

FCP Solaris™ Host Utilities 4.1 for Native OS **Installation and Setup Guide**

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Part number 215-02976_A0
March 2007

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Preface

About this guide

This guide describes how to configure a Solaris™ host in a SAN environment. The host accesses data on a NetApp® storage system that runs Data ONTAP® software with the Fibre Channel Protocol (FCP).

See the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products*, available on the NetApp on the Web™ (NOW) site at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/ for information on the specific Solaris versions supported.

Audience

This guide is for system installers and administrators who:

- ◆ Are familiar with the Sun Solaris operating system
- ◆ Understand how to configure and administer a storage system
- ◆ Understand how to use FCP to store and retrieve data on a storage system.

Terminology

This guide uses the following terms:

- ◆ NetApp storage products (filers, FAS appliances, and NearStore systems) are all storage systems and are also sometimes called filers or storage appliances.
- ◆ *igroup* refers to a collection of unique identifiers, either FCP WWPNs in a SCSI network or iSCSI node names of initiators (hosts) in an IP network, that are given access to LUNs when they are mapped to those LUNs.
- ◆ *LUN* (Logical Unit Number) refers to a logical unit of storage identified by a number.
- ◆ *LUN ID* refers to the numerical identifier for a LUN.
- ◆ *Initiator* refers to the system component that originates an I/O command over an I/O bus or network.
- ◆ *Target* refers to the storage system that receives an FCP I/O request and serves the data requested by the initiator.

Command conventions

You can enter storage system commands on the system console or from any client that can obtain access to the storage system using a Telnet session.

Formatting conventions

The following table lists different character formats used in this guide to set off special information.

Formatting 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 requires you to enter the <code>fc test adaptername</code> command, you enter the characters “<code>fc test</code>” followed by the actual name of the adapter. ◆ Book titles in cross-references.
Monospaced font	◆ Command and daemon names. ◆ Information displayed on the system console or other computer monitors. ◆ The contents of files.
Bold monospaced font	Words or characters you type. What you type is always shown in lowercase letters, unless your program is case-sensitive and uppercase letters are necessary for it to work properly.

Keyboard conventions

This guide uses capitalization and some abbreviations to refer to the keys on the keyboard. The keys on your keyboard might not be labeled exactly as they are in this guide.

What is in this guide...	What it means...
hyphen (-)	Used to separate individual keys. For example, Ctrl-D means holding down the Ctrl key while pressing the D key.
<i>Enter, enter</i>	Used to refer to the key that generates a carriage return; the key is named Return on some keyboards. Also used to mean pressing one or more keys and then pressing the Enter key.
<i>type</i>	Used to mean pressing one or more keys on the keyboard.

Special messages

This guide contains special messages that are described as follows:

Note

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

Caution

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

How to send your comments

Your feedback is important in helping us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically to docomments@netapp.com. To help us direct the comments to the correct division, please put FCP Solaris in the subject line.

About this chapter

This chapter provides a brief overview of the FCP Solaris Host Utilities for Native OS. The native OS for this release refers to Sun™ StorEdge™ SAN Foundation Software.

In addition, this chapter provides a high-level overview of the tasks you need to perform to install the Host Utilities and set up your system. It also includes pointers to other documentation that might be helpful in working with your Host Utilities setup.

Topics covered in this chapter

This chapter includes the following topics:

- ◆ [“Host Utilities Overview”](#) on page 2
- ◆ [“FCP Solaris Host Utilities installation overview”](#) on page 7
- ◆ [“Where to go for more information”](#) on page 10

Host Utilities Overview

Important information about Host Utilities and Attach Kits

Previously NetApp provided FCP Solaris Attach Kits to enable users to connect Solaris hosts to NetApp storage systems. Going forward, NetApp is using Host Utilities to provide this support.

Host Utilities both simplify the products and provide more options for the host stacks. A single FCP Solaris Host Utilities can contain software tools and documentation packages to support different host configurations.

For this release, the FCP Solaris Host Utilities provide the software and documentation to support the Solaris native OS (Sun StorEdge SAN Foundation Software) host platform.

Because the Host Utilities are the umbrella for the different kits, component version numbers are not tied to the Host Utilities version number. It is possible for each component to have a different version number. For example, at the time this document was produced, it supported the FCP Host Utilities 4.1 for Native OS using version 3.3 of the SAN Toolkit.

If you are concerned about the version numbers, you can confirm that you have the most current components by checking the Host Utilities version number in the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

Overview of the FCP Solaris Host Utilities

The Host Utilities provide the tools and information necessary to enable a Solaris host to connect to your storage systems. The Host Utilities consist of:

- ◆ Utilities, scripts, and support files, which make up the SAN Toolkit.
- ◆ Documentation, including this setup guide, *Release Notes*, and a quick command reference guide.

The FCP Solaris Host Utilities for Native OS work with Solaris hosts running Sun StorEdge SAN Foundation Software and components that make up the native stack. The following is a summary of the supported stack at the time this document was produced.

Note

The most current information on the supported stack is in the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>. NetApp adds components on an ongoing basis. This online site is updated frequently to provide you with information about the current stack.

- ◆ Operating system:
 - ❖ Solaris 10 Update 3
- ◆ Processor:
 - ❖ SPARC processor systems
 - ❖ x86/64 (AMD) processor systems.
- ◆ HBA:
 - ❖ Certain Sun StorageTek™ Host Bus Adapters (HBAs)
 - ❖ Certain Sun OEM QLogic® HBAs
 - ❖ Certain Sun OEM Emulex® HBAs
- ◆ Drivers:
 - ❖ Bundled Sun StorEdge SAN Foundation Software (SFS) drivers
- ◆ Multipathing
 - ❖ Sun StorageEdge Traffic Manager (the Solaris multiplexed I/O MPxIO)

The FCP Solaris Host Utilities for Native OS also support the following:

- ◆ Volume manager
 - ❖ Solaris Volume Manager (SVM)
 - ❖ Veritas® Volume Manager (VxVM)
- ◆ Clustering
 - ❖ Sun Clusters. This kit has been certified using the Sun Cluster Automated Test Environment (SCATE).
 - ❖ Veritas Cluster Server (VCS)

Software tools provided by the Host Utilities

The FCP Solaris Host Utilities bundle the tools into a SAN Toolkit. These tools include scripts and commands you can use to display information about LUNs, add required settings, and troubleshoot your system. The toolkit contains the following components:

- ◆ `basic_config` command line tool. This tool modifies the Fibre Channel tunable variables to set them to values required by the FCP driver.
- ◆ `filer_info` script. This script collects information about the storage system.

- ◆ `mpxio_set` script. This script lets you clean up the I/O connection if you were running the iSCSI Solaris Support Kit 1.0. (If you were not using the support kit, you should not need to use this script.)
- ◆ `san_version` command. This command displays the version of the SAN Toolkit that you are running.
- ◆ `sanlun` utility. You can use this utility to display information about LUNs on the storage system that are available to this host.
- ◆ `solaris_info` script. This script collects configuration information about your host.
- ◆ Additional diagnostic scripts. The following scripts can also be used to collect troubleshooting information:
 - ❖ `brocade_info` collects information about Brocade switches installed in the network.
 - ❖ `cisco_info` collects information about Cisco switches installed in the network.
 - ❖ `mcddata_info` collects information about McData switches installed in the network.
 - ❖ `qllogic_info` collects information about QLogic switches installed in the network.
 - ❖ `SHsupport.pm` is the support library for the `*info` scripts.
 - ❖ `Telnet.pm` support library for `*info` scripts.
 - ❖ `version` displays the version of the `sanlun` command.
- ◆ The man pages for `sanlun` and the diagnostic scripts.

About the HBAs

For this release, the Host Utilities support certain Sun StorageTek HBAs, certain QLogic HBAs, and certain Emulex HBAs.

Note

For details on the specific HBAs that are supported, see the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

Do not use different HBA brands on a single Solaris host. The supported HBAs should be installed before you install the Host Utilities. Normally, they should have the correct FCode set. You can determine what the correct FCode should be by checking the *Compatibility and Configuration Guide for NetApp's FCP and*

iSCSI Products at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>. If you want to check the FCode setting on your system, run the appropriate administration tool for your HBA.

If the Host Utilities setup procedure differs based on the HBA model, this guide will describe the different steps. Unless otherwise noted, the information in this guide applies to all supported versions HBA models.

Multipathing

The FCP Solaris Host Utilities for Native OS use Solaris MPxIO to provide multipathing. MPxIO is Sun's native multipathing solution. By using MPxIO you can configure multiple network paths between the Solaris host and storage system. If one path fails, FCP traffic continues on the remaining paths. MPxIO is required if the host has multiple paths to a LUN.

MPxIO works by making the underlying paths transparent to the user. It exposes only a consolidated device such as `/dev/rdsk/c7t60A980004334686568343655496C7931d0s2`.

The SAN Toolkit `sanlun` command will show you all NetApp consolidated devices to which the host has access to.

Volume managers

The FCP Solaris Host Utilities for Native OS work with SVM and VxVM to enable you to have different volume management solutions.

Both volume managers work with MPxIO, which is the only multipathing solution supported by the FCP Solaris Host Utilities for Native OS.

ALUA support

The FCP Solaris Host Utilities for Native OS require that you use storage systems that have Asymmetric Logical Unit Access (ALUA) enabled. Check the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> to see which versions of Data ONTAP support ALUA and are supported by the Host Utilities.

NetApp introduced ALUA support with Data ONTAP 7.2 and Single Image cfmode.

Note

ALUA is also known as Target Port Group Support (TPGS).

ALUA defines a standard set of SCSI commands for discovering and managing multiple paths to LUNs on Fibre Channel and iSCSI SANs. You still need MPxIO to run on the host, but you do not need additional host-specific plug-ins.

Remove previous versions before installing Host Utilities

The FCP Solaris Host Utilities for Native OS uses a different stack from the FCP Solaris Host Attach Kit 3.0. You should not have both products installed on the same host.

If you have an Attach Kit installed, you must remove it before you install the Host Utilities.

See “[Removing an FCP Solaris Attach Kit installation](#)” on page 21 for additional information.

