

SAN Host Attach Kit 1.0 for Fibre Channel Protocol on HP-UX® Installation and Setup Guide

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 210-00364
January 2004

Copyright and trademark information

Copyright information

Copyright © 1994–2004 Network Appliance, Inc. All rights reserved. Printed in the U.S.A.

Portions © 1998–2001 The OpenSSL Project. All rights reserved.

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.

Portions of the software were created by Netscape Communications Corp.

The contents of those portions are subject to the Netscape Public License Version 1.0 (the “License”); you may not use those portions except in compliance with the License. You may obtain a copy of the License at <http://www.mozilla.org/NPL/>.

Software distributed under the License is distributed on an “AS IS” basis, WITHOUT WARRANTY OF ANY KIND, either express or implied. See the License for the specific language governing rights and limitations under the License.

The Original Code is Mozilla Communicator client code, released March 31, 1998.

The Initial Developer of the Original Code is Netscape Communications Corp. Portions created by Netscape are Copyright © 1998 Netscape Communications Corp. All rights reserved.

This software contains materials from third parties licensed to Network Appliance Inc. which is sublicensed, and not sold, and title to such material is not passed to the end user. All rights reserved by the licensors. You shall not sublicense or permit timesharing, rental, facility management or service bureau usage of the Software.

Portions developed by the Apache Software Foundation (<http://www.apache.org/>). Copyright © 1999 The Apache Software Foundation.

Portions Copyright © 1995–1998, Jean-loup Gailly and Mark Adler

Portions Copyright © 2001, Sitraka Inc.

Portions Copyright © 2001, iAnywhere Solutions

Portions Copyright © 2001, i-net software GmbH

Portions of this product are derived from version 2.4.11 of the libxml2 library, which is copyrighted by the World Wide Web Consortium.

Network Appliance modified the libxml2 software on December 6, 2001, to enable it to compile cleanly on Windows, Solaris, and Linux. The changes have been sent to the maintainers of libxml2. The unmodified libxml2 software can be downloaded from <http://www.xmlsoft.org/>.

Copyright © 1994–2002 World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University). All Rights Reserved. <http://www.w3.org/Consortium/Legal/>

Software derived from copyrighted material of the World Wide Web Consortium is subject to the following license and disclaimer:

Permission to use, copy, modify, and distribute this software and its documentation, with or without modification, for any purpose and without fee or royalty is hereby granted, provided that you include the following on ALL copies of the software and documentation or portions thereof, including modifications, that you make:

1. The full text of this NOTICE in a location viewable to users of the redistributed or derivative work.
2. Any pre-existing intellectual property disclaimers, notices, or terms and conditions. If none exist, a short notice of the following form (hypertext is preferred, text is permitted) should be used within the body of any redistributed or derivative code: "Copyright © [Sdate-of-software] World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de

3. Notice of any changes or modifications to the W3C files, including the date changes were made.
(We recommend you provide URLs to the location from which the code is derived.)

THIS SOFTWARE AND DOCUMENTATION IS PROVIDED "AS IS," AND COPYRIGHT HOLDERS MAKE NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR THAT THE USE OF THE SOFTWARE OR DOCUMENTATION WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS OR OTHER RIGHTS.

COPYRIGHT HOLDERS WILL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF ANY USE OF THE SOFTWARE OR DOCUMENTATION.

The name and trademarks of copyright holders may NOT be used in advertising or publicity pertaining to the software without specific, written prior permission. Title to copyright in this software and any associated documentation will at all times remain with copyright holders.

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, the Network Appliance design, NetApp—the Network Appliance Company, FAServer, NearStore, NetCache, and WAFL are registered trademarks of Network Appliance, Inc. in the United States and other countries. 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. SnapCopy is a registered trademark of Network Appliance, Inc. in the European Union and a trademark of Network Appliance, Inc. in the United States. DataFabric, FilerView, SecureShare, SnapManager, SnapMirror, and SnapRestore are registered trademarks of Network Appliance, Inc. in the United States. Data ONTAP and Snapshot are trademarks of Network Appliance, Inc. in the United States and other countries. ApplianceWatch, BareMetal, Center-to-Edge, ContentDirector, gFiler, MultiStore, 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.

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

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

Network Appliance NetCache is certified RealSystem compatible.

Table of Contents

	Preface	.ix
Chapter 1	Introduction to Host/Filer Communication	1
	Understanding host and filer communication	2
	Supported host/filer configurations.	3
	How target FCP ports process traffic for a cluster	5
Chapter 2	Preparing for Installation and Setup.	9
	Overview of the host attach kit installation and setup	10
	Completing the pre-installation tasks.	13
	Where to go for more information	21
Chapter 3	Installing the NetApp Host Attach Kit.	23
	Obtaining the NetApp software package	24
	Installing the NetApp software package	27
	Uninstalling the NetApp software	32
Chapter 4	Creating, Configuring, and Managing LUNs	35
	Overview of adding LUNs to HP-UX	36
	Preparing the filer for HP-UX LUNs.	37
	Creating igroups and LUNs on the filer	38
	Configuring the LUNs	51
	Displaying LUN and HBA information	61
	Displaying host LUN information	62
	Displaying host HBA information	65
Chapter 5	Troubleshooting	67
	Troubleshooting checklists	68
	Correcting volume group multipathing with ntap_config_paths	71

Handling a filer takeover and giveback. 73

Recovering from a host reboot during a filer takeover. 74

Changing the igroup's vsa attribute 78

Commands you can use to troubleshoot problems 83

NetApp's diagnostic utilities 87

General troubleshooting 92

Index 93

Preface

About this guide	This guide describes how to set up the interaction between an HP-UX host and a Network Appliance™ storage appliance (filer) running Data ONTAP™ software with the Fibre Channel Protocol (FCP) for SCSI licensed.
Audience	This guide is for system installers and administrators who are familiar with the HP-UX operating system. It assumes that you understand how to configure and administer a filer and use the filer-licensed SAN protocol, FCP, to store and retrieve data on a filer.
Terminology	This guide uses the following terms: ◆ <i>LUN</i> (Logical Unit Number) refers to a logical unit of storage identified by a number. ◆ <i>LUN ID</i> refers to the numerical identifier for a LUN. ◆ <i>Filer</i> refers to a NetApp® storage appliance that incorporates the CompactFlash™ unit and supports FCP. ◆ <i>Type</i> refers to pressing one or more keys on the keyboard. ◆ <i>Enter</i> refers to pressing one or more keys and then pressing the Enter key.
Filer command conventions	You can enter filer commands on either the system console or from any host system that can access the filer using a remote login, such as the <code>telnet</code> command.
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 <code>lun show -v lunpath</code> command, you enter the characters “lun show -v” followed by the actual path to the LUN. ◆ Book titles listed 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 the following types of special messages:

Note

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

Caution

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

WARNING

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

About this chapter This chapter provides a brief explanation of the host and filer communication and supported configurations.

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

- ◆ “[Understanding host and filer communication](#)” on page 2
- ◆ “[Supported host/filer configurations](#)” on page 3
- ◆ “[How target FCP ports process traffic for a cluster](#)” on page 5

Understanding host and filer communication

How the host and filer communicate

The HP-UX host uses the SCSI protocol over Fibre Channel (FCP) to access data on NetApp filers running NetApp's Data ONTAP software. The filers are target FCP storage appliances. Each host must have Fibre Channel host bus adapters (HBAs) that use FCP to access logical units of storage (LUNs) on a filer to store and retrieve data.

Note

You should install the HBA on the host before you install the NetApp software package. Make sure that you use an HBA supported by NetApp.

On a host, a World Wide Port Name (WWPN) identifies each physical and virtual port on the HBA. You supply the WWPNs when you create initiator groups (igroups) on a filer. An igroup permits the host access to specific LUNs on a filer.

Each target HBA on a filer has two ports—Port A and Port B. Port A is always active. Whether Port B is active depends on the following:

- ◆ If it is part of a clustered pair, the filer's cfmode setting determines when Port B is active.

Note

For information about cfmode settings, see the *Data ONTAP Block Access Management Guide for FCP*.

- ◆ If it is a stand-alone filer, Port B is always active.

Supported host/filer configurations

Configuration components

NetApp supports several types of configurations consisting of different components.

Filer configurations components: Basic configurations for the filer can consist of the following components:

- ◆ A high-availability clustered filer pair
 - ❖ A single filer unit
 - ❖ Up to four target HBAs per filer (that is, a total of eight target HBAs if you have a clustered pair)
 - ❖ A NearStore® backup storage appliance
- ◆ Up to four target HBAs per filer (that is, a total of eight target HBAs if you have a clustered pair)

Host configurations components: Basic configurations for the host can consist of the following components:

- ◆ Up to four initiator HBAs

Connection topologies components: The connection topology between the filer and the host can be one of the following:

- ◆ A direct connection where each host HBA is directly connected to the filer's target HBA port.
- ◆ Switched fabric (SAN) consisting of either one Fibre Channel switch or a pair of redundant Fibre Channel switches

A complete configuration: The completed configuration of host and filers can consist multiple hosts and multiple filers connected directly or using either a single SAN fabric or several disjointed SAN fabrics. Regardless of the connection you use, if you have two or more physical paths to the same LUN, you must have HP-UX's PVLlinks multipathing software installed on the host.

Recommended production configurations

NetApp recommends the following configurations for production environments. For additional information about supported configurations, including topology and cabling examples, see the FCP/iSCSI Configuration Guide at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/.

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

These configurations require that you have HP-UX's PVLinks multipathing software installed on the host.

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

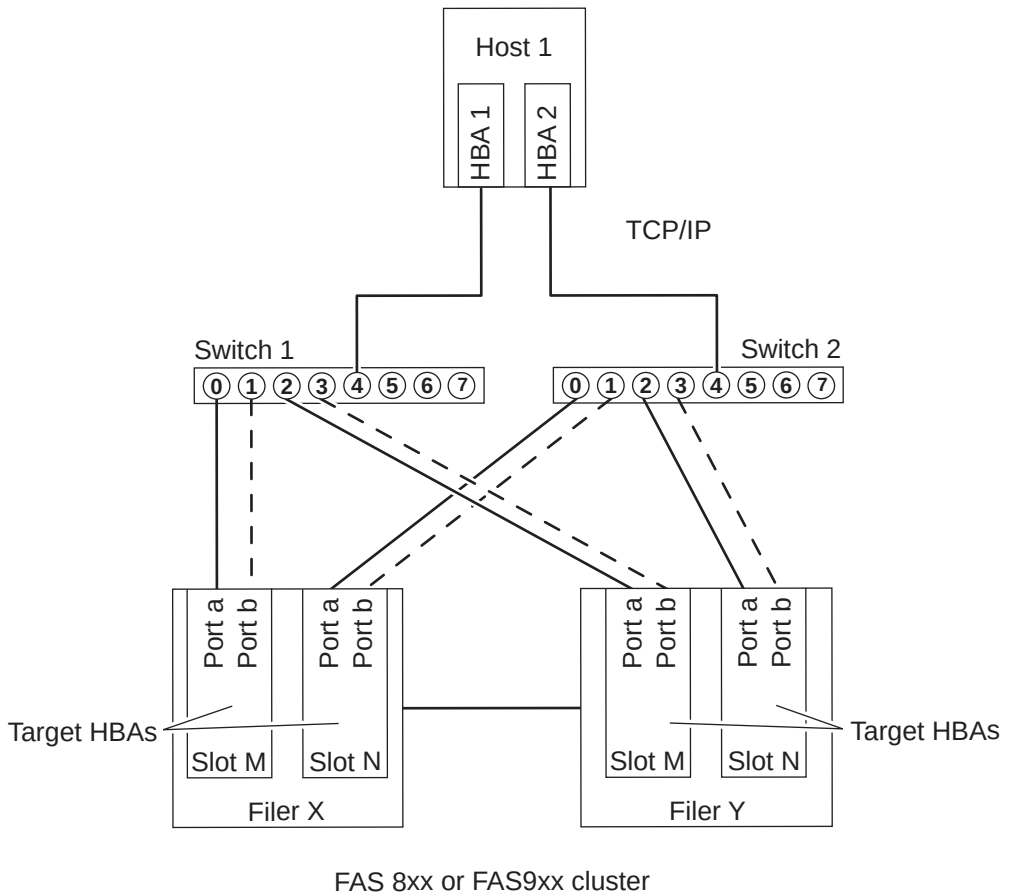
FAS270 storage appliances: Production configurations consist of a FAS270 cluster, one or more multi-attached hosts, and two switches. A FAS270 cluster consists of two storage appliances integrated into a NetApp disk shelf. Each storage appliance has one connection to each switch. FAS270 cluster configurations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

How target FCP ports process traffic for a cluster

Default target port settings for F8xx or FAS9xx clusters

Each target HBA on an F8xx or a FAS9xx filer has two ports that are labeled Port A and Port B.

When you have the default filer target port settings (tht is, the filer cfmode is set to partner), Port A provides access to local LUNs, and Port B provides access to LUNs on the partner filer. The following figure shows a sample configuration with a multi-attached host connecting to a cluster. The solid lines represent paths to LUNs on the local filer; the dotted lines represent paths to partner LUNs.



