the LUNs are not visible, continue with Step 5.

Step	Action
6	Enter the following command line: <pre>echo "scsi add-single-device \$h \$c \$t \$l" >/proc/scsi/scsi</pre> <i>\$h</i> is the adapter index (small integer). <i>\$c</i> is the channel index on the adaptor (small integer). <i>\$t</i> is the SCSI target ID. <i>\$l</i> is the LUN ID. See the <code>proc</code> man page for more information.

Error messages during I/O

SCSI transport errors

Problem: You check the `/var/log/messages` file and find I/O error messages similar to the following:

```
May 9 14:48:18 netapp kernel: scsi(2): LOOP DOWN detected.
May 9 14:49:21 netapp kernel: qla2x00: FAILOVER device 1 from
50a980010200efac -> 50a980030200efac - LUN 00, reason=0x1
May 9 14:49:21 netapp kernel: qla2x00: FROM HBA 0 to HBA 1
May 9 14:50:45 netapp kernel: SCSI disk error : host 2 channel 0 id
1 lun 0 return code = 20000
May 9 14:50:45 netapp kernel: I/O error: dev 08:10, sector 10379520
May 9 15:59:26 netapp kernel: scsi(2): LOOP UP detected.
May 9 15:59:26 netapp kernel: scsi(2): Waiting for LIP to
complete...
May 9 15:59:26 netapp kernel: scsi(2): Topology - (F_Port), Host
Loop address 0xffff
```

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	On the host console, enter the following command: <pre># sanlun fcp show adapter -v</pre> Result: The sanlun command shows the status of the HBA. The following text shows example output: <pre>[netapp]# sanlun fcp show adapter -v</pre> <pre>qla2 WPN:210000e08b078b6b WWNN: 200000e08b078b6b driver name: qlaQLA2312 model: QLA2312 model description: QLogic QLA2312 serial number: E86283 hardware version: FC5010409-10 x driver version: v.6.04.00 firmware version: v. 3.01.18 Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 Gbit/sec negotiated speed: 2 Gbit/sec OS device name: /proc/scsi/qla2300/2</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 supports only 1 Gbit/sec. The filer and switches by NetApp support a 2 Gbit/sec data transfer rate.

General troubleshooting

Basic operations take a long time

Problem: There are no errors and everything appears to be correctly connected, but basic operations are taking exceptionally long times; in some cases, hours instead of minutes.

Explanation: If there are no other problems, this could mean that one of the connectors is not firmly attached. This can be the case even when it has a link and is reporting information such as the correct speed.

What to do: Disconnect the connector and reconnect it.

Index

Symbols

/etc/modules.conf file
 modify 23, 33
 troubleshooting 74

A

alias command 33

B

boot loader
 specifying LUNs 33

C

cable requirements 14
cabling
 direct-attached host 16
 host to filer 14
 single-path host 14
cat command 24
command conventions vii
commands
 alias 33
 cat 24
 depmod 23, 33
 dmesg 24
 fcpx show initiator 54
 igroup show 53
 lsmod 73
 lun setup 55
 lun show 62
 modprobe 24, 28, 73
 qlremote 74
 sanlun lun show 65, 68
communication between host and filer 2
configurations
 direct-attached 5
 fabric-attached 3
 multipath 4
 types of supported 2

conventions

 command vii
 keyboard vii
 typographic viii

D

deleted LUNs 76
depmod 23
depmod command 33
direct-attached configuration 5
 cabling 16
disk
 labeling 65
disk shelves
 turning on power 17
driver
 building 22
 confirming its loaded 72
 downloading 20
 installing 21
 loading 22
 reloading 28
 reloading automatically 28, 63
 reloading manually 28, 63
 removing 28
 sample setup 29
 supported 10