FCP Solaris Host Utilities installation overview

Overview of Installing the Host Utilities and setting up your system

Installing the FCP Solaris Host Utilities and setting up your system involves a number of steps that are performed on both the storage system and the host. The following sections provide information about the tasks you need to perform.

Pre-requisites

Before you install the Host Utilities, you must perform the following tasks:

1. Set up your system:
 - ❖ Host OS and appropriate updates
 - ❖ HBAs
 - ❖ Drivers
 - ❖ Storage system and Data ONTAP with ALUA supported
 - ❖ Switches (if used)

See the *Compatibility and Configuration Guide for NetApp FCP and ISCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml> for current information about the system requirements.

2. Verify that your storage system is:
 - ❖ Licensed correctly
 - ❖ Using the cfmode set to single image mode
 - ❖ Running the FCP service
 - ❖ Using ALUA
 - ❖ Configured to work with the target HBAs (if needed)
 - ❖ Set up to work with the Solaris host and the initiator HBAs
 - ❖ Set up with working volumes and qtrees (if desired)

Note

It is recommended that you create volumes and LUNs with space reservations enabled.

3. If you're using a fabric connection, verify that the switch is:
 - ❖ Set up correctly
 - ❖ Zoned (if appropriate for your system)

- ❖ Cabled according to the instructions that came with the switch
4. Verify that:
- ❖ The power to the switches, disk shelves, storage systems, and hosts is turned on in the correct order
 - ❖ The host and the storage system can communicate

Installation overview

Installing the Host Utilities involves the following tasks:

1. Get a copy of the Host Utilities' SAN Toolkit software package.
 - ❖ Get the compressed file containing the software package by either downloading it or copying it from the CD.
 - ❖ Extract the software package from the compressed file.
2. Install the toolkit package:
 - ❖ Go to the directory containing the extracted software package.
 - ❖ Use the command `pkgadd -d NTAPSANTool.pkg` to install the toolkit.
 - ❖ Use the command `basic_config` command to set the driver parameters.
3. Configure the LUNs by performing the following tasks:
 - ❖ Create at least one igroup and at least one LUN.
One way to create igroups and LUNs is to use the `lun setup` command to create igroups and LUNs.
 - ❖ Enable ALUA, if you haven't already done so.
 - ❖ Map the LUN to the igroup.
 - ❖ If necessary, enable MPxIO on your host. You may need to reboot.
 - ❖ Configure the host to discover the LUNs.
You can do this using the `/usr/sbin/cfgadm -c configure cx` command, where `x` is the controller number of the HBA where the LUN is expected to be visible.
 - ❖ Label the LUNs using the Solaris format utility
Use the `/usr/sbin/format` utility.
 - ❖ Display information about the LUNs and HBA.
Use the `sanlun` command.

For detailed information on these tasks

The following sections in this document provide more details about setting up your system, installing and configuring the Host Utilities, and creating igroups and LUNs:

- ◆ [“Confirming that your system is correctly set up”](#) on page 68
- ◆ [“Installing the FCP Solaris Host Utilities for Native OS”](#) on page 14
- ◆ [“Completing the installation and configuring system parameters”](#) on page 17
- ◆ [“Mapping igroups and LUNs”](#) on page 25
- ◆ [“Configuring the host to discover LUNs”](#) on page 26
- ◆ [“Formatting or labeling the new LUN”](#) on page 29
- ◆ [“Configuring Volume Management”](#) on page 29
- ◆ [“Displaying host LUN information”](#) on page 32
- ◆ [“Displaying information about paths”](#) on page 34
- ◆ [“Displaying host HBA information”](#) on page 38

In addition, the section [“Where to go for more information”](#) on page 10 provides pointers to additional documents and web sites that can help you with your system setup.

Optional procedures

You may wish to perform the following tasks after installation is complete.

Task	Additional information
Configure SAN boot. SAN boot uses a SAN attached disk, like a LUN, as a boot device for a Solaris host	See “Configuring SAN Boot” on page 41
Run diagnostic scripts. Normally, you would only run these scripts if you encountered a problem. These scripts collect information about your system and place it in compressed file that you can send to customer support.	See “Using Diagnostic Utilities” on page 78

Where to go for more information

Where to go for host and storage system information

The following table describes the documents on the NetApp on the Web (NOW) site at the time this guide was written. They provide information about host and storage system requirements, supported configurations, and cabling instructions.

If you need information about...	See the following NetApp product documentation...
Known issues, system requirements, and last minute updates	The <i>Release Notes</i> , which are available at http://now.netapp.com/NOW/knowledge/docs/san/
A summary of some of the commands you might use with the Host Utilities	The <i>Quick Reference</i> for the FCP Solaris Host Utilities, which is available from the NOW site
The latest supported configurations	◆ The appropriate interoperability matrix <i>Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products</i> at http://now.netapp.com/NOW/knowledge/docs/docs.shtml ◆ <i>System Configuration Guide</i> at http://now.netapp.com/NOW/knowledge/docs/docs.shtml
Supported Fibre Channel SAN topologies	<i>FCP Configuration Guide</i> at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/
Configuring the storage system	◆ <i>Best Practices for Reliability: New System Installation</i> at http://now.netapp.com/NOW/knowledge/docs/other/best_practices/index.shtml ◆ <i>Data ONTAP® Software Setup Guide</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml
Enabling ALUA	<i>Data ONTAP® Block Access Management Guide for FCP</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml In particular, see the section “ <i>Enabling ALUA for a Fibre Channel igroup.</i> ”

If you need information about...	See the following NetApp product documentation...
Managing SAN storage on the storage system	◆ <i>Data ONTAP® Block Access Management Guide for FCP</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml ◆ <i>Data ONTAP® Release Notes</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml ◆ <i>Command Reference</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml ◆ <i>FilerView® Online Help</i> - available from within the FilerView GUI ◆ <i>Best Practices for Reliability: Ongoing Maintenance</i> at http://now.netapp.com/NOW/knowledge/docs/other/best_practices/newsys/index.htm
Verifying compatibility of storage system with environmental requirements	◆ <i>Site Requirements</i> at http://now.netapp.com/NOW/knowledge/docs/docs.shtml
Upgrading Data ONTAP	◆ <i>Data ONTAP® Upgrade Guide</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml.
Installing and configuring the HBA in your host	◆ Refer to your HBA vendor documentation.
Your host operating system and using its features, such as SVM or MPxIO	◆ Refer to your operating system documentation. You can download Sun manuals in PDF format from http://docs.sun.com/.
Veritas Volume Manager	◆ Refer to your Veritas documentation.

Chapter overview

This chapter explains how to install the FCP Solaris Host Utilities 4.0 for Native OS and configure the Solaris host.

Topics in this chapter

This chapter includes the following topics:

- ◆ [“Installing the FCP Solaris Host Utilities for Native OS”](#) on page 14
- ◆ [“Completing the installation and configuring system parameters”](#) on page 17
- ◆ [“Configuring Sun Cluster to use NFSv3”](#) on page 19
- ◆ [“Removing the FCP Solaris Host Utilities”](#) on page 20
- ◆ [“Removing an FCP Solaris Attach Kit installation”](#) on page 21

Installing the FCP Solaris Host Utilities for Native OS

Before you begin

The FCP Solaris Host Utilities for Native OS provides support for the Solaris native stack. You must set up your host to use supported Sun, Emulex, or Qlogic HBAs, a Sun Fibre Channel driver, and MPxIO. You may use Solaris Volume Manager or Veritas Volume Manager and other applications, such as Sun Cluster or Veritas Cluster.

If you are using an environment, such as Sun Cluster, you must set up that environment also.

Before you install the SAN Toolkit software package:

- ◆ You must verify that your host system meets requirements before you begin the installation. Refer to the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/ for the latest hardware and software requirements.
- ◆ If you currently have the FCP Solaris Host Utilities 4.0 or FCP Solaris Attach Kit installed, you must remove it. See and “[Removing the FCP Solaris Host Utilities](#)” on page 20 or “[Removing an FCP Solaris Attach Kit installation](#)” on page 21.

Once your host is set up, you must install the SAN Toolkit software package.

After you install the toolkit, you can use the configuration tools it provides to configure your host. See “[Completing the installation and configuring system parameters](#)” on page 17.

Obtaining the software

There are two Host Utilities software distributions: one for SPARC processor systems and one for AMD processor systems.

- ◆ SPARC CPU: `santoolkit_solaris_sparc_3.3.tar.Z`
- ◆ x86/x64 (AMD) CPU: `santoolkit_solaris_amd_3.3.tar.Z`

These distributions are provided on the CD-ROM in your Host Utilities media kit. You can also download the correct distribution from the NOW web site at <http://now.netapp.com/NOW/cgi-bin/software>. Copy the appropriate Solaris Host Utilities file to a working directory on your Solaris host.

Note

To prevent you from accidentally installing the wrong file for your processor system, the file will only install if it is the right file for your processor. If you have the wrong file, the installation ends with a message saying that it did not install the software.

Installing the SAN Toolkit

To install the SAN Toolkit software, complete the following steps:

Step	Action
1	Place the compressed file for your processor in a directory on your host and go to that directory. ◆ SPARC CPU: santoolkit_solaris_sparc_3.3.tar.Z ◆ x86/x64 (AMD) CPU: santoolkit_solaris_amd_3.3.tar.Z Example: If you are installing the santoolkit_solaris_sparc_3.3.tar.Z file on a SPARC system, you might put it in the /tmp directory. You can use following command lines to place the file in that directory and then move to the directory: <pre># cp santoolkit_solaris_sparc_3.3.tar.Z /tmp # cd /tmp</pre>
2	Unzip the file and extract the software package. You can use the zcat command to do this. Result: When you unzip the file, the scripts are extracted to the default directory. Example: The following is an example of the output you see when you use these commands to extract the scripts on a SPARC system. <pre>zcat santoolkit_solaris_sparc_3.3.tar.Z tar -xvf - x ./NTAPSANTool.pkg, 1199616 bytes, 2343 tape blocks</pre>
3	Add the packages that you extracted from tar file. Enter: <pre># pkgadd -d ./NTAPSANTool.pkg</pre> Result: The packages are added to the opt/NTAP/SANToolkit/bin directory.