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

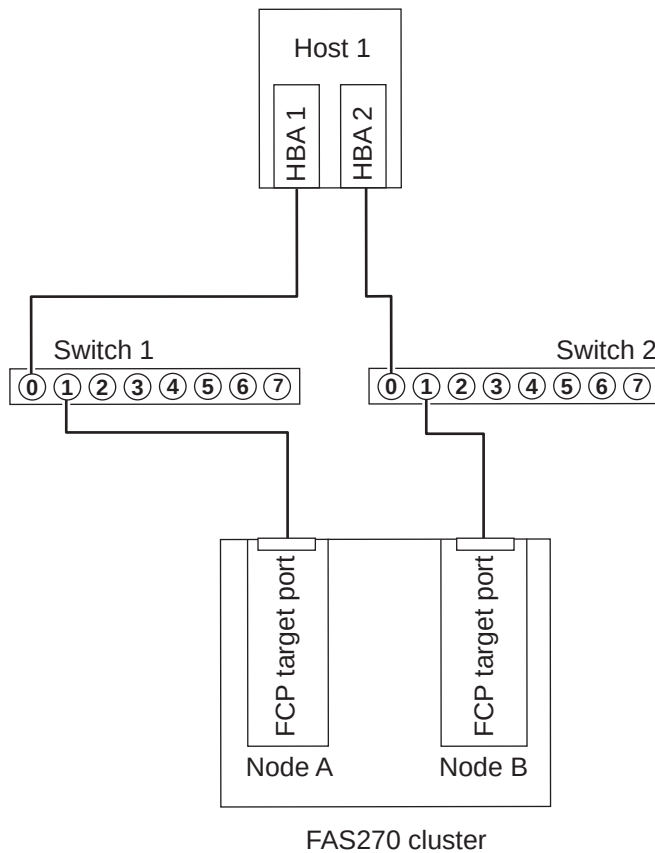
The table shows paths to a LUN on each filer in the configuration example.

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

Default target port settings for FAS270 clusters

A FAS270 cluster consists of two storage appliances integrated into a DS14 disk shelf. Each storage appliance has two Fibre Channel ports. The port labeled Fibre Channel 1 operates as a Fibre Channel target port after you license the FCP service and reboot the storage appliance. The port labeled Fibre Channel 2 is used to connect additional disk shelves to the FAS270 cluster.

The following figure shows a configuration example using the default target port settings where a multi-attached host accesses a FAS270 cluster.



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

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

About this chapter This chapter describes the tasks you should perform before installing the NetApp Host Attach Kit on the HP-UX host.

Topics in this chapter This chapter discusses the following topics:

- ◆ “[Overview of the host attach kit installation and setup](#)” on page 10
- ◆ “[Completing the pre-installation tasks](#)” on page 13
- ◆ “[Where to go for more information](#)” on page 21

Overview of the host attach kit installation and setup

Checklist of tasks to perform

Installing the host attach kit and setting up your system involves numerous steps that are performed on both the filer and the host. The following is a high-level checklist of the tasks you must perform and the machines involved.

Note_____

The instructions in this document use HP-UX commands to perform tasks, not HP-UX’s GUI System Administration tool (SAM). This is because you cannot perform all the tasks using SAM. Some tasks, such as setting up alternate links to a physical volume, must be performed using HP-UX commands.

Step	Action	Machine	Details
Preparing to install the NetApp software package			
1	Review the information on the supported configurations and plan your configuration.		Chapter 1
2	Get a copy of the host attach kit and review its contents.		Chapter 2
3	Verify that your system meets the system requirements and that you have the HBA installed. Note _____	Host	Chapter 2
4	Verify that the filer is set up and configured as outlined in the <i>SAN Setup Overview</i> . This document is included with your host attach kit.	Filer	<i>SAN Setup Overview</i> , Chapter 2

Step	Action	Machine	Details
5	Verify that the switch, if you're using a fabric connection, is set up correctly and, if appropriate for your system, zoned.	Switch, Filer, Host	Chapter 2, <i>SAN Setup Overview, FCP/iSCSI Configuration Guide</i>
6	Verify that the power to the switches, disk shelves, filers, and hosts is turned on in the correct order.	Switch, Disk shelves, Filer, Host	Chapter 2
7	Verify that the host and filer can communicate.	Filer, Host	Chapter 2
Installing the NetApp software package			
8	Get a copy of the NetApp software package, either by downloading it from the NOW site or from the CD.		Chapter 3
9	Uncompress the NetApp software package file using gunzip.	Host	Chapter 3
10	Install the NetApp software package, which is a standard HP-UX depot file.	Host	Chapter 3
Creating and configuring LUNs			
11	If you have a filer cluster, verify that the cfmode is correct.	Filer	Chapter 4
12	Create the igroups.	Host, Filer	Chapter 4
13	Create and configure the LUNs.	Filer	Chapter 4
14	Discover the LUNs on the host.	Host	Chapter 4

Step	Action	Machine	Details
15	Configure the LUNs into the HP-UX Logical Volume Management (LVM) software and configure the LVM to work with PVLinks.	Host	Chapter 4

Completing the pre-installation tasks

Tasks to perform

This section describes the following tasks you should perform in preparation to installing the NetApp software and setting up your system, including:

- ◆ Verify the contents of the host attach kit.
- ◆ Verify that your host meets the system requirements.
- ◆ Verify that the filer is installed and configured properly.
- ◆ Verify that the switch is installed and configured.
- ◆ Verify that the filer is cabled to the switch according to the topology requirements of your configuration.
- ◆ Verifying that the host and filer can communicate.

Verifying the contents of the host attach kit,

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

Step	Action
1	Open the host attach kit and check for the following items: ◆ <i>SAN Setup Overview for FCP</i> ◆ <i>SAN Host Attach Kit 1.0 for Fibre Channel Protocol on HP-UX® Installation and Setup Guide</i> (this guide) ◆ Media kit ❖ <i>SAN Host Release Notes 1.0 for Fibre Channel Protocol on HP-UX</i> ❖ CD-ROM with the <code>ntap_hpux_fcp_1_0.depot.gz</code> file that contains the <code>san lun</code> utility and other scripts that NetApp supplies with this release (you can also download this file from the NOW site) ❖ License agreement

Correct order for powering up the equipment

The different pieces of hardware communicate with each other in a prescribed order, which means that problems occur if you turn on power to the equipment in the wrong order. Throughout the procedures that you use to set up and install the NetApp software package, here is the order you must follow when you power on equipment:

1. The configured Fibre Channel switches. It might take several minutes for the switches to boot.
2. Disk shelves.
3. Filers.
4. Host.

Verify that your host meets the system requirements

At the time this manual was printed, NetApp supported the following operating system, platform, and HBA requirements for FCP on HP-UX. For the most up-to-date information on system requirements, see the support matrix in the online *FCP/iSCSI Configuration Guide* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>

Component	Requirement
Host OS	◆ PA-RISC ❖ HP-UX 11i ❖ Gold Base Patches for HP-UX 11i, June 2003 ❖ Hardware Enablement Patches for HP-UX 11i, June 2003 ◆ Itanium ❖ HP-UX 11i version 1.6 ❖ Maintenance Pack Patches for HP-UX 11i, June 2003 ◆ Patch PHKL_29094 Caution _____ Check the HP site for any warnings about patch PHKL_29094 or upgrades to it. While this patch is required to work around an HP-UX bug, it has been linked to creating a system panic on 64-bit systems in a high-availability cluster that has volume groups activated in shared mode. For more information, see the HP site. If you are not using the native logical volume manager, use patch PHCO_29603. This patch depends on patches PHKL_29611 and PHCO_28693 and are available from the HP-UX resource center (http://www.itrc.hp.com).
HP-UX platforms	The following HP-UX classes of PCI-based systems: ◆ A-Class (RP24xx with 1 to 2 CPUs) ◆ L-Class (RP54xx with 1 to 4 CPUs) ◆ Legacy D Class (d2xx, d3xx) ◆ Legacy K Class (k2xx, k3xx, k4xx) ◆ N Class (rp74xx with 1 to 4 CPUs) ◆ RP84xx with 2 to 16 CPUs ◆ RX26xx with 1 to 2 CPUs ◆ RX56xx with 4 CPUs

Component	Requirement
HBA	Native HP-UX: ◆ PCI A5158A, 1Gb/s, SC connectors ◆ PCI A6795A, 2 Gb/s, LC (SFF) connectors ◆ HSC A6684A and A6685A, 1 Gb/s, SC connectors Note_____ NetApp does not provide the HP-UX components. If you have any questions about setting up any of the components, see the HP-UX documentation that came with your system.
Multipath software	HP-UX PVLinks Note_____ PVLinks supports up to eight paths per LUN. You must have PVLinks installed on the host if you have two or more physical paths to the same LUN.
Standard failover cluster software	HP-UX's MC/Serviceguard Note_____ NetApp qualified MC/Serviceguard for two-node clusters only.
Storage appliances	◆ NetApp F8xx series ◆ NetApp FAS9xx series ◆ NetApp FAS270 ◆ NetApp NearStore Rxxx Caution_____ Only NetApp Fibre Channel storage appliances are supported with this release of the host attach kit. This release does not support mixed SAN storage arrays (other than NetApp filers) on the same host or Fibre Channel switch.
Filer OS	Data ONTAP 6.5

Component	Requirement
Cable	50 micron multimode fiber optic cable Purchase the length of optical cable appropriate for your site requirements. Note_____ The <i>Cable Support for FCP</i> page in the <i>FCP/iSCSI Configuration Guide</i> on the NetApp NOW site contains the most up-to-date information on cabling specifications and requirements. It also has information on ordering cables. _____

Verify that the host HBA is installed

The host HBAs should be installed before you install the NetApp software package. If you have not installed the HBA, complete the following steps.

Step	Action
1	Check your system to make sure the host is running HP-UX 11i with the correct patches. (“Verify that your host meets the system requirements” on page 14 lists the requirements at the time this document was printed.) Note_____ The HP-UX 11i version of the operating system includes the HBA drivers by default. _____
2	Power down your host machine.
3	Install the HBA card(s). See the documentation that came with your HBA cards for information on doing this.
4	Restart the system.

Verify that the filer is installed and configured

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

Step	Action
1	Confirm that the filer is set up and configured as described in the <i>SAN Setup Overview</i>. This document provides a high-level overview for setting up your NetApp SAN, including setting up the filer and connecting it to the host. This book presents the correct order for powering on the different components. Caution The filer must be set up and configured before creating initiator groups and LUNs on the filer. For the filer to be setup correctly, you should have completed the following tasks: ◆ Set up the HP-UX host and the initiator HBAs. ◆ Installed the filer and target HBAs (if needed). ◆ Cabled the filer according to your configuration topology. You can cable a host and filer in the following ways: ❖ Fabric-attached, where a host is cabled to a filer cluster through a single or dual-fabric. ❖ Direct-attached, where a single-attached with one HBA or multi-attached host with multiple HBAs is cabled directly to a stand-alone filer. ◆ Set up and configured Data ONTAP on the filer. Note For more information, see the <i>Data ONTAP Block Access Management Guide</i>. ◆ Licensed and enabled the FCP protocol and any other protocols appropriate for the filer. ◆ Created working filer volumes and qtrees (if desired) on the filer. Note NetApp strongly recommends that you create volumes with space reservations enabled.

Verify the switch is installed and configured

If you have fabric-attached configuration, verify that the switch is installed and configured by completing the following step.

Step	Action
1	Check that the switch is set up and configured as outlined in the <i>SAN Setup Overview</i>. You should have completed the following tasks: ◆ Installed the switch in a system cabinet or rack. ◆ Turned on power to the switch based on the order listed in the <i>SAN Setup Overview</i>. ◆ Configured the network parameters for the switch, including its serial parameters and IP address.

Determining whether to use switch zoning

If you have a fabric-attached configuration, determine whether switch zoning is appropriate for your system setup.

The Logical Volume Manager limits the number of paths to per LUN in a volume group to a maximum of eight. If your host has more than eight paths, you can use switch zoning to reduce the number of those paths that are visible to the LUN.

Zoning requires more configuration on the switch, but it results in the following:

- ◆ Configuring the host is simplified.
- ◆ Information becomes more manageable. When you use host tools such as `iostate` and `ioscan`, the output is easier to read because fewer paths are displayed.

If you have a high-availability configuration, make sure that there is at least one primary path and one secondary path through each switch for each LUN. For example, if you have two switches, you would have minimum of four paths per LUN.

For more information on zoning, see the *FCP/iSCSI Configuration Guide*, which is online at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>

Verify the host and filer can communicate

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.

Where to go for more information

Documentation relevant to this host attach kit

This guide provides information on the basic tasks involved in setting up an HP-UX host using Fibre Channel protocol with a NetApp storage appliance. The information in it is current as of its publication.

For more recent information or additional information, you might want to consult the following documents:

- ◆ *The FCP/iSCSI Configuration Guide*

This is a dynamic, online document that contains the most up-to-date information about NetApp's FCP HP-UX host attach kit.

It also provides the most current details about filer and host platforms, cabling issues, switch issues, and configurations. This document is available at the NOW site: <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

- ◆ *The SAN Host Release Notes 1.0 for Fibre Channel Protocol on HP-UX*

This document contains any last-minute information that you need to get your configuration up and running smoothly. A printed copy of this document comes with the host attach kit. You can also download it from the NOW site.

- ◆ *The SAN Setup Overview*

This is a high-level document that provides an overview of setting up a filer to work with a host. By following the order specified in this document, you can avoid problems that might occur when you perform steps out of order. This document is part of the host attach kit.

- ◆ *System Configuration Guide*

This is an online document that contains information about the supported filer models for Data ONTAP licensed with FCP. It is available at the NOW site: <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

- ◆ *Data ONTAP Block Access Management Guide for FCP*

This document provides information about using Data ONTAP. It contains information on setting up your filer to work with Data ONTAP.