F

fabric-attached host
 multipath connection 4
 single-path connection 3
 single-path host cabling 14
FCP service
 start 23
fcpx show initiator 54
FCP/iSCSI Configuration Guide 11
 table of pages 12
filers
 defined vii
 turning on power 17

files

/etc/modules.conf 23, 33, 74

initrd 25

G

GRUB boot loader 33

gunzip

uncompressing software package 44

H

HBA

displaying information with sanlun 68

LEDs 74

supported 9

HBA port

creating alias 33

host

attach kit contents 7

cabling direct-attached configuration 16

cabling to a filer 14

configuring host to find LUNs 63

direct-attached configuration 5

discover new LUNs 64

multipath configuration 4

single-path cabling 14

single-path configuration 3

turning on power 17

host attach kit

contents 7

I

igroup show 53

initiator group, creating 51

initrd file 25

installation

installing from CD 46

installing the software 45

obtaining the software package 42

preparing for NetApp software 42

sample output 46

uncompressing the software package 42, 43

uninstalling the NetApp software 47

K

kernel

building 22

keyboard conventions vii

L

LEDs on the HBA 74

LILO boot loader 30

lsmod

checking what's in use 73

LUN ID 60

defined vii

lun setup 55

lun show 62

LUNs

best practices for creating 50

creating with lun setup 55

defined vii

deleted 76

displaying host information 67

labeling as disks 65

not visible 76

only one visible per target 77

partitioning for multiprotocol access 66

rules for creating 50

set Preferred Path 35

specifying for SCSI mid-level driver 33

spreading out I/O 25

tasks for creating on filer 50

troubleshooting 76

verifying 65

verifying mapping 62

LUNs per Target option 36

setting 25

M

modprobe

command fails 73

modprobe command 24

fails 73

removing driver 28

using depmod 33

multipath configuration 4

- multipathing
 - check LUN 24
 - checking LUNs 34
 - QLogic Multi-pathing 20

N

- NetApp software package 42
 - downloading from NOW 43
 - installing 45
 - installing from CD 46
 - sanlun utility 42
 - scripts 42
 - uncompressing 43
 - uninstalling 47

P

- partition table
 - creating 26
- password
 - SANblade Manager 36
- power
 - order for turning on 17

Q

- QLogic
 - Multi-pathing 24, 34
 - SANsurfer 21
 - setting up Multi-pathing 20
- QLogic driver
 - see driver 19
- qlremote 26
 - machine hangs 72
 - running 34
 - stopping 74
- queue depth
 - specifying 33

R

- RAMDISK
 - changing option values 74
 - creating 27, 39
 - raw access

- setting up 26
- Red Hat
 - creating a RAMDISK 27
 - driver 20
 - driver requirements 10
- Red Hat® Enterprise Linux vii requirements 9
 - cable 14
 - driver 10
 - HBA 9
 - SANsurfer 10

S

- SAN Host Release Notes 1.0 for Fibre Channel Protocol on Linux 11
- SAN Setup Overview for FCP 11
- SANblade Manager 25, 35
 - default password 36, 37
 - LUNs per Target option 36
 - starting 34
 - switch timeout option 36
- sanlun fcp show 70
- sanlun lun show 65, 68
- sanlun utility 42
 - about 67
 - sanlun fcp show adapter 70
 - sanlun lun show 68
- SANsurfer
 - configuring LUNs 25
 - getting 21
 - qlremote 26
 - SANblade Manager 35
 - starting 34, 35
 - version 10
- SCSI mid-level driver
 - LUNs in use 33
- single-path configuration 3
- software package
 - contents 42
- SuSE
 - creating a RAMDISK 27
 - driver 20
 - driver requirements 10
 - driver setup 30

- SuSE® Enterprise Server 8 vii
- switches
 - setting timeout values 36
 - timeout values 25
 - turning on power 17
- system requirements 9
 - driver 10
 - HBA 9
 - SANsurfer 10

T

- timeout values
 - setting for switch 25
- troubleshooting
 - /etc/modules.conf 74

- checking the LEDs on the HBA 74
- confirming driver loaded 72
- LUN deleted 76
- LUNs not visible 76
- machine hangs 72
- modprobe -r fails 73
- only one LUN visible 77
- stopping qlremote 74
- typographic conventions viii

W

- WWPN
 - getting 51