Step	Action
4	Confirm that the toolkit was successfully installed: <pre># pkginfo NTAPSANTool</pre> Example: You can use the pkginfo command to confirm that the toolkit was successfully installed. <pre># pkginfo NTAPSANTool application NTAPNTAPSANTool Solaris SAN Tool Utility for NetApp filers.</pre> Once the toolkit is installed, you should have the following tools in the installation directory: <pre>\$ ls -al /opt/NTAP/SANToolkit/bin total 1004 drwxrwxr-x 2 root sys 512 Feb 13 15:41 . drwxrwxr-x 3 root sys 512 Feb 13 15:41 .. -r-xr-xr-x 1 root sys 19906 Feb 13 13:06 basic_config -r-xr-xr-x 1 root sys 4018 Feb 13 13:06 brocade_info -r-xr-xr-x 1 root sys 4274 Feb 13 13:06 cisco_info -r-xr-xr-x 1 root sys 51639 Feb 13 13:06 create_binding.pl -r-xr-xr-x 1 root sys 8914 Feb 13 13:06 filer_info -r-xr-xr-x 1 root sys 43123 Feb 13 13:06 FTP.pm -r-xr-xr-x 1 root sys 4558 Feb 13 13:06 mcdata_info -r-xr-xr-x 1 root sys 13270 Feb 13 13:04 mpxio_set -r-xr-xr-x 1 root sys 6172 Feb 13 13:06 qllogic_info -r-xr-xr-x 1 root sys 154942 Feb 13 13:06 sanlun -r-xr-xr-x 1 root sys 1248 Feb 13 13:06 san_version -r-xr-xr-x 1 root sys 14036 Feb 13 13:06 SHsupport.pm -r-xr-xr-x 1 root sys 16671 Feb 13 13:06 solaris_info -r-xr-xr-x 1 root sys 12612 Feb 13 13:06 ssd_config.pl -r-xr-xr-x 1 root sys 130743 Feb 13 13:06 Telnet.pm -r-xr-xr-x 1 root sys 677 Feb 13 13:06 vidpid.dat</pre>

Completing the installation and configuring system parameters

Remove MPxIO installed with a support kit

If you had installed an iSCSI Solaris Support Kit or Host Utilities Kit on the host in the past and were not using it with ALUA, you must remove the MPxIO that was set up with it. Execute the command:

```
# mpzio_set -d
```

Use basic_config to configure system parameters

Use the basic_config script to configure the Fibre Channel parameters. This script is part of the Host Utilities SAN Toolkit. The arguments you use with the script vary depending on whether you are using a SPARC processor system or an x86/x64 (AMD) processor system.

For SPARC processor systems: Run the basic_config -ssd_set command. This script modifies the /kernel/drv/ssd.conf to add the settings required for your storage system.

```
ssd-config-list="NETAPP LUN", "netapp-ssd-config";  
netapp-ssd-config=1,0x9007,64,30,300,0,0,0,0,0,0,0,0,0,0,30,0,0,8,0,0;
```

For x86/x64 (AMD) processor systems: Run the basic_config -sd_set command. This script modifies the /kernel/drv/sd.conf to add the settings required for your storage system.

```
sd-config-list="NETAPP LUN", "netapp-sd-config";  
netapp-sd-config=1,0x9c01,64,0,0,0,0,0,0,0,0,0,0,0,300,30,30,0,0,8,0,0;
```

Note

The basic_config -ssd_set and basic_config -sd_set commands make a backup of the appropriate configuration file (ssd.conf or sd.conf), but they only allow you to revert to the backup once. It is a good practice to manually make a separate backup of the file before you execute the command.

**Executing
basic_config**

To configure system parameters, complete the steps below.

Note_____

If you need to remove these changes, run the `basic_config -ssd_unset` command on SPARC systems and the `basic_config -sd_unset` command on x86/x64 (AMD) systems.

Step	Action
1	Execute the appropriate <code>basic_config</code> command for your system. ◆ For SPARC systems, execute <code>basic_config -ssd_set</code> ◆ For x86/x64 (AMD) systems, execute <code>basic_config -sd_set</code> Example: The following example shows the type of output produced by the <code>basic_config -ssd_set</code> command when you execute it on a SPARC system. <pre># /opt/NTAP/SANToolkit/bin/basic_config -ssd_set W A R N I N G This script will modify /kernel/drv/ssd.conf to add settings required for your storage system. Do you wish to continue (y/n)?-->y The original version of /kernel/drv/ssd.conf has been saved to /kernel/drv/ssd.conf.1158267336 Please reboot now</pre>
2	To enable the changes, you must reboot your system. ◆ For SPARC systems, execute <code># stmsboot -e</code> This command sets up MPxIO and forces your system to reboot. ◆ For x86/x64 (AMD) systems, MPxIO is on by default. You need to manually reboot the host to enable the Fibre Channel parameters.

Configuring Sun Cluster to use NFSv3

Sun Cluster components need special NFS version

If you are using Sun Clusters, you may need to manually modify the version of Sun Cluster Data Service for NFS due to an issue Sun has reported.

At the time this document was produced, the default protocol for Solaris 10 servers was NFSd version 4. Sun Cluster 3.1 8/05 did not support this version of NFS with Sun Cluster HA when used in an effort to achieve high-availability for an NFS server.

You must modify the `/etc/default/nfs` file to change the version from 4 to 3. Edit the file to remove the comment symbol (`#`) and change the version to 3. The string should read:

```
NFS_SERVER_VERSMAX=3
```

Note

For more information on this issue, see the Sun Cluster 3.1 8/05 Release Notes or Sun bug ID 6244819. This issue is not documented in the Data Service for NFS documentation or Sun Cluster Administration or Installation guides. It is only documented in the Release Notes.

Removing the FCP Solaris Host Utilities

Removing the Host Utilities

To remove the FCP Solaris Host Utilities from your system, you must remove the software for the SAN Toolkit:

```
# pkgrm NTAPSANTool
```

Remove the Fibre Channel parameters

You should remove the Fibre Channel parameters that were set when you ran the `basic_config` command. To restore the `ssd.cof` or `sd.conf` file values, run the following command:

- ◆ On SPARC systems: `basic_config -ssd_unset` command
- ◆ On x86/x64 (AMD) systems: `basic_config -sd_unset` command

Now reboot your system so that the changes will take effect.

Disable MPxIO on a SPARC system

If you are on a SPARC system and want to disable MPxIO, use the `stmsboot` command:

```
# stmsboot -d
```

Removing an FCP Solaris Attach Kit installation

Methods for removing an FCP Solaris Attach Kit

If you had installed an FCP Solaris Attach Kit on the host in the past, you must remove it.

The method you use for uninstalling an FCP Solaris Attach Kit depends on the version of the kit that you installed.

FCP Solaris Attach Kit 3.0: Use the following command to remove FCP Solaris Attach Kit 3.0 software from the /opt/NTAP/SANToolkit/bin directory.

```
# pkgrm NTAPSANTool
```

If you no longer need the lpfc driver and any /etc/system settings that may have been installed with basic_config, you should remove them.

FCP Solaris Attach Kit 2.0: Use the uninstall script from the FCP Solaris Attach Kit 2.0 software to uninstall previous versions of the Attach Kit software. The uninstall script automatically creates a backup copy of the /kernel/drv/lpfc.conf and sd.conf files as part of the uninstall procedure. However, it is a good practice to create a separate backup copy before you begin the uninstall.

Uninstalling the Attach Kit 2.0 software

To uninstall the Attach Kit 2.0 software, complete the following steps.

Step	Action
1	Ensure that you are logged in as root.
2	Locate the FCP Solaris Attach Kit 2.0 software. By default, the FCP Solaris Attach Kit is installed in /opt/NTAPsanlun/bin.
3	From the /opt/NTAPsanlun/bin directory, enter the following command to remove the existing software: ./uninstall

Step	Action
4	At the prompt “Are you sure you want to uninstall lpfc and sanlun packages?”enter y. Result: The uninstall script creates a backup copy of the /kernel/drv/lpfc.conf and sd.conf files to /usr/tmp. The backup files are named as follows: ◆ lpfc.conf.save ◆ sd.conf.save If a backup copy already exists, the install script prompts you to overwrite the backup copy.
5	Reboot the host with the reconfigure option (reboot -- -r).

About this chapter This chapter describes what you need to do to complete the configuration.

Topics in this chapter

This chapter includes the following topics:

- ◆ [“Overview of completing the configuration”](#) on page 24
- ◆ [“Mapping igroups and LUNs”](#) on page 25
- ◆ [“Configuring the host to discover LUNs”](#) on page 26
- ◆ [“Completing the configuration”](#) on page 29

Overview of completing the configuration

Task overview

Completing the configuration involves the following tasks.

Task	Discussion	Additional information
1. Create and map igroups and LUNs	An igroup is a collection of WWPNs on the storage system that map to one or more host HBAs. After you create the igroup, you must create LUNs on the storage system, and map the LUNs to the group.	For complete information, refer to your version of the <i>Data ONTAP® Block Access Management Guide for FCP</i> at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml .
2. Enable ALUA	You must have ALUA set up to work with igroups. To see if ALUA is set up for your igroup, use the <code>igroup show -v</code> command.	Refer to “ Check the ALUA settings on the storage system ” on page 75.
3. Discover LUNs	You can discover LUNs using <code>/usr/sbin/cfgadm -c configure cx</code> <i>x</i> is the controller number of the HBA where the LUN is expected to be visible.	Refer to “ Discovering LUNs ” on page 26 for additional information.
4. Label LUNs, if appropriate for your system	Use the Solaris format utility to label the LUNs.	Refer to Solaris documentation for complete information about the format utility.

Mapping igroups and LUNs

Methods for creating igroups and LUNs

You can create igroups and LUNs on the storage system by:

- ◆ Entering the `lun setup` command
This method prompts you through the process of creating a LUN, creating an igroup, and mapping the LUN to the igroup.
- ◆ Entering a series of individual commands (such as `lun create`, `igroup create` and `lun map`).
Use this method to create one or more LUNs and igroups in any order.