- ◆ *Network Appliance FCP Quick Reference Commands-HP-UX 11i*

The quick reference summarizes the commands you use on an HP-UX system attached to a NetApp filer. This document is available online as part of the FCP/iSCSI Configuration guide (http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/related_docs.shtml).

- ◆ Host operating system and HBA information

NetApp does not provide these documents. See the readme files and other documentation that you received when you got your HP-UX operating system.

About this chapter

This chapter describes procedures for installing the NetApp's software package for an HP-UX host connected to a NetApp storage appliance running Data ONTAP with FCP for SCSI. It also includes instructions for uninstalling the software, if you should need to.

Note

All installation procedures require root privileges. In addition, you must have the host and HBA set up before you install your NetApp software package.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Obtaining the NetApp software package”](#) on page 24
- ◆ [“Installing the NetApp software package”](#) on page 27
- ◆ [“Uninstalling the NetApp software”](#) on page 32

Obtaining the NetApp software package

Contents of the NetApp software package

The NetApp software package is a standard HP-UX depot file that contains the following components:

- ◆ The NetApp sanlun utility, which helps you manage LUNs and host HBAs
- ◆ NetApp diagnostic and troubleshooting scripts

Ways to obtain the NetApp software package

You can obtain the NetApp software package in two ways:

- ◆ Download it from the NOW site, which is detailed in the section “[Downloading the software from the NOW site](#)” on page 24.
- ◆ Get it from a CD provided with the media package in your NetApp SAN Host Attach Kit for Fibre Channel Protocol on HP-UX. See “[Verifying the contents of the host attach kit](#),” on page 13.

Note

To verify that you have the latest NetApp software package, check the *FCP/iSCSI Configuration Guide*, which is online at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

Downloading the software from the NOW site

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, complete the following steps: 1. Enter your user name and password. 2. From the Select Start Page list box, click Service and Support. 3. 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 HP-UX from the Select Platform drop-down list.

Step	Action
4	Click Go!
5	Follow the prompts to reach the Software Download page.
6	Download the software file to a local directory. Note At the time this document was printed, the software was in a file called <code>ntap_hpux_fcp_1_0.depot.gz</code>. If you download the file to a different machine, you must move it to directory on the HP-UX machine. You can do that using commands similar to the following: <pre># mkdir /tmp/hpux # cd /tmp/hpux # cp /u/hpux/HP-pkgs/ntap_hpux_1_0.depot.gz .</pre> Make sure you include the period at the end of the above command line.
7	Go to “Installing the NetApp software package” on page 27.

Getting the software from the CD-ROM

To get the software from the CD-ROM, complete the following steps.

Step	Action
1	Insert the CD-ROM into the CD-ROM drive.
2	Change to the directory containing the <code>ntap_hpux_fcp_1_0.depot.gz</code> file.
3	Copy the file to a directory on the host, such as the <code>/tmp/hpux</code> directory. For example, you might need to enter commands similar to the following: <pre># mkdir /tmp/hpux # mount /dev/cdrom /mnt/cdrom # cp /mnt/cdrom/ntap_hpux_fcp_1_0.depot.gz /tmp # cd /tmp/hpux</pre>

Installing the NetApp software package

Tasks involved in installing the NetApp software

You follow the same steps whether you are installing the NetApp software package for the first time or upgrading it. NetApp provides a standard HP-UX depot file that contains the installation script. You can install it the same way you normally install an HP-UX depot file.

One method of installing the software, which is documented in the sections that follow, is to perform these steps:

- ◆ Use the `gunzip` command to uncompress the files.
- ◆ Execute the `swinstall` command to install the NetApp software.

Note

This software is not locatable. You cannot supply a path name to the installation directory on the `swinstall` command line. The installation directory is determined by the depot file.

- ◆ Verify your installation using the `swverify` command.

Actions performed by the installation script

The installation script performs the following actions:

- ◆ Checks your system to confirm that it meets the system requirements. The installation fails if your system does not meet the requirements.
- ◆ Installs NetApp's `sun lun` utility and diagnostic tools in the appropriated directories. (You cannot specify which directories.)
- ◆ Adds paths to the NetApp utilities and man pages to the appropriate HP-UX search paths.

Installing or upgrading the NetApp software

To install or update the Netapp software, complete the following steps.

Step	Action
1	Enter the following command to uncompress the ntap_hpux_fcp_1_0.depot.gz file: <pre># gunzip ntap_hpux_fcp_1_0.depot.gz</pre> Result: The system places the extracted software (package contents) in the /tmp/hpux directory.

Step	Action
2	Use the <code>swinstall</code> command to install the software. Do not supply a path name to the installation directory on the <code>swinstall</code> command line; the installation directory is determined by the depot file. Caution _____ The installation fails if your system does not meet the system requirements. See “Verify that your host meets the system requirements” on page 14 a list of the requirements. Result: This command runs an installation script that verifies the status of your HP-UX setup. If your system meets the requirements, this script installs the NetApp <code>san lun</code> utility and diagnostic scripts in the <code>/opt/NetApp/santools</code> directory. Example: The following output is similar to what you might see when you install the NetApp software for the first time. This example assumes that you uncompressed the files in the <code>/tmp/hpux</code> directory on an HP-UX host called <code>machine1</code>. <pre># swinstall -s /tmp/hpux/ntap_hpux_fcp_1.0.depot santools ===== 08/01/03 16:25:41 EST BEGIN swinstall SESSION (non-interactive) (jobid=machine1-0126) * Session started for user "root@machine1". * Beginning Selection * Target connection succeeded for "machine1:/". * Source: /tmp/hpux/ntap_hpux_fcp_1.0.depot * Targets: machine1:/ * Software selections: santools.command_itanium,r=1.0,fr=1.1,fa=HP-UX_B.11.22_IA santools.command_parisc,r=1.0,fr=1.1,fa=HP-UX_B.11.00_32/64 santools.man,r=1.0 santools.support_scripts,r=1.0 * Selection succeeded. * Beginning Analysis and Execution * Session selections have been saved in the file "/.sw/sessions/swinstall.last". * The analysis phase succeeded for "machine1:/". * The execution phase succeeded for "machine1:/". * Analysis and Execution succeeded.</pre> NOTE: More information may be found in the agent logfile using the command <code>"swjob -a log machine1-0126 @ machine1:/"</code>. <pre>===== 08/01/03 16:26:01 EST END swinstall SESSION (non-interactive) (jobid=machine1-0126)</pre>

Step	Action
3	Verify your installation using the <code>swverify</code> command. Example: The following example shows output you might see when you execute the <code>swverify</code> command after installing the NetApp software on an HP-UX host called machine1: <pre># swverify santools ===== 08/01/03 16:26:21 EST BEGIN swverify SESSION (non-interactive) (jobid=machine1-0127) * Session started for user "root@machine1". * Beginning Selection * Target connection succeeded for "machine1:/". * Software selections: santools.command_itanium, l=/opt/NetApp/santools, r=1.0, fr=1.1, fa=HP- UX_B.11.22_IA santools.command_parisc, l=/opt/NetApp/santools, r=1.0, fr=1.1, fa=HP- UX_B.11.00_32/64 santools.man, l=/opt/NetApp/santools, r=1.0 santools.support_scripts, l=/opt/NetApp/santools, r=1.0 * Selection succeeded. * Beginning Analysis * Session selections have been saved in the file "/.sw/sessions/swverify.last". * The analysis phase succeeded for "machine1:/". * Verification succeeded. NOTE: More information may be found in the agent logfile using the command "swjob -a log machine1-0127 @ machine1:/". ===== 08/01/03 16:26:26 EST END swverify SESSION (non-interactive) (jobid=machine1-0127) #</pre>

Updates to the system search paths

By default, the installation script updates the system search paths. It adds the following paths:

- ◆ /opt/NetApp/santools/bin and /opt/NetApp/santools/man to the system search path.
- ◆ /opt/NetApp/santools/bin to /etc/PATH.
- ◆ /opt/NetApp/santools/man to /etc/MANPATH.

You might need to log out and log back in for these changes to take effect.

If you modified your startup to ignore /etc/PATH and /etc/MANPATH, you should manually add the santool paths to your search path.

Uninstalling the NetApp software

Uninstalling the NetApp software from the host

To uninstall the NetApp software from the host, complete the following steps.

Note

NetApp recommends that you remove your current installation of the NetApp software before you install a new package.

Step	Action
1	Use the <code>swremove</code> command to remove the NetApp software. Example: The following example shows output you might see when you execute the <code>swremove</code> command after installing the NetApp software on an HP-UX host called machine1. <pre>bash-2.04# swremove santools ===== 08/01/03 16:25:06 EST BEGIN swremove SESSION (non-interactive) (jobid=machine1-0125) * Session started for user "root@machine1". * Beginning Selection * Target connection succeeded for "machine1:/". * Software selections: santools.command_itanium, l=/opt/NetApp/santools, r=1.0, fr= 1.1, fa=HP-UX_B.11.22_IA santools.command_parisc, l=/opt/NetApp/santools, r=1.0, fr=1 .1, fa=HP-UX_B.11.00_32/64 santools.man, l=/opt/NetApp/santools, r=1.0 santools.support_scripts, l=/opt/NetApp/santools, r=1.0 * Selection succeeded. * Beginning Analysis * Session selections have been saved in the file "/.sw/sessions/swremove.last". * The analysis phase succeeded for "machine1:/". * Analysis succeeded. * Beginning Execution * The execution phase succeeded for "machine1:/". * Execution succeeded. NOTE: More information may be found in the agent logfile using the command "swjob -a log machine1-0125 @ machine1:/". ===== 08/01/03 16:25:21 EST END swremove SESSION (non- interactive) (jobid=machine1-0125) #</pre>
2	If you want to install the latest software version, go to “Installing the NetApp software package” on page 27.

About this chapter

This chapter provides the following information:

- ◆ Tasks required to add LUNs to systems with HP-UX hosts
- ◆ How to create initiator groups (igroups) and LUNs on the filer
- ◆ How to configure LUNs and make them accessible by the host
- ◆ How to use the sanlun utility to manage host LUN and HBA information

Note

The procedures in this chapter require root privileges.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Overview of adding LUNs to HP-UX”](#) on page 36
- ◆ [“Creating igroups and LUNs on the filer”](#) on page 38
- ◆ [“Configuring the LUNs”](#) on page 51
- ◆ [“Displaying LUN and HBA information”](#) on page 61

Overview of adding LUNs to HP-UX

Tasks you perform on the filer

You perform the following tasks on the filer when you add a LUN to an HP-UX host:

1. Make sure the filer is correctly set up for adding HP-UX LUNs by verifying that the cfmode is correctly set. You only need to do this once.
2. Create an igroup using HP-UX as the operating system type for the host HBAs.
3. Create a LUN and map it to the igroup.

Tasks you perform on the host

You must perform the following tasks on the HP-UX host when you add a LUN:

1. Discover the newly created filer LUNs.
2. Create device nodes (/dev/dsk/ and /dev/rdisk/) for the newly discovered LUN.
3. Configure device nodes into HP-UX Logical Volume Manager (LVM).
 - ❖ Tag the LUN as a physical volume.
 - ❖ Create a volume group with one or more physical volumes.
 - ❖ Create one or more logical volumes within the volume group.
 - ❖ Either create a file system on a logical volume and mount it or use the logical volume device nodes directly.

Note

To perform some of these tasks, you must use NetApp's `san lun` utility. When you installed the NetApp software package on the host, the installation program placed the utility in `/opt/NetApp/santools/bin` and added it to the system search path (see [“Updates to the system search paths”](#) on page 31).

Preparing the filer for HP-UX LUNs

Preparing the filer Before you create the igroups or LUNs, you must prepare the filer by confirming that it has the correct FCP cluster failover mode (cfmode) setting. The cfmode value determines how a filer cluster handles a failover.

Correct cfmode settings for clustered filers For an HP-UX host, the following cfmodes should be set by default:

- ◆ FAS270 filers: dual-fabric mode
- ◆ All other filers and backup storage appliances: partner. (In some circumstances, you might need to use mixed mode. Consult with NetApp if you have any questions about which mode you should use.)

Determining the current cfmode To check the current cfmode settings, complete the following step.

Step	Action
1	Enter the following command: fcv show cfmode Result: The system displays the cfmode setting. Caution_____ If the cfmode is not set correctly, contact NetApp. Do not change the cfmode. _____

Creating igroups and LUNs on the filer

Tasks to create and map LUNs on the filer

Before you can complete your HP-UX setup with a NetApp storage appliance, you must perform the following tasks:

- ◆ Create an igroup on the filer. An igroup is a collection of host WWPNs.
- ◆ Create one or more LUNs on the filer and map the LUNs to an igroup.

Rule for creating LUNs

Ensure that the LUNs are at the root of a qtree in a volume in the filer.

Best practices for creating LUNs

The best practices for creating LUNs include the following:

- ◆ Each igroup should map to an application and should include all the initiators used by the application to access its data.
- ◆ 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*.

Creating an igroup on the filer

To create an igroup on the filer, complete the following steps.

Note

The examples used in these steps assume that the application is running on a single host, not a cluster. They also assume that you have already attached the host and filers to fabric.

Step	Action
1	Log in as root on the host.