Create the igroups and LUNs

For complete information about creating igroups and LUNs, refer to *Data ONTAP™ Block Access Management Guide for FCP* at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml.

Configuring the host to discover LUNs

Discovering LUNs Follow these steps to have the host discover new LUNs and validate that they are visible on the host.

Step	Action																																																		
1	To discover new LUNs, enter <code>/usr/sbin/cfgadm -c configure cx</code> where <i>x</i> is the controller number of the HBA where the LUN is expected to be visible. Note_____ To determine what the controller number of the HBA is, use the <code>cfgadm -al</code> command. _____ If you do not see the HBA in the output, check your driver installation to make sure it is correct. Result: The system probes for new devices. When it finds the new LUNs, it might generate a warning about a corrupt label. This warning means that the host discovered new LUNs that need to be labeled as Solaris disks. Example of getting the HBA controller number: To determine what the controller number of the HBA is, use the <code>cfgadm -al</code> command. <pre>\$ cfgadm -al</pre> <table><tr><th>Ap_Id</th><th>Type</th><th>Receptacle</th><th>Occupant</th><th>Condition</th></tr><tr><td>c0</td><td>fc-fabric</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c0::500a098187f93622</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c0::500a098197f93622</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c1</td><td>scsi-bus</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c1::dsk/c1t0d0</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c1::dsk/c1t1d0</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c2</td><td>fc-fabric</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c2::500a098287f93622</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr><tr><td>c2::500a098297f93622</td><td>disk</td><td>connected</td><td>configured</td><td>unknown</td></tr></table>	Ap_Id	Type	Receptacle	Occupant	Condition	c0	fc-fabric	connected	configured	unknown	c0::500a098187f93622	disk	connected	configured	unknown	c0::500a098197f93622	disk	connected	configured	unknown	c1	scsi-bus	connected	configured	unknown	c1::dsk/c1t0d0	disk	connected	configured	unknown	c1::dsk/c1t1d0	disk	connected	configured	unknown	c2	fc-fabric	connected	configured	unknown	c2::500a098287f93622	disk	connected	configured	unknown	c2::500a098297f93622	disk	connected	configured	unknown
Ap_Id	Type	Receptacle	Occupant	Condition																																															
c0	fc-fabric	connected	configured	unknown																																															
c0::500a098187f93622	disk	connected	configured	unknown																																															
c0::500a098197f93622	disk	connected	configured	unknown																																															
c1	scsi-bus	connected	configured	unknown																																															
c1::dsk/c1t0d0	disk	connected	configured	unknown																																															
c1::dsk/c1t1d0	disk	connected	configured	unknown																																															
c2	fc-fabric	connected	configured	unknown																																															
c2::500a098287f93622	disk	connected	configured	unknown																																															
c2::500a098297f93622	disk	connected	configured	unknown																																															

Step	Action
2	To label LUNs for the Solaris host: 1. Enter /usr/sbin/format. 2. At the format> prompt, select the disk you want to modify. 3. When prompted to label the disk, enter y. The LUN is now labeled and ready for the volume manager to use. Example 1: This example labels disk number 15 on a SPARC system. (Portions of this example have been removed to make it easier to review.) <pre> \$ format Searching for disks...done AVAILABLE DISK SELECTIONS: 0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107> /pci@1f,700000/scsi@2/sd@0,0 1. c1t1d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107> /pci@1f,700000/scsi@2/sd@1,0 2. c1t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107> flasharc /pci@1f,700000/scsi@2/sd@2,0 3. c1t3d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107> flasharc /pci@1f,700000/scsi@2/sd@3,0 4. c5t60A9800043346859444A2D36702D6B69d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d36702d6b69 5. c5t60A9800043346859444A2D36702D6D77d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d36702d6d77 ... 10. c5t60A9800043346859444A2D36702D787Ad0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128 /scsi_vhci/ssd@g60a9800043346859444a2d36702d787a 11. c5t60A9800043346859444A2D36702D6956d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d36702d6956 12. c5t60A9800043346859444A2D3670414A6Bd0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d3670414a6b 13. c5t60A9800043346859444A2D3670414D30d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d3670414d30 14. c5t60A9800043346859444A2D3670414F48d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d3670414f48 15. c5t60A9800043346859444A2D3670415A70d0 <NETAPP-LUN-0.2 cyl 2046 alt 2 hd 16 sec 128> /scsi_vhci/ssd@g60a9800043346859444a2d3670415a70 Specify disk (enter its number): 15 selecting c5t60A9800043346859444A2D3670415A70d0 [disk formatted] ... Disk not labeled. Label it now? y </pre>

Step	Action
	Example 2: This example labels disk number 15 on a x86/x64 (AMD) system. <pre> \$ format Searching for disks...done AVAILABLE DISK SELECTIONS: 0. c1t0d0 <DEFAULT cyl 8920 alt 2 hd 255 sec 63> /pci00,0/pci1022,7450@a/pci17c2,10@4/sd@0,0 1. c4t60A9800043346859444A2D3670464A6Cd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670464a6c 2. c4t60A9800043346859444A2D3670464C7Ad0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670464c7a 3. c4t60A9800043346859444A2D3670464F43d0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670464f43 4. c4t60A9800043346859444A2D3670465A52d0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670465a52 5. c4t60A9800043346859444A2D3670466A64d0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670466a64 6. c4t60A9800043346859444A2D3670466C74d0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670466c74 7. c4t60A9800043346859444A2D3670466F39d0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670466f39 8. c4t60A9800043346859444A2D3670467A4Cd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670467a4c 9. c4t60A9800043346859444A2D3670472D2Fd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d3670472d2f 10. c4t60A9800043346859444A2D367046484Ed0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367046484e 11. c4t60A9800043346859444A2D367046684Fd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367046684f 12. c4t60A9800043346859444A2D367046714Cd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367046714c 13. c4t60A9800043346859444A2D367047384Bd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367047384b 14. c4t60A9800043346859444A2D367047474Bd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367047474b 15. c4t60A9800043346859444A2D367047492Fd0 <DEFAULT cyl 1020 alt 2 hd 128 sec 32> /scsi_vhci/disk@g60a9800043346859444a2d367047492f Specify disk (enter its number)[15]: selecting c4t60A9800043346859444A2D367047492Fd0 [disk formatted] ... Disk not labeled. Label it now? y </pre>

Completing the configuration

Formatting or labeling the new LUN

The format utility is a menu driven script that is provided on the Solaris host. Use the format utility to format and label LUNs.

Follow the step below to activate the format utility and configure LUNs.

Step	Action
1	To activate the format utility, enter: 1. <code>/usr/sbin/format</code> 2. Follow screen directions to format or label LUNs. Result: The format script displays available disks and configuration options.

Configuring Volume Management

If your configuration uses either the Solaris Volume Manager or the Veritas Volume Manager, you must configure the LUNs so they are under the volume manager control. See the documentation for the your volume manager for information on doing this.

About this chapter This chapter describes how to use the sanlun utility to display information about the LUNs, paths to the LUNs, and the Solaris HBA.

Topics in this chapter Topics in this chapter include the following:

- ◆ [“Displaying host LUN information”](#) on page 32
- ◆ [“Displaying information about paths”](#) on page 34
- ◆ [“Displaying host HBA information”](#) on page 38

Displaying host LUN information

Displaying host LUN information

To display host LUN information, complete the following steps.

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /opt/NTAP/SANToolkit/bin directory: <pre># cd /opt/NTAP/SANToolkit/bin</pre>
3	Enter the <code>sanlun lun show</code> command to display LUN information. The command has the following format: <pre>sanlun lun show [-v] [-d <i>host device filename</i> <i>all</i> <i>storage system name</i> <i>storage system name:storage system pathname</i>] -p</pre> <code>-v</code> produces verbose output. <code>-d</code> is the device option and can be one of the following: ❖ <code>host device filename</code> is the special device file name for the disk on Solaris (which might represent a storage system LUN). ❖ <code>all</code> lists all storage system LUNs under /dev/rdisk. ❖ <code>storage system name</code> lists all storage system LUNs under /dev/rdisk on that storage system. ❖ <code>storage system name:storage system pathname</code> lists all storage system LUNs under /dev/rdisk that are connected to the storage system path name LUN on that storage system. <code>-p</code> provides information the target port group information.

Step	Action
	Example: The following is an example of the output you see when you use the sanlun command. <pre># ./sanlun lun show -v -d /dev/rdisk/c7t60A980004334686568343655496C7931d0s2 filer: lun-pathname device filename adapter protocol lun size lun state fas3020-rtp21: /vol/vol0/lun0 /dev/rdisk/c7t60A980004334686568343655496C7931d0s2 qlc1 FCP 20g (21474836480) GOOD Serial number: C4heh46UIly1 Filer FCP nodename:500a098086b7f128 Filer FCP portname:500a098186b7f128 Filer adapter name: 0c Filer IP address: 10.60.236.33 192.168.01.210 Filer volume name:vol0 FSID:0x3407f128 Filer qtree name:/vol/vol0 ID:0x0 Filer snapshot name: ID:0x0 LUN partition table permits multiprotocol access: no why: there can be only one data partition LUN has valid label: yes</pre>

Displaying information about paths

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

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /opt/NTAP/SANToolkit/bin directory: <code>cd /opt/NTAP/SANToolkit/bin</code>