Step	Action
2	Get the WWPN for each of the host's HBAs by entering the following command and then copying the resulting command line so you can enter it in step 4: sanlun fcp show adapter -c The -c option tells the sanlun utility to generate the output the filer needs to create the igroup. Result: An <code>igroup create</code> command with the host's WWPNs appears on the screen when you execute the command. The igroup's name matches the name of the host. Example: Running <code>sanlun fcp show adapter -c</code> produces the following output on an HP-UX system called hostA. This example uses two WWPNs. Enter this filer command to create an initiator group for this system: <pre>igroup create -f -t hpux "hostA" 50060b000010a700 50060b000010a606</pre> Because the name of the host is "hostA," this command line produces an igroup called "hostA."
3	On the host in a different session, use the <code>telnet</code> command to access the filer.
4	Copy the <code>igroup create</code> command from Step 2. Example: If you use the information in Step 2, you would copy the following command line: <pre>igroup create -f -t hpux "hostA" 50060b000010a700 50060b000010a606</pre>
5	Paste the command on the filer's command line and press Enter. The filer executes the command. Result: The filer creates the igroup and gives it the same name as the host name.

Step	Action
6	On the filer command line, verify that the new igroup exists by entering the following command: igroup show Result: The filer displays the newly created igroup with the host's WWPNs. Example: The following is output from the igroup show command displays. Note If you change the <code>ostype</code> attribute to <code>hpux</code> after you've created the igroup, you must manually set the <code>vsa</code> attribute, which HP-UX sets correctly by default. Chapter 5, "Troubleshooting," on page 67 contains information about how to do this. <pre>filerX> igroup show -v hostA hostA (FCP): OS Type: hpux Member: 50:06:0b:00:00:10:a7:00 Member: 50:06:0b:00:00:10:a6:06 filerX></pre>

Step	Action
7	Optional: Display the FCP initiator port names for the HP-UX drivers that are currently logged into the fabric by entering the following command on the filer's command line: <pre>fcpx show initiator</pre> Result: The filer displays the WWPNs for the FCP initiator HBAs and their igroups. Note_____ If you want to see which HP-UX drivers are currently logged into the fabric, you can run this command. This command might not show all the HP-UX FCP host initiators, because an HP-UX FCP driver logs off the target port when it is not in use. It only logs into the target port when it is in use. _____ 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 50:06:0b:00:00:10:a7:00 hostA Initiators connected on adapter 4b: Portname Group Initiators connected on adapter 5a: Portname Group 50:06:0b:00:00:10:a6:06 hostA Initiators connected on adapter 5b: Portname Group filerX></pre>

Step	Action
	Example: The following example is for a direct-attached configuration. <pre>filerY> fcp show initiator Initiators connected on adapter 5a: Portname Group 50:06:0b:00:00:10:a7:00 hostA Initiators connected on adapter 5b: None connected. filerY></pre>

Creating a LUN on the filer using the interactive script

The `lun setup` command starts an interactive script that prompts you for information required to perform the following tasks:

- ◆ Create a LUN.
- ◆ Create a new igroup (or use the igroup you created in the previous section).

Note

If you use an existing igroup, you must still add the WWPNs during the LUN setup.

- ◆ Map the LUN to an igroup.

When a prompt displays a default in brackets [], you can press Enter to accept the default.

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

Note

You can also create a LUN using the `lun setup` command in command line mode. Instead of answering the prompts from the interactive script, you would supply those values as command line options using the following format:

```
lun create -s <size> [-t <type>] [-o noreserve] <lun_path>
```

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

Step	Action
1	On the filer's command line, start the LUN creation process by entering the following command: lun setup Result: The filer starts an interactive script that prompts you for information needed to create a LUN. Example: This example shows the output that appears when you enter the <code>lun setup</code> command. <pre>filerX> lun setup 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.</pre>
2	Enter y in response to the prompt: <pre>Do you want to create a LUN? [y]: y</pre>
3	Enter hpux to specify the host operating system: <pre>Multiprotocol type of LUN (image/solaris/windows/hpux/aix/linux) [image]: hpux</pre>

Step	Action
4	Enter the LUN path. Caution_____ Do not put LUNs in /vol/vol0 (the root volume). 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> <i>lun_path</i> is the path name to the LUN. Result: The name of the LUN (the LUN path) is defined. Example: Some examples of a <i>lun_path</i> are /vol/vol1/qtree1/lun_sdata or /vol/vol1/hostA_0. Enter LUN path: /vol/vol1/hostA_0
5	Enter y or n to specify whether you want to use space reservations. Note_____ NetApp strongly recommends that you enable space reservations. 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.

Step	Action
6	Enter the LUN size: 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: <code>x_x</code> <code>x_x</code> is the size you want the LUN to be. Result: The setup script accepts the value you enter here as the size for the LUN you are creating. The quantity of usable disk space by the host varies depending on the host's operating system and the application using the LUN. Example: An example of a size you might enter is 5g, meaning 5 GB of raw disk. Enter LUN size: 5g
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® browser interface, a LUN description is the same as a comment. For more information about the <code>lun comment</code> command, see the <code>na_lun (1)</code> man page on the filer.

Step	Action
8	Specify the igroup in one of the following ways: ◆ To use an existing igroup, enter that group's name. You can see the existing igroups by entering <code>?</code> at the prompt. Go to step 12 to continue setting up a LUN. ◆ To create an igroup, enter a unique name for the group when prompted. Go to step 9 to continue setting up the LUN. ◆ To accept the default igroup (shown in brackets), press Enter. Go to step 12 to continue setting up a LUN. 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 [<i>default_igroup</i>]: <i>new_group_name</i> <i>new_group_name</i> is either the name of an existing igroup or the name of a group you want to create. A group name can be something similar to <code>hpux_groupB</code> or <code>hostA</code>. Result: The program either creates a new igroup or uses the existing group that you specify. Example 1: This example uses an existing igroup. This example is continued in step 12. <pre>Name of initiator group [hostA]: hostA An initiator group named "hostA" already exists. hostA (FCP) (ostype: hpux): 50:06:0b:00:00:10:a7:00 (logged in on: vtic) 50:06:0b:00:00:10:a6:06 (logged in on: vtic) Do you want to use this existing group? [n]: y</pre> Example 2: This example creates a new igroup called <code>hpuxB</code>. This example is continued in Step 9. <pre>Name of initiator group [hostA]: hpuxB</pre>

Step	Action
9	When you create an igroup (as illustrated in Example 2 in the previous step), you must specify setup information for the igroup. Press Enter to accept FCP as the protocol: Type of initiator group <i>new_group_name</i> (FCP/iSCSI) [FCP]: Result: Choosing FCP means that the initiator WWPNs in this igroup are using FCP to access the LUN. Note_____ If you created an igroup as shown in “Creating an igroup on the filer” on page 38, you would have already specified this information, so you would not see this prompt or any other prompts until step 12. _____

Step	Action						
10	Enter comma-separated port names in response to the next prompt: A Fibre Channel Protocol (FCP) initiator group is a collection of initiator port names. Each port name (WWPN) is 16 hexadecimal digits, separated (only) by optional colon (:) characters. You can separate port names by commas. Enter '?' to display a list of connected initiators. Hit ENTER when you are done adding port names to this group. Enter comma separated portnames: Note_____ Enter ? to see the list of initiator WWPNs connected to the target HBAs and associated igroups (if they exist). The <code>sanlun fcp show adapter</code> command runs on the host and lists the host's initiator HBAs and their WWPNs. _____ Example: Enter comma separated portnames:? Initiators connected on adapter 5a: <table> <tr> <td>Portname</td><td>Group</td></tr> <tr> <td>50:06:0b:00:00:10:a7:00</td><td>hostA</td></tr> <tr> <td>50:06:0b:00:00:10:a6:06</td><td>hostA</td></tr> </table> Initiators connected on adapter 7a: None connected. Enter comma separated portnames:50:06:0b:00:00:10:a7:00 Enter comma separated portnames: In this example, the initiator HBA with WWPN 50:06:0b:00:00:10:a7:00 is added to the igroup you are creating (new_group_name).	Portname	Group	50:06:0b:00:00:10:a7:00	hostA	50:06:0b:00:00:10:a6:06	hostA
Portname	Group						
50:06:0b:00:00:10:a7:00	hostA						
50:06:0b:00:00:10:a6:06	hostA						
11	Enter hpux in response to the next prompt: OS type of initiator group "new_group_name" (default/solaris/windows/hpux/aix/linux):hpux Result: The operating system for the igroup is defined.						

Step	Action
12	Enter the LUN ID for the LUN that is mapped to the igroup in response to the next prompt. The program supplies the next available LUN ID. (Enter ? to display the LUNs already in use.) Note Make sure you record the LUN ID associated with the <i>lun_path</i> and the igroup 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 "new_group_name". LUN ID at which initiator group "new_group_name" sees "lun_path"[0]: Result: The LUN ID is assigned to the LUN (LUN path) and mapped to the igroup. Example: This example contains output you might see in response to this prompt. 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 "hostA". LUN ID at which initiator group "hostA" sees "/vol/vol0/foobar" [0]: 3333 <pre> LUN Path : /vol/vol0/foobar OS Type : hpux Size : 2g (2147483648) Comment : test lun Initiator Group : hostA Initiator Group Type : FCP Initiator Group Members : 50:06:0b:00:00:10:a7:00 : 50:06:0b:00:00:10:a6:06 Mapped to LUN-ID : 3333 </pre>
13	Respond to the next prompt by entering y to accept the configuration or n to discard the configuration: Do you want to accept this configuration? [y]: Result: If you enter y, the LUN is mapped to the specified igroup and all changes to the system are committed. At this point, Ctrl-C cannot undo the changes.

Step	Action
14	Terminate this session or continue to create additional LUNs by responding to the final prompt: Do you want to create another LUN? [n]:

Verifying the mapped LUN

To verify the mapped LUN, complete the following step.

Step	Action
1	On the filer's command line, display information about the mapped LUN by entering the following command: lun show -v <i>lun-path</i> <i>lun-path</i> is the path to a specific LUN. Result: The information for the specified LUN is displayed. Example: The following example shows information about the LUN hostA. <pre>filerX> lun show -v /vol/vol1/hostA /vol/vol1/hostA 2g (2147483648) (r/w, online, mapped) Serial#: 0cABC1234ABC Share: none Multiprotocol Type: image Maps: hostA=3333 filerX></pre>

Configuring the LUNs

Getting the host to discover the new LUNs

- There are two ways to get the host to discover the new LUNs and manage them using HP-UX’s Logical Volume Manager (LVM):
- ◆ Reboot the host. The host automatically discovers the new LUNs when you reboot the host.
 - ◆ Complete the following steps. If rebooting the host is not a reasonable action for your system, perform the steps listed here. Doing this enables the host to discover the LUNs without requiring a host reboot.

Note_____

For more detailed instructions about working with LVM, see the HP-UX documentation.

Step	Action
1	Log in as root on the host.
2	Perform an <code>ioscan</code> on the HP-UX host to see whether it discovers the newly created LUNs: <code>ioscan -fn -C disk</code> Example: In this example, the output from an <code>ioscan</code> command provides the following information: ◆ The filer is in <code>cfmode</code> mixed because there are eight instances (paths) to the filer LUN that you created. Although these look like eight different devices, it is actually just one device with eight paths. ◆ There are no device entries for the NetApp LUNs yet. ◆ The LUN is visible to the host and ready to use because its state is <code>CLAIMED</code>. # ioscan -fn -C disk Class I H/W Path Driver S/W State H/W Type Description ===== disk 0 0/0/1/1.15.0 sdisk CLAIMED DEVICE HP 18.2GMAN3184MC /dev/dsk/c1t15d0 /dev/rdisk/c1t15d0 disk 1 0/4/0/0.1.5.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN disk 3 0/4/0/0.1.6.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN disk 2 0/6/2/0.1.13.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN disk 4 0/6/2/0.1.14.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN

Step	Action
3	Create the device entries on the HP-UX host by entering the following command: <pre>ioinit -i</pre> If the <code>ioinit -i</code> command doesn't create device entries, use the <code>insf -e</code> command to install the device special files. Note_____ Do not use these disk device entries. They do not have the PVLlinks multipathing capability yet, so if you do use them, you risk destroying any physical volume, volume group, or LVM information that is in the LUN. _____ Example: The following is an abbreviated example of the type of output you might see when you run the <code>ioinit -i</code> command. <pre># ioinit -i insf: Installing special files for sdisk instance 1 address 0/4/0/0.1.5.0.26.0.5 insf: Installing special files for sctl instance 4 address 0/4/0/0.1.5.255.0.0.0 insf: Installing special files for sdisk instance 3 address 0/4/0/0.1.6.0.26.0.5 insf: Installing special files for sctl instance 6 address 0/4/0/0.1.6.255.0.0.0 insf: Installing special files for sdisk instance 2 address 0/6/2/0.1.13.0.26.0.5 insf: Installing special files for sctl instance 5 address 0/6/2/0.1.13.255.0.0.0 insf: Installing special files for sdisk instance 4 address 0/6/2/0.1.14.0.26.0.5 insf: Installing special files for sctl instance 7 address 0/6/2/0.1.14.255.0.0.0</pre>

Step	Action
4	Check to see which disk devices map to which HBA devices by entering the following command: <pre>tdlist</pre> Note— HP-UX automatically handles mapping and records the information in the /etc/ioconfig file. Example: The <code>tdlist</code> command produces output similar to the following. This list has been truncated list to fit on this page. <pre># tdlist /dev/td0 0/4/0/0.1.5.255.0.0.0 fcpdev 0x010500 CLAIMED DEVICE NETAPP VSA CONTROLLER /dev/rscsi/c33t0d0 /dev/td0 0/4/0/0.1.6.255.0.0.0 fcpdev 0x010600 CLAIMED DEVICE NETAPP VSA CONTROLLER /dev/rscsi/c36t0d0 /dev/td0 0/4/0/0.1.4.214.0 fcparray 0x0104d6 /dev/td0 0/4/0/0.1.4.214.26 fcparray 0x0104d6 /dev/td0 0/4/0/0.1.5.0.26 fcparray 0x010500 CLAIMED DEVICE NETAPP LUN /dev/dsk/c31t0d5 /dev/rdisk/c31t0d5 /dev/td0 0/4/0/0.1.5.214.0 fcparray 0x0105d6 /dev/td0 0/4/0/0.1.5.214.26 fcparray 0x0105d6 /dev/td0 0/4/0/0.1.6.0.26 fcparray 0x010600 CLAIMED DEVICE NETAPP LUN /dev/dsk/c34t0d5 /dev/rdisk/c34t0d5 /dev/td0 0/4/0/0.1.6.218.0 fcparray 0x0106da /dev/td0 0/4/0/0.1.6.218.26 fcparray 0x0106da /dev/td0 0/4/0/0.1.7.218.0 fcparray 0x0107da /dev/td0 0/4/0/0.1.7.218.26 fcparray 0x0107da</pre>

Step	Action
5	Display information about the device nodes by entering the following command: <pre>sanlun lun show -p</pre> Write down which paths are primary; you need this information later in these steps. Example: The following example shows the type of output you see using the <code>sanlun lun show</code> command. <pre># sanlun lun show -p filerX:/vol/vol0/511 (LUN 511) VG: none 2g (2147483648) lun state: GOOD ----- path path /dev/dsk host target partner PVlinks state type filename HBA port port priority ----- up primary /dev/dsk/c35t0d5 td1 5a up secondary /dev/dsk/c30t0d5 td1 5b up primary /dev/dsk/c34t0d5 td0 4a up secondary /dev/dsk/c31t0d5 td0 4b</pre>
6	Create a physical volume on the filer LUN by entering the following command: <pre>pvcreate /dev/rdisk/primary_path_disk_device</pre> <i>primary_path_disk_device</i> is the path to the disk device that contains the LUN. This must be a primary path. Note_____ You only need to perform this process once, even if you have multiple paths to the LUN. _____ Example: The <code>pvcreate</code> command produces output similar to the following: <pre># pvcreate /dev/dsk/c35t0d5 Physical volume "/dev/dsk/c35t0d5" has been successfully created.</pre>

Step	Action
7	Check the minor numbers of the existing volume groups by entering the following command: <pre>ls -l /dev/vg*/group</pre> The LVM requires a unique minor number for each volume group device entry. Example: The <code>ls -l /dev/vg*/group</code> command provides output similar to the following. In this example, the next unused minor device number is 0x010000. <pre># ls -l /dev/*/group crw-r----- 1 root sys 64 0x000000 Aug 12 2002 /dev/vg00/group #</pre>
8	Use the <code>mkdir</code> command to create a <code>/dev</code> entry: <pre>mkdir /dev/directory_name</pre> Example: This example continues the previous example and specifies a directory name that ends with the number '01', which is the next minor device number. Using the same minor number as the volume group number is an HP-UX convention; it is not a requirement. <pre># mkdir /dev/vg_ntap01</pre>
9	Create a device node on the host for the physical volume group using the <code>mknod</code> command. You must supply a unique minor device number. Don't enter a number that another volume group is using. Note_____ The device node you create is used only for volume group and logical volume operations; it is not used for I/O. _____ Example: This example creates a device node using the unique minor number 0x04000. <pre>mknod /dev/vg_ntap01/group c 64 0x010000</pre>

Step	Action
10	Use the vgcreate command to create a volume group with one primary path. Use a regular or block disk device node. Do not use raw disk devices. vgcreate [vg_name ...] <i>vg_name</i> is a volume group name, with or without the /dev/ prefix. Note_____ Volume groups must follow a specific order for paths. The first path to the volume group, which you specify using the vgcreate command, must use a disk device node that corresponds to a primary path. See the next step for information on adding paths to the volume group. _____ Example: In this example, the vgcreate command sets up a primary path to the volume group. <pre># vgcreate /dev/vg_ntap01 /dev/dsk/c35t0d5 Volume group "/dev/vg_ntap01" has been successfully created. Volume Group configuration for /dev/vg_ntap01 has been saved in /etc/lvmconf/vg_ntap01.conf</pre>

Step	Action
11	Specify the remaining paths to the volume group using NetApp's <code>ntap_config_paths</code> utility, which is in the <code>/opt/netapp/santools/bin/</code> directory. Enter the following command: ntap_config_paths Note_____ This utility sets up paths in the correct order. It specifies the disk device nodes that correspond to the primary paths first and then the device notes that correspond to the secondary paths. For more information about the <code>ntap_config_paths</code> utility, see “Correcting volume group multipathing with ntap_config_paths” on page 71. Example: The <code>ntap_config_paths</code> utility adds the rest of the paths using the <code>vgextend</code> command. You can verify the path ordering by running the <code>strings</code> command on the <code>/etc/lvmtab</code> file. <pre># ntap_config_paths Getting information from sanlun... Adding missing path with: vgextend /dev/vg_ntap01 /dev/dsk/c34t0d5 Volume group "/dev/vg_ntap01" has been successfully extended. Volume Group configuration for /dev/vg_ntap01 has been saved in /etc/lvmconf/vg_ntap01.conf Adding missing path with: vgextend /dev/vg_ntap01 /dev/dsk/c30t0d5 Current path "/dev/dsk/c34t0d5" is an alternate link, skip. Volume group "/dev/vg_ntap01" has been successfully extended. Volume Group configuration for /dev/vg_ntap01 has been saved in /etc/lvmconf/vg_ntap01.conf Adding missing path with: vgextend /dev/vg_ntap01 /dev/dsk/c31t0d5 Current path "/dev/dsk/c34t0d5" is an alternate link, skip. Current path "/dev/dsk/c30t0d5" is an alternate link, skip. Volume group "/dev/vg_ntap01" has been successfully extended. Volume Group configuration for /dev/vg_ntap01 has been saved in /etc/lvmconf/vg_ntap01.conf #</pre>

Step	Action
12	Create one or more logical volumes in the volume group using the following command line: <pre>lvcreate [-L -l] <size> <volume_group></pre> <size> with an uppercase -L option is the total size of the logical volume in megabytes. <size> with a lowercase -l option is the number of physical extents that you want to assign to the logical volume. The value you supply for <size> must not equal or exceed the size of the LUN. The LUN reserves an area for physical volume, volume group, and LVM information. The lvcreate and the lvextend commands fail if the size you specify here does not fit into the volume group. Note_____ After you create a logical volume, PVLink multipathing is in effect on the logical volume device node so you can use it for I/O. NetApp recommends, though, that you create a file system on the logical volume first before using it for I/O. _____ Example: The following example creates a logical volume for /dev/vg_ntap01 that uses all the physical extents available for that volume. The vgdisplay command displays the number of available physical extents (511). The lvcreate command with a lowercase -l option assigns them to the logical volume. See the man pages for more information about vgdisplay and lvcreate.

Step	Action
	<pre> # vgdisplay /dev/vg_ntap01 --- Volume groups --- VG Name /dev/vg_ntap01 VG Write Access read/write VG Status available Max LV 255 Cur LV 0 Open LV 0 Max PV 16 Cur PV 1 Act PV 1 Max PE per PV 1016 VGDA 2 PE Size (Mbytes) 4 Total PE 511 Alloc PE 0 Free PE 511 Total PVG 0 Total Spare PVs 0 Total Spare PVs in use 0 # lvcreate -l 511 /dev/vg_ntap01 Logical volume "/dev/vg_ntap01/lvol1" has been successfully created with character device "/dev/vg_ntap01/rlvol1". Logical volume "/dev/vg_ntap01/lvol1" has been successfully extended. Volume Group configuration for /dev/vg_ntap01 has been saved in /etc/lvmconf/vg_ntap01.conf # </pre>
13	Create a file system on the logical volume device node using the <code>nwfs</code> command. Example: The following example creates a file system on the logical volume <code>/dev/vg_ntap01</code>: <pre> # newfs -F vxfs /dev/vg_ntap01/rlvol1 version 4 layout 2093056 sectors, 2093056 blocks of size 1024, log size 1024 blocks unlimited inodes, largefiles not supported 2093056 data blocks, 2091440 free data blocks 64 allocation units of 32768 blocks, 32768 data blocks last allocation unit has 28672 data blocks # </pre>

Step	Action
14	Mount the new file system using the <code>mount</code> command. Example: This example mounts the file system you created in the previous step. <pre># mount /dev/vg_ntap01/lvol1 /mnt/vg_ntap01_lv1 # ls -l /mnt/vg_ntap01_lv1 total 0 drwxr-xr-x 2 root root 96 Oct 30 18:10 lost+found #</pre>

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.
2	Display information about the device nodes by entering the following command: sanlun lun show -p <filer_name>:<lun_path> Write down the primary paths. Example: This example shows the type of output you see using the <code>sanlun lun show -p</code> command. <pre># sanlun lun show -p filerX:/vol/vol1/3333 (LUN 3333) VG: none 2g (2147483648) lun state: GOOD ----- path path /dev/dsk host target partner PVlinks state type filename HBA port port priority ----- up primary /dev/dsk/c35t0d5 td1 5a up secondary /dev/dsk/c30t0d5 td1 5b up primary /dev/dsk/c34t0d5 td0 4a up secondary /dev/dsk/c31t0d5 td0 4b -----</pre>

Displaying LUN and HBA information

Utility for displaying information

The `san lun` utility is a NetApp HP-UX 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 62
- ◆ [“Displaying host HBA information”](#) on page 65

Displaying host LUN information

Displaying host LUN information

To display host LUN information, complete the following steps.

Step	Action
1	Log in as root on the host.
2	At the host command line, use the <code>sanlun lun show</code> command to display LUN information. This command has two basic formats: ◆ <code>sanlun lun show -p [-v] [filer name:filer pathname filer name all]</code> Note _____ You must use the <code>-p</code> version of the command if you want to see information about the primary and secondary paths. You cannot use the <code>-d</code> option if you use the <code>-p</code> option. ◆ <code>sanlun lun show [-v] [-d host_device_filename all filer_name filer_name:filer_pathname]</code> <code>-p</code> provides information about the primary and secondary paths available to the LUN when you are using multipathing. <code>-v</code> option produces verbose output. <code>-d</code> specifies the special device file on the host (<i>host_device_filename</i>); for example, <code>-d /dev/rdisk/c4t0d7</code>. <i>filer_name</i> is the name of the target filer. <i>filer_pathname</i> is the path to the LUN on the filer. <code>all</code> displays information for all LUNs that are currently attached to the host. If you enter <code>sanlun lun show</code>, <code>sanlun lun show -p</code>, or <code>sanlun lun show -v</code> without any parameters, the utility responds as if you had included the <code>all</code> parameter.

Step	Action
	The command line you enter depends on the information you want to view: ◆ To display a listing of the paths associated with the LUN, enter the following command line: sanlun lun show -p This information from this command line is useful if you need to set up path ordering for PVLinks or troubleshoot a problem with path ordering. ◆ To display the summary listing of the filer LUN(s) associated with the host device /dev/rdisk/c3t4d2s2, enter the following command line: sanlun lun show -d /dev/rdisk/c3t4d2s2 ◆ To display verbose output for all the LUNs currently available on the host enter the following command line: sanlun lun show -v all ◆ To display a summary listing of all the LUNs available to the host served by a filer called toaster, enter the following command line: sanlun lun show toaster ◆ To display a summary listing of all the LUNs available to the host served by lun0 on the filer toaster, enter the following command line: sanlun lun show toaster:/vol/vol0/lun0 Note— When you specify either the <code>sanlun lun show <filer name></code> or the <code>sanlun lun show <filer name>:filer pathname</code> command, the utility displays only the LUNs that were discovered by the host. LUNs that were created on the filer and have not been discovered by the host are not displayed. Example 1: This example displays output you might see when you execute the <code>sanlun lun show</code> command with the <code>-p</code> option prior to running the <code>ntap_config_paths</code> utility, as shown in Step 11 of the section “Verifying the mapped LUN” on page 50. Keep the following information in mind as you look at the output: ◆ A primary path type indicates a connection that goes straight to the primary filer, either via a SAN switch or a direct attached connection. This is the preferred route for I/O to the filer. ◆ A secondary path type indicates a path through a second filer. This path is used only when one filer head fails. ◆ The target port column refers to the port on the filer on which the LUN are accessed. It always represents a primary path. ◆ Partner port column refers to the port on the partner filer. It always represents a secondary path. ◆ The PVlinks Priority column is empty because the LUN is not in a volume group.