Step	Action
3	At the host command line, enter the following command to display LUN information: <pre data-bbox="202 286 552 312"># sanlun lun show -p all -v</pre> -p provides information about the optimized (primary) and non-optimized (secondary) paths available to the LUN when you are using multipathing. Note_____MPxIO makes the underlying paths transparent to the user. It only exposes a consolidated device such as /dev/rdisk/c7t60A980004334686568343655496C7931d0s2. As a result, sanlun cannot display the underlying multiple paths. Instead it displays the target port group information. all lists all storage system LUNs under /dev/rdisk. -v turns on verbose mode. Because MPxIO provides multiple paths, sanlun selects one of the available paths to display. This is not a fixed path and could vary each time you execute the sanlun command with the -v option. Example: The following example uses the -p option to display information about the paths. <pre data-bbox="202 829 1018 1357"># sanlun lun show -p ONTAP_PATH: fas3020-rtp21:/vol/vol0/lun0 LUN: 0 LUN Size: 20g (21474836480) Host Device: /dev/rdisk/c7t60A980004334686568343655496C7931d0s2 LUN State: G00D Filer_CF_State: Cluster Enabled Multipath_Policy: Native Multipath-provider: Sun Microsystems TPGS flag: 0x10Filer Status: TARGET PORT GROUP SUPPORT ENABLED Target Port Group : 0x1001 Target Port Group State: Active/optimized Vendor unique Identifier : 0x10 (2GB FC) Target Port Count: 0x2 Target Port ID : 0x1 Target Port ID : 0x2 Target Port Group : 0x3002 Target Port Group State: Active/non-optimized Vendor unique Identifier : 0x30 (2GB FC)</pre>

Step	Action
	Target Port Count: 0x2 Target Port ID : 0x101 Target Port ID : 0x102 Target Port Group : 0x3002 Target Port Group State: Active/non-optimized Vendor unique Identifier : 0x30 (2GB FC) Target Port Count: 0x2 Target Port ID : 0x101 Target Port ID : 0x102 ONTAP_PATH: fas3020-rtp21:/vol/vol1/lun1 LUN: 1 LUN Size: 20g (21474836480) Host Device: /dev/rdisk/c7t60A980004334686568343655496D5464d0s2 LUN State: GOOD Filer_CF_State: Cluster Enabled Multipath_Policy: Native Multipath-provider: Sun Microsystems TPGS flag: 0x10Filer Status: TARGET PORT GROUP SUPPORT ENABLED Target Port Group : 0x1001 Target Port Group State: Active/optimized Vendor unique Identifier : 0x10 (2GB FC) Target Port Count: 0x2 Target Port ID : 0x1 Target Port ID : 0x2 Target Port Group : 0x3002 Target Port Group State: Active/non-optimized Vendor unique Identifier : 0x30 (2GB FC) Target Port Count: 0x2 Target Port ID : 0x101 Target Port ID : 0x102

Interpreting `sanlun lun show -p` output

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

- ◆ LUN details, including its device name and size and its state.
- ◆ The host device name (i.e., the special device file name for the disk on Solaris that represents the LUN)
- ◆ The multipathing provider
- ◆ The target port group and its state, count, and ID. See information on ALUA in the *Data ONTAP® Block Access Management Guide for FCP*.
- ◆ The vendor unique identifier

Displaying host HBA information

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

Step	Action
1	Ensure that you are logged in as root on the host.
2	Change to the /opt/NTAP/SANToolkit/bin directory: <code>cd /opt/NTAP/SANToolkit/bin</code>
3	At the host command line, enter the following command to display host HBA information: <pre>./sanlun fcp show adapter[-c] [-v] [adapter name all]</pre> -c option produces configuration instructions. -v option produces verbose output. all lists information for all FCP adapters. adapter name lists information for a specified adapter. Result: The FCP adapter information is displayed. Example: The following command line displays information about the adapter. <pre># sanlun fcp show adapter -v</pre> <pre>adapter name: qlc0 WWPN: 21000003ba16dec7 WWNN: 20000003ba16dec7 driver name: 20060630-2.16 model: 2200 model description: 2200 serial number: Not Available hardware version: Not Available driver version: 20060630-2.16 firmware version: 2.1.144 Number of ports: 1 port type: Private Loop port state: Operational supported speed: 1 GBit/sec negotiated speed: 1 GBit/sec OS device name: /dev/cfg/c1</pre>

Step	Action
	adapter name: qlc1 WWPN: 210000e08b88b838 WWNN: 200000e08b88b838 driver name: 20060630-2.16 model: QLA2462 model description: Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel serial number: Not Available hardware version: Not Available driver version: 20060630-2.16 firmware version: 4.0.23 Number of ports: 1 of 2 port type: Fabric port state: Operational supported speed: 1 GBit/sec, 2 GBit/sec, 4 GBit/sec negotiated speed: 4 GBit/sec OS device name: /dev/cfg/c2 adapter name: qlc2 WWPN: 210100e08ba8b838 WWNN: 200100e08ba8b838 driver name: 20060630-2.16 model: QLA2462 model description: Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel serial number: Not Available hardware version: Not Available driver version: 20060630-2.16 firmware version: 4.0.23 Number of ports: 2 of 2 port type: Fabric port state: Operational supported speed: 1 GBit/sec, 2 GBit/sec, 4 GBit/sec negotiated speed: 4 GBit/sec OS device name: /dev/cfg/c3

About this chapter

This appendix describes of what you need to do to configure SAN booting on an Solaris host.

Note

NetApp qualifies solutions and components on an ongoing basis. To verify that SAN booting is supported in your configuration, see the *FCP Host Compatibility Matrix* at http://now.netapp.com/NOW/knowledge/docs/san/fcp_iscsi_config/fcp_support.shtml.

Topics in this appendix

Topics in this appendix include the following:

- ◆ “[SAN boot overview](#)” on page 42
- ◆ “[Configuration overview](#)” on page 43
- ◆ “[Performing a direct installation](#)” on page 44
- ◆ “[File system dump, restore for a SPARC system without MPxIO](#)” on page 45
- ◆ “[File system dump, restore for an x86/x64 system with MPxIO](#)” on page 49
- ◆ “[File system dump, restore for an x86/x64 system without MPxIO](#)” on page 54

SAN boot overview

What is SAN boot

SAN boot is using a SAN-attached disk, like a LUN, as a boot device for a Solaris host. Configuring SAN boot allows you to do the following:

- ◆ Remove the hard drives from your servers and use the SAN for your boot needs, thereby eliminating the cost associated with maintaining and servicing hard drives
- ◆ Use the SAN for both storage and boot needs, thereby consolidating and centralizing storage

Contents of this appendix

This appendix provides an example that uses a Solaris host to configure a SAN boot LUN and install a new OS image onto it. The procedure described in this appendix is an example of one method for creating a bootable LUN. You can apply this procedure to most configurations.

This appendix does not describe other examples of bootable LUNs, such as configurations that boot multiple volumes or use diskless servers.

Refer to Solaris documentation for details about additional configuration methods.

Sun documentation for this procedure

For complete details on the procedures that follow, see Sun's document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide*, which is available in PDF format on the Sun site.

Configuration overview

Pre-requisites

The examples in this chapter assume that the host and storage system are configured properly and use software and firmware that is supported by the FCP Solaris Host Utilities.

For more information on configuring SAN booting on a Solaris host, see Sun's document Sun StorEdge SAN Foundation Software 4.4 Configuration Guide, which is available in PDF format on the Sun site. Make sure, though, that you use the FCode specified in the *Compatibility and Configuration Guide for NetApp FCP and ISCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

Examples in this appendix

This appendix provides examples of copying data from an existing, locally booted server. The examples show how to perform this task using:

- ◆ A direct installation
- ◆ A file system dump and restore for a SPARC system with MPxIO disabled
- ◆ A file system dump and restore for an x86/x64 (AMD) system with MPxIO disabled
- ◆ A file system dump and restore for an x86/x64 (AMD) system with MPxIO enabled

Performing a direct installation

Options for setting up SAN booting

There are two ways to set up SAN booting:

- ◆ Copying the data from a locally booted device to a SAN device. Then reconfigure the host to boot to the SAN device. On x86/x64 (AMD) systems, using this method means you do not have to re-setup a currently configured host and its MPxIO settings.
- ◆ Installing the operating system directly on the SAN device. Once you do this, you must configure the SAN boot LUN on the storage system and map it to the host.

Performing a direct install

To perform a direct install, run the Solaris Installer and choose the SAN device as your install device.

File system dump, restore for a SPARC system without MPxIO

Setting up a SPARC system without MPxIO

The following steps show you how to perform a file system dump and restore for a SPARC system that has MPxIO disabled.

SPARC systems: Copying data from locally booted server

If you have a SPARC system and you want to copy data from a locally booted server, complete the following steps.

Step	Action
1	If MPxIO is enabled, disable it: - Set the mpxio-disable flag to yes in /kernel/drv/fp.conf. - Execute the <code>stmsboot -d</code> command.
2	Use the <code>mount</code> command to identify the current boot device. Example: The following mounts the current boot device. <pre># mount / on /dev/dsk/c0t0d0s0 read/write/setuid/devices/intr/largefiles/logging/xattr/onerror=panic/dev=8000 10 on Tue Jan 2 07:44:48 2007</pre>

Step	Action
3	Configure the LUN for ◆ The root file system ◆ The file systems that will be copied to the bootable LUN. You may want to create slices and place the file systems on the slices. In addition, you might want to set up the swap slice and slices for the metadatabase replicas. Use the format command to choose the LUN. Write down the device path for the LUN so you can refer to it later. Example: In this example, you first run the format command. Based on its output, you determine that you want number 34, which has the device path /pci@1f,2000/QLGC,qlc@1/fp@0,0/ssd@w500a09838350b481,20. <pre>34. c1t500A09838350B481d32 <NETAPP-LUN-0.2 cyl 5118 alt 2 hd 16 sec 512> /pci@1f,2000/QLGC,qlc@1/fp@0,0/ssd@w500a09838350b481,20</pre>
4	Install the bootblock on the new bootable LUN by using the installboot command: <pre>installboot /usr/platform/<platform>/lib/fs/ufs/bootblk /dev/rdisk/<boot lun></pre> Example: The following command line installs the bootlock on the boot LUN c1t500A09838350B481d32s0. <pre>installboot /usr/platform/'uname -a'/lib/fs/ufs/bootblk /dev/rdisk/c1t500A09838350B481d32s0</pre>
5	Create the SAN file system that you will dump the current file system to. Example: The following command line creates a new file system. <pre>newfs /dev/dsk/c1t500A09838350B481d32s0</pre>
6	Mount the file system that you will use when you copy the boot data. Example: The following example mounts the SAN file system. <pre>mount /dev/dsk/c1t500A09838350B481d32s0 /mnt/boot lun</pre>