Step	Action
	<pre># sanlun lun show -p filerX:/vol/vol0/511 (LUN 511) VG: none 2g (2147483648) lun state: GOOD ----- path path /dev/dsk host target partner PVlinks state type filename HBA port port priority ----- up primary /dev/dsk/c35t0d5 td1 5a 0 up secondary /dev/dsk/c30t0d5 td1 5b not in VG up primary /dev/dsk/c34t0d5 td0 4a not in VG up secondary /dev/dsk/c31t0d5 td0 4b not in VG</pre> Example 2: The following example shows an excerpt of output you might see when you execute the <code>san lun</code> command without the <code>-p</code> option. (This example was shortened to fit on this page.) <pre># sanlun lun show -v filer: lun-pathname device filename adapter lun size lun state 3333: /vol/vol1/3333 /dev/rdsk/c31t0d5 td0 2g (2147483648) GOOD Serial number: 0dHNI3miy7Q0 Filer FCP nodename:50a980000200f2fa Filer FCP portname:50a9800a0200f2cc Filer adapter name: v.4b Filer IP address: 10.97.102.55 Filer volume name:vol1 FSID:0x2500f2cc Filer qtree name:/vol/vol1 ID:0x0 Filer snapshot name: ID:0x0 3333: /vol/vol1/3333 /dev/rdsk/c34t0d5 td0 2g (2147483648) GOOD Serial number: 0dHNI3miy7Q0 Filer FCP nodename:50a980000200f2cc Filer FCP portname:50a980010200f2cc Filer adapter name: 4a Filer IP address: 10.97.102.55 Filer volume name:vol1 FSID:0x2500f2cc Filer qtree name:/vol/vol1 ID:0x0 Filer snapshot name: ID:0x0 3333: /vol/vol1/3333 /dev/rdsk/c30t0d5 td1 2g (2147483648) GOOD ...</pre>

Displaying LUN and HBA information

Displaying host HBA information

Displaying host HBA information

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

Step	Action
1	Log in as root on the host.
2	At the host command line, use the <code>sanlun</code> command to display host HBA information. This command has the following format: <pre>sanlun fcp show adapter [-c [-v] [adapter name all]]</pre> <code>-v</code> option produces verbose output. <code>-c</code> gives configuration information that you can use to create igroups. <code>all</code> lists information for all FCP adapters. <i>adapter name</i> lists adapter information for the adapter you specify. Examples: The following example shows the type of output you see when you use different versions of the <code>sanlun fcp show adapter</code> command line. <pre># sanlun fcp show adapter</pre><pre>td0 WWPN:50060b000010a4fa td1 WWPN:50060b000010a53c</pre><pre># sanlun fcp show adapter -c</pre> Enter this filer command to create an initiator group for this system: <pre>igroup create -f -t hpux "netapp" 50060b000010a4fa 50060b000010a53c #</pre>

Step	Action
	<pre> # sanlun fcp show adapter -v td0 WWPN:50060b000010a700 WWNN: 50060b000010a701 driver name: td model: A6795A model description: Fibre Channel Mass Storage Adapter (PCI) - 2 Gig serial number: Not Available hardware version: 2.2 driver version: @(#) PATCH_11.11: libtd.a : Jun 28 2002, 11:08:35, PHSS_26799 firmware version: Not Available Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /dev/td0 td1 WWPN:50060b000010a606 WWNN: 50060b000010a607 driver name: td model: A6795A model description: Fibre Channel Mass Storage Adapter (PCI) - 2 Gig serial number: Not Available hardware version: 2.2 driver version: @(#) PATCH_11.11: libtd.a : Jun 28 2002, 11:08:35, PHSS_26799 firmware version: Not Available Number of ports: 1 port type: Fabric port state: Operational supported speed: 2 GBit/sec negotiated speed: 2 GBit/sec OS device name: /dev/td1 # </pre>

About this chapter

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

Topics covered in this chapter

This chapter discusses the following topics:

- ◆ “[Troubleshooting checklists](#)” on page 68
- ◆ “[Correcting volume group multipathing with `ntap\_config\_paths`](#)” on page 71
- ◆ “[Handling a filer takeover and giveback](#)” on page 73
- ◆ “[Recovering from a host reboot during a filer takeover.](#)” on page 74
- ◆ “[Changing the igroup’s vsa attribute](#)” on page 78
- ◆ “[Commands you can use to troubleshoot problems](#)” on page 83
- ◆ “[NetApp’s diagnostic utilities](#)” on page 87
- ◆ “[General troubleshooting](#)” on page 92

Troubleshooting checklists

Connectivity problems

On HP-UX systems, applications don't generally produce I/O errors. Instead, I/O retries continue uninterrupted if connectivity is lost. If you have a situation where I/O retries appear to be continuing without succeeding, check the following areas for connectivity problems:

- ◆ Filer setup
- ◆ Filer connectivity to the Fibre Channel switch
- ◆ Fibre Channel switch setup
- ◆ Fibre Channel connectivity to the host
- ◆ Host setup

Filer setup checklist

The following is a checklist of items that pertain to the filer setup. You should make sure that the following situations are true:

- ◆ The filer FCP cfmode is set to one of the following options:
 - ❖ Partner
 - ❖ Mixed
 - ❖ Dual-fabric (applies only to FAS2xx NetApp storage appliances).
- ◆ FCP is running and all the target ports are in a good state.

Note

Keep in mind that if an HP-UX FCP driver is not in use, it logs off the target port. For this reason, the `fcv show initiators` command might not display all the host drivers as connected even though they are.

- ◆ The igroups have the following values for the attributes:
 - ❖ The `ostype` attribute must be `hpux`
 - ❖ The `vsa` attribute must be set to `yes`

Note

This attribute only appears in the output displays if it is incorrectly set. When it is correctly set, no references to it appear.

- ◆ For the LUNs, the following is true:
 - ❖ They are mapped to host igroups.

- ❖ They are in a good state (that is, when you execute the `sanlun lun show -p` command, it lists the LUN state as “good”)

Host setup checklist

The following is a checklist of items that pertain to the host setup. You should check to see that the following is true:

- ◆ The HBAs are working.
Check the output from the `sanluns fcp show adapter` command.
- ◆ The host is seeing all of the LUNs it should.
- ◆ The software states reported by the `ioscan` command for the LUNs are “CLAIMED” (that is, in a good state).
- ◆ The `sanlun lun show -p` command is not reporting problems such as the following:
 - ❖ Downed paths
 - ❖ Missing paths
 - ❖ Out of order paths
 - ❖ Filer in takeover
- ◆ There are no suspicious messages in the `/usr/adm/syslog/syslog.log` file, including messages about the following:
 - ❖ I/O timeouts
 - ❖ Reported disk or SCSI errors
 - ❖ EMS event notifications

Note

A suspicious message might simply say that there is a loss of connectivity without explaining what the problem is.

- ◆ There are no other volume group configuration problems reported.
Use the `vgdisplay -v` command to display information about volume group configurations.

Situations affecting volume groups and disk devices

If certain events or changes occur, you must reconfigure the volume groups on the HP-UX host and disk devices the system sees from the filer. These situations include the following:

- ◆ If the host reboots while a filer cluster is in a degraded or takeover state (see [“Recovering from a host reboot during a filer takeover.”](#) on page 74)
- ◆ If you change any of the following settings on the filer:

- ❖ FCP cfmode (do not do this unless directed to do so by NetApp)
- ❖ igroup VSA setting

Fixing problems with the volume groups online

You can resolve problems with a volume group while it is online as long as you have at least one active path to each physical volume in the volume group. For example, if there is a missing path, you can locate it without taking the volume group offline.

Fixing problems with the volume groups offline

If all the paths to a physical volume go down and new paths appear, you must perform a host volume group reconfiguration. The following situations require a host volume group reconfiguration:

- ◆ The filer cfmode needs to change. (Do not change the cfmode unless directed to do so by NetApp.)
- ◆ The vsa attribute for the igroup is not enabled. This would happen if you created an igroup without specifying hpux as the operating system type. By default, this value is set correctly when you create an HP-UX igroup. (For information about setting the vsa attribute, see [“Changing the vsa value”](#) on page 78.)

Correcting volume group multipathing with ntap_config_paths

Using the utility ntap_config_paths

- When you’re using multipathing, you can use the `ntap_config_paths` utility that NetApp provides to perform the following tasks:
- ◆ Set up alternate paths to a volume group after you create the volume group with one primary path.
 - ◆ Correct problems with path order within a volume group.

Example: The following example shows how `ntap_config_paths` works to correct paths to volume groups in a multipathing environment. The `san lun lun show -p` command output includes the comment “not in VG,” which means that the LUN is a member of a volume group, but some of the paths to it are missing.

Note_____

To make this example easier to read, the `ntap_config_paths` output was removed.

```
# sanlun lun show -p

filer1:/vol/vol0/3333 (LUN 3333) VG: /dev/vg_ntap01
      2g (2147483648)      lun state: GOOD
-----
-
path      path      /dev/dsk host target partner PVlinks
state     type          filename HBA  port  port  priority
-----
-
up        primary    /dev/dsk/c35t0d5 td1  5a          0
up        secondary  /dev/dsk/c30t0d5 td1          5b  not in VG
up        primary    /dev/dsk/c34t0d5 td0  4a          not in VG
up        secondary  /dev/dsk/c31t0d5 td0          4b  not in VG

# ntap_config_paths

Getting information from sanlun...

Adding missing path with:
    vgextend /dev/vg_ntap01 /dev/dsk/c30t0d5
(output removed)
Moving VG path to the end of the alternate paths with:
    vgreduce /dev/vg_ntap01 /dev/dsk/c34t0d5
```

```
vgextend /dev/vg_ntap01 /dev/dsk/c34t0d5  
(output removed)  
Moving VG path to the end of the alternate paths with:  
vgreduce /dev/vg_ntap01 /dev/dsk/c31t0d5  
vgextend /dev/vg_ntap01 /dev/dsk/c31t0d5  
(output removed)
```

Handling a filer takeover and giveback

Handling a filer takeover and giveback

If a filer fails, a filer takeover occurs. If your system is set up correctly, the filer starts using the secondary paths during the takeover. When the filer giveback occurs, the filer starts using the primary paths again.

Note

If the host reboots during the takeover, the filer loses the primary paths. See [“Recognizing a host reboot during a filer takeover”](#) on page 74 for information about how to determine whether the host rebooted during a takeover. If the reboot occurred, the section [“Recovering from a host reboot during a filer takeover”](#) on page 75 tells you which steps you must perform to get the filer to rediscover the primary paths.

What happens during a filer takeover

Several things happen during a filer takeover:

- ◆ All the primary paths become unresponsive. If you execute the `ioscan` command, it displays a SW State of `NO_HW`, which means unresponsive paths.
- ◆ Applications do not see I/O errors from the system.
- ◆ It might take PVLlinks up to $(P * T)$ seconds to resume I/O on the secondary paths during a filer takeover, where
 - ❖ P is the number of primary paths.
 - ❖ T is the I/O timeout on the physical volume. To see the value, enter `pvdisplay -v`; to change this value, enter `pvchange`.
- ◆ There might be timeout messages in the host’s syslog file.

What happens during a filer giveback

After the filer giveback occurs, the primary paths come back up. When the host notices that these paths are back, it takes approximately 15 to 30 seconds to transfer I/O back to the path that was active before the filer takeover.

Recovering from a host reboot during a filer takeover.

Events that occur if a host reboots during a takeover

If a host reboots while the filer is in a takeover state, the following events occur:

- 1. The primary paths to the LUNs on the downed filer disappear.
- 2. The volume groups inactivate those primary paths.
- 3. The volume groups remain active, but are aware of the secondary paths only.
- 4. When the giveback occurs, the host is only aware of the secondary paths; it uses the proxy paths, not the primary paths.

When a reboot occurs, you need to perform steps so that the host rediscovers the primary paths to the volume groups.

If no host reboot occurs during the filer takeover, the host automatically notices when the primary paths come back up and transfers information back to them without any user intervention. See “[Handling a filer takeover and giveback](#)” on page 73 for more information.

Recognizing a host reboot during a filer takeover

When a host reboots while the filer is in a takeover state, information about the primary paths disappear. You can determine whether a host reboot occurred during a filer takeover by executing commands such as `sanlun lun show -p`, `ioscan -fnkC disk`, and `vgdisplay -v` after the giveback occurs. These commands display current information about the configuration information.

For example, when you execute `sanlun lun show -p` after the giveback occurs, the output produces information about the secondary paths only.

```
# sanlun lun show -p

filerX:/vol/vol1/3333 (LUN 3333) VG: /dev/vg_ntap01
      2g (2147483648)      lun state: GOOD
-----
path      path      /dev/dsk host target partner PVlinks
state     type          filename HBA  port  port  priority
-----
takeover  secondary    /dev/dsk/c30t0d5 td1      5b    0
takeover  secondary    /dev/dsk/c31t0d5 td0      4b    1
```

If you then issued an `ioscan -fnkC disk` command, the display would appear normal except that all the devices listed would correspond to secondary paths only. No primary paths would appear.

Executing the `vgdisplay -v` command would produce warnings similar to the following:

```
vgdisplay: Warning: couldn't query physical volume "<volume_name>":
The specified path does not correspond to physical volume attached
to this volume group
```

Recovering from a host reboot during a filer takeover

If the host reboot occurs while the filer is in a takeover state, it does not automatically rediscover the paths to the LUNs. You must deactivate the volume groups and then reactivate them.

After the giveback occurs, you must perform these steps for each volume group hosted on the filer.

Complete the following steps.