Step	Action																																																																																																		
7	Create the required directory structure on the bootable LUN and copy the boot data. Enter: <pre>ufsdump 0f - <source_boot_device> cd/ <mntpoint of bootable_ lun>; ufsrestore rf -)</pre> Note_____ If your configuration boots off more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see the Sun’s document <i>Sun StorEdge SAN Foundation Software 4.4 Configuration Guide</i> for instructions. _____ Example: The following example copies the information from c0t0d0s0. <pre>ufsdump 0f - /dev/rdsk/c0t0d0s0 (cd /mnt/bootlun; ufsrestore rf -)</pre>																																																																																																		
8	Edit the vfstab file to on the SAN file system. Change the swap, root, and file systems in the vfstab file to show the boot device instead of the local device. One way to do this is to edit the file using vi: <pre># cd /mnt/bootlun/etc/ # vi vfstab</pre> Example: The following shows the vfstab entry for the bootable LUN. <table><tr><td>#device</td><td>device</td><td>mount</td><td>FS</td><td>fsck</td><td>mount</td><td>mount</td></tr><tr><td>#to mount</td><td>to fsck</td><td>point</td><td>type</td><td>pass</td><td>at boot</td><td>options</td></tr><tr><td>#</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>fd</td><td>-</td><td>/dev/fd fd</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/proc</td><td>-</td><td>/proc proc</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/dev/dsk/c1t500A09838350B481d32s1</td><td></td><td></td><td>-</td><td>-</td><td>swap</td><td>- no -</td></tr><tr><td>/dev/dsk/c1t500A09838350B481d32s0</td><td></td><td></td><td colspan="4">/dev/rdsk/c1t500A09838350B481d32s0</td></tr><tr><td>/</td><td>ufs</td><td>1 no</td><td>-</td><td></td><td></td><td></td></tr><tr><td>/dev/dsk/c1t500A09838350B481d32s6</td><td></td><td></td><td colspan="4">/dev/rdsk/c1t500A09838350B481d32s6</td></tr><tr><td>/globaldevices</td><td>ufs</td><td>2 yes</td><td>-</td><td></td><td></td><td></td></tr><tr><td>/devices</td><td>-</td><td>/devices</td><td>devfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>ctfs</td><td>-</td><td>/system/contract</td><td>ctfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>objfs</td><td>-</td><td>/system/object</td><td>objfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>swap</td><td>-</td><td>/tmp tmpfs</td><td>-</td><td>yes</td><td>-</td><td></td></tr></table>	#device	device	mount	FS	fsck	mount	mount	#to mount	to fsck	point	type	pass	at boot	options	#							fd	-	/dev/fd fd	-	no	-		/proc	-	/proc proc	-	no	-		/dev/dsk/c1t500A09838350B481d32s1			-	-	swap	- no -	/dev/dsk/c1t500A09838350B481d32s0			/dev/rdsk/c1t500A09838350B481d32s0				/	ufs	1 no	-				/dev/dsk/c1t500A09838350B481d32s6			/dev/rdsk/c1t500A09838350B481d32s6				/globaldevices	ufs	2 yes	-				/devices	-	/devices	devfs	-	no	-	ctfs	-	/system/contract	ctfs	-	no	-	objfs	-	/system/object	objfs	-	no	-	swap	-	/tmp tmpfs	-	yes	-	
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9	Umount the file system on the bootable LUN. <pre>umount /mnt/bootlun</pre>																																																																																																		

Step	Action
10	Using the device name you wrote down in Step 3, boot to the bootable LUN. Two things to keep in mind when you do this: ◆ You can specify the slice of the bootable LUN by using ":a" for slice zero, ":b" for slice 1, and so on. ◆ If you are using Emulex HBAs or StorageTek HBAs based on Emulex technology, replace the "ssd" part of the string with "disk". Examples: The following examples show command lines for QLogic HBAs and Emulex HBAs. Qlogic: <pre>boot /pci@1f,2000/QLGC,qlc@1/fp@0,0/ssd@w500a09838350b481,20:a</pre> Emulex: <pre>boot /pci@1d,700000/SUNW,emlxs@2/fp@0,0/disk@w500a09818350b481,20:a</pre>
11	Verify that you booted to the correct LUN by using the <code>df -k</code> command. In addition, configure the system crash dump for the new bootable LUN boot device using the <code>dumpadm -d</code> command: <pre>dumpadm -d /dev/rdisk/c1t500A09838350B481d32s1</pre>

File system dump, restore for an x86/x64 system with MPxIO

Setting up an x86/x64 (AMD) system with MPxIO

The following steps show you how to perform a file system dump and restore for an x86/x64 (AMD) system that has MPxIO enabled.

x86/x64 (AMD) with MPxIO systems: Copying data from locally booted server

If you have an x86/x64 (AMD) system that is using MPxIO and you want to copy data from a locally booted server, complete the following steps.

Step	Action
1	Use the <code>mount</code> command to identify the current boot device. Example: The following mounts the current boot device. <pre># mount / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/logging/xattr/onerror=panic/dev=1980 000 on Tue Jan 2 12:50:22 2007</pre>
2	Configure the LUN for ◆ The root file system ◆ The file systems that will be copied to the bootable LUN. You may want to create slices and place the file systems on the slices. In addition, you might want to set up the swap slice, <code>/var</code>, and other file systems. Use the <code>format</code> command to choose the LUN. Write down the device path for the LUN so you can refer to it later. Example: In this example, you first run the <code>format</code> command. Based on its output, you determine that you want number 33, which has the device path <code>/scsi_vhci/disk@g60a9800056716436636f393164695969</code>. <pre>33. c4t60A9800056716436636F393164695969d0 <DEFAULT cyl 9787 alt 2 hd 255 sec 63> /scsi_vhci/disk@g60a9800056716436636f393164695969</pre>

Step	Action
3	Create the SAN file system that you will dump the current file system to. Example: The following command line creates a new file system. <pre>newfs /dev/dsk/c4t60A9800056716436636F393164695969d0s0</pre>
4	Mount the file system that you will use when you copy the boot data. Example: The following example mounts the file system. <pre>mount /dev/dsk/c4t60A9800056716436636F393164695969d0s0 /mnt/bootlun</pre>
5	Create the required directory structure on the bootable LUN and copy the boot data. Enter: <pre>ufsdump 0f - <source_boot_device> cd/ <mntpoint of bootable_lun>; ufsrestore rf -)</pre> Note _____ If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see the Sun's document <i>Sun StorEdge SAN Foundation Software 4.4 Configuration Guide</i> for instructions. _____ Example: The following example copies the information from c1d0s0. <pre>ufsdump 0f - /dev/rdisk/c1d0s0 (cd /mnt/bootlun; ufsrestore rf -)</pre>

Step	Action																																																																																																		
6	Edit the vfstab file on the SAN file system. Change the swap, root, and file systems in the vfstab file to show the boot device instead of the local device. One way to do this is to edit the file using vi: <pre># cd /mnt/bootlun/etc/ # vi vfstab</pre> Example: The following shows the vfstab entry for the bootable LUN. <table><tr><th>#device</th><th>device</th><th>mount</th><th>FS</th><th>fsck</th><th>mount</th><th>mount</th></tr><tr><th>#to mount</th><th>to fsck</th><th>point</th><th>type</th><th>pass</th><th>at boot</th><th>options</th></tr><tr><td>#</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>fd</td><td>-</td><td>/dev/fd fd</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/proc</td><td>-</td><td>/proc proc</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/dev/dsk/c4t60A9800056716436636F393164695969d0s1</td><td>-</td><td></td><td>-</td><td>-</td><td>swap</td><td>-</td></tr><tr><td>no</td><td>-</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>/dev/dsk/c4t60A9800056716436636F393164695969d0s0</td><td>/dev/rdisk/</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>c4t60A9800056716436636F393164695969d0s0</td><td>/</td><td>ufs</td><td>1</td><td>no</td><td>-</td><td></td></tr><tr><td>/dev/dsk/c4t60A9800056716436636F393164695969d0s6</td><td>/dev/rdisk/c4t60A9800056716436636F393164695969d0s6</td><td>/globaldevices</td><td>ufs</td><td>2</td><td>yes</td><td>-</td></tr><tr><td>/devices</td><td>-</td><td>/devices</td><td>devfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>ctfs</td><td>-</td><td>/system/contract</td><td>ctfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>objfs</td><td>-</td><td>/system/object</td><td>objfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>swap</td><td>-</td><td>/tmp tmpfs</td><td>-</td><td>yes</td><td>-</td><td></td></tr></table>	#device	device	mount	FS	fsck	mount	mount	#to mount	to fsck	point	type	pass	at boot	options	#							fd	-	/dev/fd fd	-	no	-		/proc	-	/proc proc	-	no	-		/dev/dsk/c4t60A9800056716436636F393164695969d0s1	-		-	-	swap	-	no	-						/dev/dsk/c4t60A9800056716436636F393164695969d0s0	/dev/rdisk/						c4t60A9800056716436636F393164695969d0s0	/	ufs	1	no	-		/dev/dsk/c4t60A9800056716436636F393164695969d0s6	/dev/rdisk/c4t60A9800056716436636F393164695969d0s6	/globaldevices	ufs	2	yes	-	/devices	-	/devices	devfs	-	no	-	ctfs	-	/system/contract	ctfs	-	no	-	objfs	-	/system/object	objfs	-	no	-	swap	-	/tmp tmpfs	-	yes	-	
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ctfs	-	/system/contract	ctfs	-	no	-																																																																																													
objfs	-	/system/object	objfs	-	no	-																																																																																													
swap	-	/tmp tmpfs	-	yes	-																																																																																														

Step	Action
7	Modify the /boot/solaris/bootenv.rc file to reflect the new bootpath parameter. Use the device name noted above to replace the bootpath. To identify the boot slices, use "...:a" at the end if your boot slice is slice 0, use "...:b" for slice1, and so on. Note_____ You can also see the device path by executing a list command: <pre>ls -al /dev/rdisk/c4t60A9800056716436636F393164695969d0s2</pre> Example: The following is an example of a modified file. <pre>... setprop bootpath /scsi_vhci/disk@g60a9800056716436636f393164695969:a ... # # Copyright 2005 Sun Microsystems, Inc. All rights reserved. # Use is subject to license terms. # #ident "@(#)bootenv.rc 1.32 05/09/01 SMI" # # bootenv.rc -- boot "environment variables" # setprop kbd-type US-English setprop ata-dma-enabled 1 setprop atapi-cd-dma-enabled 0 setprop ttyb-rtts-dtr-off false setprop ttyb-ignore-cd true setprop ttya-rtts-dtr-off false setprop ttya-ignore-cd true setprop ttyb-mode 9600,8,n,1,- setprop ttya-mode 9600,8,n,1,- setprop lba-access-ok 1 setprop prealloc-chunk-size 0x2000 setprop bootpath /scsi_vhci/disk@g60a9800056716436636f393164695969:a setprop console 'ttya'</pre>
8	Install GRUB on the new file systems. <pre>cd /boot/grub /sbin/installgrub stage1 stage2 /dev/rdisk/c3t500A09818350B481d32s0</pre> Note_____ The GRUB configuration may indicate the wrong partition information for the bootable LUN. It may indicate that the boot slice is slice 1. If that is the case, you may need to change it to slice0 in the menu.lst file.

Step	Action
9	Update the GRUB bootloader: bootadm update-archive -R /mnt/boot lun
10	Umount the file system on the bootable LUN. umount /mnt/boot lun
11	Shut down the system. sync;halt
12	Configure your HBA's bios to boot to the bootable LUN. Then configure your x86/x64 (AMD) system to boot to the HBA. See the documentation for your server and HBA for more details.

File system dump, restore for an x86/x64 system without MPxIO

Setting up an x86/x64 (AMD) system without MPxIO

The following steps show you how to perform a file system dump and restore for an x86/x64 (AMD) system that has MPxIO disabled.

x86/x64 (AMD) without MPxIO systems: Copying data from locally booted server

If you have an x86/x64 (AMD) system that is not using MPxIO and you want to copy data from a locally booted server, complete the following steps.

Step	Action
1	Use the <code>mount</code> command to identify the current boot device. Example: The following mounts the current boot device. # mount / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/logging/xattr/onerror=panic/dev=1980 000 on Tue Jan 2 12:50:22 2007

Step	Action
2	Configure the LUN for ◆ The root file system ◆ The file systems that will be copied to the bootable LUN. You may want to create slices and place the file systems on the slices. In addition, you might want to set up the swap slice. /var, and other file systems. Use the format command to choose the LUN. Write down the device path for the LUN so you can refer to it later. Example: This example uses a QLogic HBA. You first run the format command. Based on its output, you determine that you want number 33, which has the device path /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20. <pre>33. c3t500A09818350B481d32 <DEFAULT cyl 9787 alt 2 hd 255 sec 63> /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20</pre> Note_____ Emulex HBAs have "fc" in the device name. QLogic HBAs have "fp" in the device name. _____
3	Create the SAN file system that you will dump the current file system to. Example: The following command line creates a new file system. <pre>newfs /dev/dsk/c3t500A09818350B481d32s0</pre>
4	Mount the file system that you will use when you copy the boot data. Example: The following example mounts the file system. <pre>mount /dev/dsk/c3t500A09818350B481d32s0 /mnt/boot lun</pre>

Step	Action																																																																																																		
5	Create the required directory structure on the bootable LUN and copy the boot data. Enter: <pre>ufsdump 0f - <source_boot_device> cd/ <mntpoint of bootable_ lun>; ufsrestore rf -)</pre> Note_____ If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see the Sun’s document Sun StorEdge SAN Foundation Software 4.4 Configuration Guide for instructions. _____ Example: The following example copies the information from c0t0d0s0. <pre>ufsdump 0f - /dev/rdsk/c0t0d0s0 (cd /mnt/bootlun; ufsrestore rf -)</pre>																																																																																																		
6	Edit the vfstab file on the SAN file system. Change the swap, root, and file systems in the vfstab file to show the boot device instead of the local device. One way to do this is to edit the file using vi: <pre># cd /mnt/etc/ # vi vfstab</pre> Example: The following shows the vfstab entry for the bootable LUN. <table><tr><td>#device</td><td>device</td><td>mount</td><td>FS</td><td>fsck</td><td>mount</td><td>mount</td></tr><tr><td>#to mount</td><td>to fsck</td><td>point</td><td>type</td><td>pass</td><td>at boot</td><td>options</td></tr><tr><td>#</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>fd</td><td>-</td><td>/dev/fd fd</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/proc</td><td>-</td><td>/proc proc</td><td>-</td><td>no</td><td>-</td><td></td></tr><tr><td>/dev/dsk/c3t500A09818350B481d32s1</td><td>-</td><td>-</td><td>swap</td><td>-</td><td>no</td><td>-</td></tr><tr><td>/dev/dsk/c3t500A09818350B481d320</td><td>/dev/rdsk/c3t500A09818350B481d32s0</td><td></td><td></td><td></td><td></td><td>/</td></tr><tr><td>ufs</td><td>1</td><td>no</td><td>-</td><td></td><td></td><td></td></tr><tr><td>/dev/dsk/c3t500A09818350B481d32s6</td><td>/dev/rdsk/c3t500A09818350B481d32s6</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>/globaldevices</td><td>ufs</td><td>2</td><td>yes</td><td>-</td><td></td><td></td></tr><tr><td>/devices</td><td>-</td><td>/devices</td><td>devfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>ctfs</td><td>-</td><td>/system/contract</td><td>ctfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>objfs</td><td>-</td><td>/system/object</td><td>objfs</td><td>-</td><td>no</td><td>-</td></tr><tr><td>swap</td><td>-</td><td>/tmp tmpfs</td><td>-</td><td>yes</td><td>-</td><td></td></tr></table>	#device	device	mount	FS	fsck	mount	mount	#to mount	to fsck	point	type	pass	at boot	options	#							fd	-	/dev/fd fd	-	no	-		/proc	-	/proc proc	-	no	-		/dev/dsk/c3t500A09818350B481d32s1	-	-	swap	-	no	-	/dev/dsk/c3t500A09818350B481d320	/dev/rdsk/c3t500A09818350B481d32s0					/	ufs	1	no	-				/dev/dsk/c3t500A09818350B481d32s6	/dev/rdsk/c3t500A09818350B481d32s6						/globaldevices	ufs	2	yes	-			/devices	-	/devices	devfs	-	no	-	ctfs	-	/system/contract	ctfs	-	no	-	objfs	-	/system/object	objfs	-	no	-	swap	-	/tmp tmpfs	-	yes	-	
#device	device	mount	FS	fsck	mount	mount																																																																																													
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/proc	-	/proc proc	-	no	-																																																																																														
/dev/dsk/c3t500A09818350B481d32s1	-	-	swap	-	no	-																																																																																													
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/devices	-	/devices	devfs	-	no	-																																																																																													
ctfs	-	/system/contract	ctfs	-	no	-																																																																																													
objfs	-	/system/object	objfs	-	no	-																																																																																													
swap	-	/tmp tmpfs	-	yes	-																																																																																														

Step	Action
7	Modify the /boot/solaris/bootenv.rc file to reflect the new bootpath parameter. Use the device name noted above to replace the bootpath. To identify the boot slices, use "...:a" at the end if your boot slice is slice 0, use "...:b" for slice1, and so on. Note_____ You can also see the device path by executing a list command: <pre>ls -al /dev/rdisk/c3t500A09818350B481d32s2</pre> _____ Example: The following sets the bootpath parameter. <pre>... setprop bootpath /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20:a ...</pre>
8	Install GRUB on the new file systems. <pre>cd /boot/grub /sbin/installgrub stage1 stage2 /dev/rdisk/c3t500A09818350B481d32s2</pre> Note_____ The GRUB configuration may indicate the wrong partition information for the bootable LUN. It may indicate that the boot slice is slice 1. If that is the case, you need to change it to slice0 in the menu.lst file. _____
9	Update the GRUB bootloader: <pre>bootadm update-archive -R /mnt/bootlun</pre>
10	Umount the file system on the bootable LUN. <pre>umount /mnt/bootlun</pre>
11	Shut down the system. <pre>sync;halt</pre>
12	Configure your HBA's bios to boot to the bootable LUN. Then configure your x86/x64 (AMD) system to boot to the HBA.

Appendix overview This appendix describes how to install and remove the Array Support Library (ASL).

Topics in this appendix Topics in this appendix include the following:

- ◆ “[Overview of the Array Support Library](#)” on page 60
- ◆ “[Installing the ASL](#)” on page 61
- ◆ “[Removing the ASL](#)” on page 65

Overview of the Array Support Library

What the Array Support Library is

The Array Support Library (ASL) is an ONTAP-qualified library that provides information about storage array attributes configuration to the Device Discovery Layer (DDL) component of Veritas Volume Manager™ (VxVM).

The DDL is a component of VxVM that discovers available enclosure information for disks and disk arrays that are connected to a host system. The DDL calls ASL functions during the storage discovery process on the host.

You can add or remove ASLs from a running VxVM system. This way, dynamic support is added or removed from VxVM without stopping VxVM or rebooting the VxVM system.

What the ASL provides

The ASL provides enclosure-based naming information about SAN-attached storage systems. With enclosure-based naming, the name of the disk is based on the logical name of its enclosure, or disk array, and not a raw device name. The ASL provides specific information to VxVM about SAN-attached storage systems, instead of referring to them as JBOD devices or raw devices.

With enclosure-based naming, the name of the disk is based on the logical name of the enclosure, or disk array, in which the disk resides. The name of the disk is not based on the host assigned raw device name.

Using storage with the ASL

You cannot use storage systems simultaneously as JBODs and vendor arrays. If you install the ASL, storage systems cannot be configured in VxVM as JBODs. They are reported as storage arrays unless you explicitly exclude them by using the `vxddladm exclude array` command.

Installing the ASL

ASL installation overview

Installing the ASL involves the following tasks:

- ◆ Determining the ASL version
- ◆ Verifying that your configuration meets system requirements.
- ◆ Installing a fresh version of the ASL *or* upgrading an existing ASL version.