Step	Action
1	Repair the problem that caused the filer to fail, and then reboot.
2	Perform the giveback.
3	Perform an <code>ioscan</code> on the HP-UX host to see the LUNs it discovers. The <code>ioscan</code> reports only devices corresponding to secondary paths. Example: The following is an example of the output from the <code>ioscan</code> command. <pre># ioscan -fnkC disk Class I H/W Path Driver S/W State H/W Type Description ===== disk 0 0/0/1/1.15.0 sdisk CLAIMED DEVICE HP 18.2GMAN3184MC /dev/dsk/c1t15d0 /dev/rdisk/c1t15d0 disk 1 0/4/0/0.1.5.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN /dev/dsk/c31t0d5 /dev/rdisk/c31t0d5 disk 2 0/6/2/0.1.13.0.26.0.5 sdisk CLAIMED DEVICE NETAPP LUN /dev/dsk/c30t0d5 /dev/rdisk/c30t0d5</pre>
4	Stop all applications using the affected volume groups.
5	Unmount all file systems on any logical volumes using the affected volume groups.

Step	Action
6	Enter the following command to deactivate the volume groups: <pre>vgchange -a n <vg_name></pre> <i>vg_name</i> is the name of the volume group. Example: This example uses a volume group called <code>vg_ntax01</code>: <pre># vgchange -a n vg_ntax01 vgchange: Warning: couldn't query physical volume "/dev/dsk/c35t0d5": The specified path does not correspond to physical volume attached to this volume group vgchange: Warning: couldn't query physical volume "/dev/dsk/c34t0d5": The specified path does not correspond to physical volume attached to this volume group (additional warnings removed) vgchange: Warning: couldn't query all of the physical volumes. Volume group "vg_ntax01" has been successfully changed.</pre>
7	Reactivate the volume groups by entering the following command: <pre>vgchange -a y <vg_name></pre> <i>vg_name</i> is the name of the volume group. Example: This example uses a volume group called <code>vg_ntax01</code>: <pre># vgchange -a y vg_ntax01 Activated volume group Volume group "vg_ntax01" has been successfully changed. #</pre>

Step	Action																																			
8	Use the <code>sanlun lun show -p</code> command to verify that the primary paths are now visible. Example: This example uses the <code>sanlun lun show -p</code> command to display the path information for filerX. <pre># sanlun lun show -p filerX:/vol/vol1/3333 (LUN 3333) VG: /dev/vg_ntap01 2g (2147483648) lun state: GOOD</pre> <table><thead><tr><th>path state</th><th>path type</th><th>/dev/dsk filename</th><th>host HBA</th><th>target port</th><th>partner port</th><th>PVlinks priority</th></tr></thead><tbody><tr><td>up</td><td>primary</td><td>/dev/dsk/c35t0d5</td><td>td1</td><td>5a</td><td></td><td>0</td></tr><tr><td>up</td><td>primary</td><td>/dev/dsk/c34t0d5</td><td>td0</td><td>4a</td><td></td><td>1</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c30t0d5</td><td>td1</td><td></td><td>5b</td><td>2</td></tr><tr><td>up</td><td>secondary</td><td>/dev/dsk/c31t0d5</td><td>td0</td><td></td><td>4b</td><td>3</td></tr></tbody></table>	path state	path type	/dev/dsk filename	host HBA	target port	partner port	PVlinks priority	up	primary	/dev/dsk/c35t0d5	td1	5a		0	up	primary	/dev/dsk/c34t0d5	td0	4a		1	up	secondary	/dev/dsk/c30t0d5	td1		5b	2	up	secondary	/dev/dsk/c31t0d5	td0		4b	3
path state	path type	/dev/dsk filename	host HBA	target port	partner port	PVlinks priority																														
up	primary	/dev/dsk/c35t0d5	td1	5a		0																														
up	primary	/dev/dsk/c34t0d5	td0	4a		1																														
up	secondary	/dev/dsk/c30t0d5	td1		5b	2																														
up	secondary	/dev/dsk/c31t0d5	td0		4b	3																														
9	Remount any file systems for those volume groups.																																			
10	Restart the applications.																																			

Changing the igroup's vsa attribute

Changing the vsa value

The igroup vsa attribute enables the HP-UX host to identify more than eight LUNs per target HBA.

By default, this attribute is set when you create an igroup that specifies `hpux` as the operating system type. You must manually set this attribute if you change an existing igroup to an HP-UX igroup by modifying the `ostype` attribute.

Note—
You should never turn this attribute off.

To manually set the `vsa` attribute to on, complete the following steps.

Step	Action
1	On the host, make a backup of all the volume groups that contain LUNs. These backups must contain up-to-date information for both the data within the volume group and the volume group configuration. You should record the LUN volume group membership. To find all the LUNs and volume groups that contain LUNs from a specific pair of filers, run the <code>sanlun lun show -p</code> command for each filer: <pre>sanlun lun show -p <filer1 name> sanlun lun show -p <filer2 name></pre>
2	Close the logical volumes. If a logical volume contains a file system, unmount the file system.
3	Deactivate each volume group by entering the following command: <pre>vgchange -a n <vg_name>/dev/vol_group_name</pre> <code>vg_name</code> is the path to the volume group. Example: The following command deactivates the volume group <code>/dev/ntap01</code>: <pre># vgchange -a n /dev/ntap01</pre>

Step	Action
4	Remove the volume group entry from the <code>/etc/lvmtab</code> and associated device files by using the <code>vgexport</code> command: <pre>vgexport /dev/ntap01</pre>
5	Go into diagnostic mode by entering the following command: <pre>priv set diag</pre> Example: When you start diagnostic mode, a warning appears. <pre># priv set diag Warning: These diagnostic commands are for use by Network Appliance personnel only.</pre>
6	Enter the following command: <pre>igroup set <igroup> vsa <value></pre> <code><igroup></code> is the name of the igroup for which you want to change the setting. <code><value></code> is either <i>on</i> or <i>off</i>. For HP-UX systems, you must always set this value to <i>on</i>. Result: The igroup you specify in this command. Note _____ Although this command lets you change the <code>vsa</code> value of a specific igroup and all igroups you create in the future, it does not change the value of any other existing igroups. You must perform this command on each existing igroup to change its attribute value. Example: Here is an example showing the output you might see when you change the igroup <code>hostA</code> on <code>filerX</code> to <i>on</i>: <pre>filerX> igroup set -f netapp vsa on Wed Sep 3 21:13:59 GMT [filerX: scsitarget.notice:notice]: VSA setting changed on initiator group "hostA" to "on"</pre>

Step	Action
7	Confirm that the <code>vsa</code> value for that igroup is now correct by using the <code>igroup show -v</code> command. ◆ If the attribute is not set correctly for an HP-UX system, the line “Volume Set Addressing: No” appears in the output. ◆ If the attribute is correctly set, there is no reference to volume set addressing or <code>vsa</code> in the output. Example: This example checks the settings for the igroup <code>hostA</code> and corrects the value for <code>vsa</code>. <pre>filerX> igroup show -v hostA hostA (FCP): OS Type: hpux Volume Set Addressing: No Member: 50:06:0b:00:00:10:a7:00 Member: 50:06:0b:00:00:10:a6:06</pre> <pre>filerX> priv set diag Warning: These diagnostic commands are for use by Network Appliance personnel only.</pre> <pre>filerX> igroup set hostA vsa on Wed Sep 3 21:13:59 GMT [filerX: scsitarget.notice:notice]: VSA setting changed on initiator group "hostA" to "on" filerX> igroup show -v hostA hostA (FCP) (ostype: hpux): OS Type: hpux Member: 50:06:0b:00:00:10:a7:00 Member: 50:06:0b:00:00:10:a6:06 filerX> priv set</pre>

Step	Action
8	Return to the host and execute the <code>ioscan -fnC disk</code> command and the <code>ioinit -i</code> command to have the host discover the disks and create device nodes for them. <pre># ioscan -fnC disk # ioinit -i</pre> Note If the <code>ioinit -i</code> command does not create the devices, use the <code>insf -e</code> command. Result: The old disk devices then show up as NO_HW in the <code>ioscan</code> output.
9	Either manually remove the old device paths or reboot the host. Doing this removes the old disk devices and causes the host to discover the new ones. Make sure that the only device nodes that are removed are those that disappeared as a result of the <code>igroup</code> attribute change.
10	Run the <code>vgscan -v</code> command and the <code>sanlun lun show -p</code> command to view the new locations: <pre># vgscan -v # sanlun lun show -p</pre> Correlate the new <code>sanlun</code> output with the <code>sanlun</code> information from Step 1 to determine which devices go with which volume group.

Step	Action
11	Re-add the volume group entries to /etc/lvmtab and the associated device files to the system. For each volume group, perform the following tasks: 1. Create a new directory with the <code>mkdir</code> command: # <code>mkdir /dev/<vg_name></code> 2. Create a group file in the preceding directory with the <code>mknod</code> command: # <code>mknod /dev/<vg_name>/group c 64 <vg minor dev num></code> 3. Issue the <code>vgimport</code> command with a device that represents a primary path (as indicated by the <code>sanlun lun show -p</code> command) for the volume group: # <code>vgimport /dev/<vg_name> <dev_name_primary_path></code>
12	For each volume group you exported before changing the <code>Vsa</code> attribute, activate the newly imported volume group: <pre># vgchange -a y /dev/vol_group_name</pre>
13	Run the <code>ntap_config_paths</code> utility to configure multipathing for the newly imported volume groups: <pre># ntap_config_paths</pre>
14	Verify that the paths are now set up correctly: <pre># sanlun lun show all -p</pre>
15	Repeat these steps for each filer in the cluster.

Commands you can use to troubleshoot problems

Commands you can use to check for problems

There are several commands you can use to check your system and look for problems. The following two commands are especially useful in tracking down problems:

- ◆ The HP-UX command `ioscan`
- ◆ The NetApp `san lun` utility

Using HP-UX's `ioscan` command

The HP-UX `ioscan` command displays information about the state of the LUNs and whether the host recognizes them.

Example of `ioscan` output

The following example shows the type of output from the `ioscan` command that you would see after a filer takeover occurs. From this example, you can determine the following information:

- ◆ The filer is in `cfmode mixed` because there are multiple paths to the filer LUN.
- ◆ There are no device entries for the NetApp LUNs yet.
- ◆ The state `CLAIMED` on four paths to the LUN means that these paths are visible to the host and ready to use.
- ◆ The state `NO_HW` on four paths to the LUN means that these paths are not visible to the host, so they cannot be used. These four paths would have been the primary paths, which were lost during the takeover.

# ioscan -fnC disk									
Class	I	H/W Path	Driver	S/W State	H/W Type	Description			
=====									
disk	0	0/0/1/1.15.0	sdisk	CLAIMED	DEVICE	HP 18.2GMAN3184MC			
			/dev/dsk/c1t15d0		/dev/rdsk/c1t15d0				
disk	1	0/4/0/0.1.5.0.26.0.5	sdisk	CLAIMED	DEVICE	NETAPP LUN			
			/dev/dsk/c31t0d5		/dev/rdsk/c31t0d5				
disk	3	0/4/0/0.1.6.0.26.0.5	sdisk	NO_HW	DEVICE	NETAPP LUN			
			/dev/dsk/c34t0d5		/dev/rdsk/c34t0d5				
disk	2	0/6/2/0.1.13.0.26.0.5	sdisk	CLAIMED	DEVICE	NETAPP LUN			
			/dev/dsk/c30t0d5		/dev/rdsk/c30t0d5				
disk	4	0/6/2/0.1.14.0.26.0.5	sdisk	NO_HW	DEVICE	NETAPP LUN			
			/dev/dsk/c35t0d5		/dev/rdsk/c35t0d5				

Using NetApp's sanlun utility

You can use NetApp's sanlun utility to perform the following tasks:

- ◆ Check the status of the
 - ❖ HBA
 - ❖ LUN
 - ❖ PVLlinks path
- ◆ Determine the /dev/dsk device node association with the filer LUN
- ◆ Discover whether a path is up or down

With the -p option, you can also use the sanlun utility to

- ◆ Determine whether the path to the filer is primary or secondary.
- ◆ Report missing paths from the volume group. (You can use the ntap_config_paths utility to easily correct any missing paths.)
- ◆ Report the PVLlinks path ordering.
- ◆ Get information about a filer takeover.

Using sanlun to check device nodes

Using the -vv option with sanlun increases the amount of information you get about a system. The following example illustrates how you can use sanlun with multiple -v options to determine which device nodes are not responding to which commands:

```
# sanlun lun show -pvv
[open_device_filename] /dev/rdisk/c31t0d5
OK [/dev/rdisk/c31t0d5]
[open_device_filename] /dev/rdisk/c34t0d5
OK [/dev/rdisk/c34t0d5]
[open_device_filename] /dev/rdisk/c30t0d5
OK [/dev/rdisk/c30t0d5]
[open_device_filename] /dev/rdisk/c35t0d5
OK [/dev/rdisk/c35t0d5]

filerX:/vol/vol1/3333 (LUN 3333) VG: /dev/vg_ntap01
2g (2147483648) lun state: GOOD

-----
path      path      /dev/dsk host target partner PVLlinks
state     type     filename HBA  port  port  priority
-----
up        primary  /dev/dsk/c35t0d5 td1  5a           0
up        primary  /dev/dsk/c34t0d5 td0  4a           1
up        secondary /dev/dsk/c30t0d5 td1           5b           2
up        secondary /dev/dsk/c31t0d5 td0           4b           3
```

Using sanlun to check multipathing

The order of the paths you use when you set up the LUNs can affect performance. In general, secondary paths are slower than primary paths.

To get the best performance, you must set up your paths with the primary paths first, followed by the secondary paths. You can use `sanlun` with the `-p` option to check your paths. If the paths are not in the correct order, `sanlun` puts the word (wrong) next to them.

Example: The following example shows where the secondary paths were entered before the primary path. Also, in this example, the primary path is visible, but is not in the volume group.

```
# sanlun lun show -p

filerX:/vol/vol1/3333 (LUN 3333) VG: /dev/vg_ntap01
      2g (2147483648)      lun state: GOOD

-----
path    path                /dev/dsk host  target partner PVLlinks
state   type                filename HBA   port   port   priority
-----
up      primary            /dev/dsk/c35t0d5 td1  5a                0
up      secondary          /dev/dsk/c30t0d5 td1                5b      1 (Wrong)
up      secondary          /dev/dsk/c31t0d5 td0                4b      2 (Wrong)
up      primary            /dev/dsk/c34t0d5 td0  4a                not in VG

#
```

You can repair the ordering of the paths by running the `ntap_config_paths` utility. You must manually add the primary path to the volume group.

Example of sanlun output after filer takeover

The following example shows the type of output the `sanlun` utility displays after a filer takeover occurs. From this example, you can determine

- ◆ The four primary paths to the LUN are down.
- ◆ The four secondary paths are taking over. The takeover paths start with the active path that has the lowest priority.

```
# sanlun lun show -p

filerX:/vol/vol1/3333 (LUN 3333) VG: /dev/vg_ntap01
      2g (2147483648)      lun state: GOOD

-----
path    path                /dev/dsk host  target partner PVLlinks
state   type                filename HBA   port   port   priority
-----
```

DOWN	/dev/dsk/c35t0d5		0
DOWN	/dev/dsk/c34t0d5		1
takeover secondary	/dev/dsk/c30t0d5 td1	5b	2
takeover secondary	/dev/dsk/c31t0d5 td0	4b	3

NetApp's diagnostic utilities

NetApp's diagnostic utilities

NetApp provides several scripts that provide diagnostic information you can use for troubleshooting.

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

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

- ◆ filer_info. See “[Collecting filer information](#)” on page 87 for more information.
- ◆ hpux_info. See “[Using the HP-UX data-collection tool](#)” on page 89.
- ◆ <switch>_info, where <switch> is the name of the switch you are using (for example, brocade_info). See “[Collecting switch information](#)” on page 89.

General steps for executing the programs

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

Step	Action
1	Go to the directory /opt/NetApp/santools/bin: cd /opt/NetApp/santools/bin
2	Enter the utility name. If the utility you are using includes arguments, you can enter them as well. Result: The configuration information that the utility gathers is placed in a gzipped .tar file.

Collecting filer information

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

Note

This utility runs in command-line mode only. Double-clicking the utility name to run it does not work.

Step	Action
1	Go to the directory /opt/NetApp/santools/bin: cd /opt/netapp/santools/bin
2	At the host command prompt, enter the following command: <pre>filer_info [-d <path_and_file_name>] [-l <user>] -n <filer_name></pre> The -d option enables you to specify a different path in which to place the resulting output. The default path is /tmp/netapp/ntap_filer_<filer_name>. The -l <user> option allows the choice of a user name and password on the switch. If this option is not specified, the Brocade default settings of admin:password are used. The target of the command is specified by “-n <filer_name>”, where <i>filer_name</i> is the name of IP address of the filer to be interrogated. Result The output of various status commands are placed in the output directory named netapp_filer_<filer_name>, where <i>filer_name</i> is replaced by the filer name or IP address. The contents of this directory are placed in a tarred and gzipped file named filer_filer_<filer_name>.tar.gz. Example: The following command line checks filer1, logging on to it as the user root. <pre>host1> filer_info -d /opt/netapp/santools -l root -n filer1</pre> The information from filer1 is placed in a gzipped file with the following directory path: <pre>/tmp/netapp/filer_filer1.tar.gz</pre>
3	Send the resulting gzipped file to NetApp for analysis.

Using the HP-UX data-collection tool

If you are having a problem, NetApp Customer Support might ask you to run `hpux_info` to collect configuration information on your HP-UX system. You should run this utility only when requested to do so by NetApp.

To execute `hpux_info`, complete the following steps.

Step	Action
1	Change to the <code>/opt/netapp/santools/bin</code> directory: <code>cd /opt/netapp/santools/bin</code>
2	At the command prompt, enter the following command: <code>hpux_info [-d <directory>] [-n <file_name>]</code> <code>-d <directory></code> specifies the location for the gzipped file that <code>hpux_info</code> creates. The default location is <code>/tmp/netapp</code>. <code>-n <name></code> specifies the name for the output file and directory names. The default path name is <code>/tmp/netapp/ntap_hpux_info.tar.gz</code>. Result: When you run <code>hpux_info</code>, the utility gathers information about your HP-UX configuration and places it in a gzipped file. It also creates a directory and populates it with files containing output from numerous commands and copies of files, such as <code>/var/adm/syslog/syslog.log</code> file. Example: Depending on the options you specify, you see output similar to the following when you run this utility: <pre># hpux_info HP-UX system info is in directory /tmp/netapp/ntap_hpux_info Compressed file is /tmp/netapp/ntap_hpux_info.tar.gz Please send this file to Network Appliance for analysis</pre>
3	Send the resulting gzipped file to NetApp for analysis.

Collecting switch information

If you are having a problem, NetApp Customer Support might ask you to run the switch utility NetApp supplies when you install the host attach kit software. NetApp provides a utility for each switch it supports for this host attach kit. The utility name is `<switch>_info`, where *switch* is the name of the switch (for example, `brocade_info` or `mcddata_info`). This utility collects switch configuration information. You should run this utility only when requested to do so by NetApp.

To execute the utility, complete the following steps.

Note

This utility runs in command-line mode only. Double-clicking the utility name to run it does not work.

Step	Action
1	Go to the directory /opt/netapp/santools/bin: <code>cd /opt/netapp/santools/bin</code>

Step	Action
2	At the host command prompt, enter the following command: <pre><switch_brand>_info [-d <path_and_file_name>] [-l <user:password>] -n <switchname></pre> <switch_brand> is the name of the switch you are using; for example, brocade or mcddata. The -d <path_and_file_name> option enables you to specify a different path in which to place the resulting output. The default path is /tmp/netapp/<switch_brand>_switch_<switch_name>. The -l <user:password> option allows the choice of a user name and password on the switch. If this option is not specified, the Brocade default settings of admin:password are used. The target of the command is specified by -n <switchname>, where switchname is the name or IP address of the switch to be interrogated. Result: The output of various status commands on the switch are placed in a directory named <switch_brand>_switch_switchname, where switch_brand is the brand of the switch, such as Brocade, and switchname is replaced by the switch name or IP address. The contents of this directory are placed in a tarred and gzipped file named <switch_brand>_switch_switchname.tar.gz. Example: This example uses the brocade_info file. The switch brcd1 is connected with the user "john", who has the password "smith". <pre>host1> brocade_info -d /opt/netapp/santools -l john:smith -n brcd1</pre> The information from filer1 is placed in a tarred, gzipped file that has the pathname /tmp/netapp/brocade_switch_brcd1.tar.gz .
3	Send the resulting gzipped file to NetApp for analysis.

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/MANPATH 31
- /etc/PATH 31
- /opt/NetApp/santools/bin 31
- /opt/NetApp/santools/man 31

C

- cable
 - requirements 17
- cfmode
 - checking settings 37
 - default settings 37
 - dual-fabric 37
 - partner 37
- checklist
 - filer 68
 - host 69
 - installing 10
 - troubleshooting 68
- cluster
 - correct cfmodes 37
 - F8xx configuration 5
 - FAS9xx configuration 5
- commands
 - gunzip 28
 - igroup create 39
 - igroup show 40
 - ioinit (HP-UX) 52
 - ioscan (HP-UX) 51
 - lun comment 45
 - lun setup 42, 43
 - lun show 50
 - lvcreate (HP-UX) 58
 - mount (HP-UX) 60
 - nwfs (HP-UX) 59
 - sanlun fcp show adapter 65
 - sanlun lun show 54, 60, 62
 - swinstall 29
 - swremove 33
 - swverify 30
 - tdlist (HP-UX) 53

- vgcreate (HP-UX) 56
- vgdisplay (HP-UX) 58
- configuration
 - components 3
 - FAS270 cluster 6
 - multi-attached 5
 - recommended 3
- conventions
 - keyboard ix

D

- Data ONTAP Block Access Management Guide for FCP 21
- depot file 24
 - getting from NOW 24
 - installing 27
 - on CD 25
- documentation
 - Data ONTAP Block Access Management Guide for FCP 21
 - FCP/iSCSI Configuration Guide 21
 - Network Appliance FCP Quick Reference Commands-HP-UX 11i 21
 - related documentation 21
 - release notes 21
 - SAN Setup Overview 21
 - System Configuration Guide 21
- driver
 - logs off target port 68

E

- enter
 - defined ix
- equipment
 - order for powering up 14

F

- F8XX
 - configuration 5
- F8xx 4

- failover software 16
- FAS270 4
 - cfmode 37
 - configuration 6
- FAS8xx
 - cfmode 37
- FAS9xx 4
 - cfmode 37
 - configuration 5
- FCP/iSCSI Configuration Guide 21
- file system
 - create 59
 - mount 60
- filer
 - adding LUNs 36
 - cfmode settings 37
 - communicating with host 2, 19
 - configuration components 3
 - configuration issues 18
 - defined ix
 - entering commands ix
 - operating system 16
 - setup checklist 68

G

- gunzip command
 - uncompressing NetApp file 28

H

- HBA 2
 - displaying information 65
 - installation 17
 - supported 16
- host
 - adding LUNs 36
 - attach kit contents 13
 - communication with filer 2
 - configuration components 3
 - create file system 59
 - discovering LUNs 51
 - displaying HBA information 65
 - displaying LUN information 62
 - failover software 16
 - FAS270 configuration 6
 - issuing filer commands 19
 - multi-attached configuration 5
 - multipath software 16
 - operating system 15
 - platforms 15
 - requirements 14
 - setup checklist 69
 - supported HBAs 16
 - supported storage appliances 16
 - verifying LUN visibility 60

host bus adapter

- see HBA 2

HP-UX

- connectivity issues 68
- failover software 16
- FCP driver behavior 68
- LVM 51
- multipath software 16
- operating system versions 15
- supported platforms 15

I

I/O

- numerous retries 68

igroup

- creating 38
- definition 38
- verify 40
- vsa attribute 40

igroup create command 39

igroup show command 40

initiator group

- see igroup

initiators

- display 41

installation

- checklist 10
- HP-UX depot file 24
- NetApp software package 27
- overview 27
- pre-installation tasks 13
- tasks performed 27
- uninstalling the host software 32
- update to search paths 31

- verify 30
- ioinit command 52
- ioscan command 51

K

- keyboard conventions ix

L

- logcial volumes
 - creating 58
- LUN
 - defined ix
- lun comment command 45
- LUN ID 49
 - defined ix
- lun setup command 42
 - command line options 42
 - interactive script 43
- lun show command 50
- LUNs
 - adding 36
 - best practices for creating 38
 - creating with command line 42
 - creating with interactive script 42
 - discovered by host 51
 - displaying information on host 62
 - lun setup command 43
 - tasks for creating on filer 38
 - verifying 50
 - verifying visibility 60
- lvcreate command 58
- LVM
 - Logcial Volume Manager 51
 - volume group entries 55

M

- MC/Serviceguard
 - failover software 16
- mount command 60
- multipath software
 - PVLinks 16

N

- NetApp software package
 - contents 24
 - downloading 24
 - getting from CD 25
 - installing 27
 - uninstalling 32
- Network Appliance FCP Quick Reference Commands-HP-UX 11i
 - Quick Reference HP-UX 21
- NOW site
 - downloading software package 24
- ntap_config_paths utility 57
 - repairing paths 71
- nwfs command 59

O

- operating system 15

P

- path order
 - volume groups 57
- paths
 - displaying with sanlun lun show command 62
 - repairing with ntap_config_paths 71
- ports
 - active 2
 - traffic on a cluster 5
 - traffic on a FAS270 cluster 6
- PVLinks
 - multipath software 16

R

- requirements 14
 - cable 17
 - failover software 16
 - HBA 16
 - host platforms 15
 - multipath software 16
 - operating system 15
 - storage appliances 16

S

SAN Host Release Notes 1.0 for Fibre Channel
Protocol on HP-UX 21

SAN Setup Overview 21

sanlun fcp show adapter command 65

sanlun lun show command 54, 60, 62

sanlun utility

- about 61

- locating 36

- sanlun fcp show adapter 65

software package

- contents 24

- downloading 24

- getting from CD 25

- installing 27

- uninstalling 32

storage appliances

- F8xx 4

- FAS270 4

- FAS9xx 4

- supported 16

swinstall command 29

switches

- cable 17

- power up 14

- setup 19

- zoning 19

swremove command

- uninstalling software 33

swverify command

- verify installation 30

System Configuration Guide 21

system requirements 14

- cable 17

- failover 16

- HBA 16

- host platforms 15

- multipath software 16

- operating system 15

- storage appliances 16

system search path

- updated 31

T

tdlist command 53

topologies 3

troubleshooting

- checklists 68

type

- defined ix

U

uninstalling 32

V

vgcreate command 56

vgdisplay command 58

volume groups

- creating logical volumes 58

- creating with primary path 56

- fixing while offline 70

- fixing while online 70

- minor numbers 55

- path order 56, 57

- situations requiring reconfiguration 69

- using ntap_conf_paths 57

vsa attribute 40

W

World Wide Port Name

- see WWPN

WWPN 2

Z

zoning 19