Determining the ASL version

Use the Veritas `vxddladm listversion` command to determine the version of the ASL that is installed on the host.

Example: The following shows output from the `vxddladm listversion` command.

```
vxddladm listversion
LIB_NAME ASL_VERSION Min. VXVM version
=====
=
libvxxp256.so vm-4.0-rev-1 4.0
libvxxvpath.so vm-4.0-rev-1 4.0
libvxxveritas.so vm-4.0-rev-1 4.0
libvxstorcomp.so vm-4.0-rev-1 4.0
libvxssa.so vm-4.0-rev-1 4.0
libvxshark.so vm-4.0-rev-1 4.0
libvxsenas.so vm-4.0-rev-1 4.0
libvxrdac.so vm-4.0-rev-1 4.0
libvxpurple.so vm-4.0-rev-3 4.0
libvxnec.so vm-4.0-rev-1 4.0
libvxlsiinf.so vm-4.0-rev-1 4.0
libvxhitachi.so vm-4.0-rev-1 4.0
libvxhds.so vm-4.0-rev-1 4.0
libvxfujitsu.so vm-4.0-rev-1 4.0
libvxemc.so vm-4.0-rev-2 4.0
libvxeccs.so vm-4.0-rev-1 4.0
libvxcscovrts.so vm-4.1-rev-1 4.0
libvxatf.so vm-4.0-rev-1 4.0
libvxap.so vm-4.0-rev-1 4.0
libnetapp.so vm-4.0-rev-1 4.0
#
```

Obtaining the ASL software

Check the Veritas web site for the NetApp Solaris ASL version and follow directions.

If the NetApp Solaris ASL is not available, you can obtain it from the FCP Solaris Host Utilities Download Page on the NOW site.

Installing ASL software you downloaded

To install a fresh version of the ASL from the either the NOW site or a Veritas site, complete the following steps.

Step	Action
1	Log in to the VxVM system as the root user.
2	Check the Veritas web site for the NetApp Solaris ASL version and follow directions. Note_____ If the NetApp Solaris ASL is not available, you can obtain it from the NOW site. _____
3	Uncompress the file. Enter: uncompress <asl_filename>.tar.Z Example: The following command extracts an ASL file. uncompress NTAPasl.4.0.2.tar.Z
4	Extract the ASL software by entering the following command: tar -xvf <asl_filename>.tar Example: The following extracts ASL software. tar -xvf NTAPasl.4.0.2.tar.Z
5	Install the NTAPasl package by entering the following command: pkgadd -d <asl_filename>.pkg
6	Restart the vxconfigd daemon by entering the following command: vxctl enable

Step	Action																																																																																							
7	Verify the installation. ◆ If your host is connected to a storage system, you can verify the installation by entering the following command and then locating the Enclosure Type in the output of the <code>vxddmpadm listenclosure all</code> command. vxddmpadm listenclosure all <table><tr><th>ENCLR_NAME</th><th>ENCLR_TYPE</th><th>ENCLR_SNO</th><th>STATUS</th></tr><tr><td colspan="4">=====</td></tr><tr><th>OTHER_DISKS</th><th>OTHER_DISKS</th><th>OTHER_DISKS</th><th>CONNECTED</th></tr><tr><th>Disk</th><th>Disk</th><th>DISKS</th><th>DISCONNECTED</th></tr><tr><td>FAS960_0</td><td>FAS960</td><td>1032303</td><td>CONNECTED</td></tr><tr><td>FAS9601</td><td>FAS960</td><td>1032305</td><td>CONNECTED</td></tr></table> ◆ If your host is not connected to a storage system, enter the following: vxddladm list support all <table><tr><th>LIBNAME</th><th>VID</th><th>PID</th></tr><tr><td colspan="3">=====</td></tr><tr><td>libvxap.so</td><td>SUN</td><td>All</td></tr><tr><td>libvxatf.so</td><td>VERITAS</td><td>ATFNODES</td></tr><tr><td>libvxeccs.so</td><td>ECCS</td><td>All</td></tr><tr><td>libvxemc.so</td><td>EMC</td><td>SYMMETRIX</td></tr><tr><td>libvxfujitsu.so</td><td>FUJITSU</td><td>GR710, GR720, GR730</td></tr><tr><td>libvxhds.so</td><td>HITACHI</td><td>All</td></tr><tr><td>libvxhitachi.so</td><td>HITACHI</td><td>DF350, DF400, DF400F</td></tr><tr><td>libvxlsiinf.so</td><td>LSI</td><td>INF-01-00</td></tr><tr><td>libvxnec.so</td><td>NEC</td><td>DS1200, DS1200F, DS3000SL</td></tr><tr><td>libvxpurple.so</td><td>SUN</td><td>T300</td></tr><tr><td>libvxrdac.so</td><td>VERITAS</td><td>RDACNODES</td></tr><tr><td>libvxsenas.so</td><td>SENA</td><td>All</td></tr><tr><td>libvxshark.so</td><td>IBM</td><td>2105</td></tr><tr><td>libvxssa.so</td><td>SSA</td><td>SSA</td></tr><tr><td>libvxstorcomp.so</td><td>StorComp</td><td>OmniForce</td></tr><tr><td>libvxveritas.so</td><td>VERITAS</td><td>All</td></tr><tr><td>libvxxp256.so</td><td>HP</td><td>All</td></tr><tr><td>libnetapp.so</td><td>NETAPP</td><td>All</td></tr><tr><td>libvxvpath.so</td><td>IBM</td><td>VPATH_NODES</td></tr></table>	ENCLR_NAME	ENCLR_TYPE	ENCLR_SNO	STATUS	=====				OTHER_DISKS	OTHER_DISKS	OTHER_DISKS	CONNECTED	Disk	Disk	DISKS	DISCONNECTED	FAS960_0	FAS960	1032303	CONNECTED	FAS9601	FAS960	1032305	CONNECTED	LIBNAME	VID	PID	=====			libvxap.so	SUN	All	libvxatf.so	VERITAS	ATFNODES	libvxeccs.so	ECCS	All	libvxemc.so	EMC	SYMMETRIX	libvxfujitsu.so	FUJITSU	GR710, GR720, GR730	libvxhds.so	HITACHI	All	libvxhitachi.so	HITACHI	DF350, DF400, DF400F	libvxlsiinf.so	LSI	INF-01-00	libvxnec.so	NEC	DS1200, DS1200F, DS3000SL	libvxpurple.so	SUN	T300	libvxrdac.so	VERITAS	RDACNODES	libvxsenas.so	SENA	All	libvxshark.so	IBM	2105	libvxssa.so	SSA	SSA	libvxstorcomp.so	StorComp	OmniForce	libvxveritas.so	VERITAS	All	libvxxp256.so	HP	All	libnetapp.so	NETAPP	All	libvxvpath.so	IBM	VPATH_NODES
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libvxhds.so	HITACHI	All																																																																																						
libvxhitachi.so	HITACHI	DF350, DF400, DF400F																																																																																						
libvxlsiinf.so	LSI	INF-01-00																																																																																						
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libvxpurple.so	SUN	T300																																																																																						
libvxrdac.so	VERITAS	RDACNODES																																																																																						
libvxsenas.so	SENA	All																																																																																						
libvxshark.so	IBM	2105																																																																																						
libvxssa.so	SSA	SSA																																																																																						
libvxstorcomp.so	StorComp	OmniForce																																																																																						
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libvxxp256.so	HP	All																																																																																						
libnetapp.so	NETAPP	All																																																																																						
libvxvpath.so	IBM	VPATH_NODES																																																																																						

Upgrade Requirements

Only one version of the ASL that supports Data ONTAP is allowed on the host at any one time. However, you can run ASLs from other vendors on the same host.

Upgrading the ASL

To upgrade the ASL from a previous version, complete the following steps.

Step	Action
1	Verify that your system meets ASL requirements. Check the <i>Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products</i> at http://now.netapp.com/NOW/knowledge/docs/docs.shtml .
2	Log in to the host as root user.
3	Quiesce host I/O or take the host application offline.
4	Remove the previous version of the ASL by entering the following command: <pre>pkgrm <asl_filename></pre> Example: The following command removes a previous version of the ASL. <pre>pkgrm NTAPasl</pre> Note_____ You do not need to stop any volumes created on unaffected disk arrays, such as disk arrays from other vendors, before removing ASL support. This is also true for arrays or disks in the OTHER_DISKS category. OTHER_DISKS are local non-FCP-attached disks. Volumes created on these arrays remain accessible. _____
5	Follow direction in “ Obtaining the ASL software ” on page 62 to obtain and install new ASL software

Removing the ASL

Before you begin

You do not need to stop any volumes created on unaffected disk arrays, such as disk arrays from other vendors, before removing ASL support. This is also true for arrays or disks in the OTHER_DISKS category. OTHER_DISKS are local non-FCP-attached disks. Volumes created on these arrays remain accessible because they are not multipathed.

Only one version of an ASL that supports Data ONTAP storage system can be installed on the host at any given time.

Removing the ASL

To remove the ASL, complete the following steps.

Step	Action
1	Log into the host as the root user.
2	Enter the following command to remove the ASL package: pkgrm <asl_filename> Example: The following command removes a previous version of the ASL. pkgrm NTAPasl

About this appendix This appendix provides tips and troubleshooting information to help you as you use the FCP Solaris Host Utilities. This appendix contains the following:

- ◆ Suggestions for checking your system.
- ◆ Information about possible problems and how to handle them.
- ◆ Diagnostic tools that you can use to gather information about your system.

Topics in this appendix

This chapter discusses the following topics:

- ◆ [“Confirming that your system is correctly set up”](#) on page 68
- ◆ [“Using Diagnostic Utilities”](#) on page 78
- ◆ [“Collecting storage system information”](#) on page 79
- ◆ [“Collecting Solaris information”](#) on page 81
- ◆ [“Collecting switch information”](#) on page 82
- ◆ [“Known issues with the Host Utilities”](#) on page 84

Confirming that your system is correctly set up

About the sections that follow

If you have any problems with the Host Utilities, you should make sure your system setup is correct.

The information in the sections that follow helps you check your system setup. As you go through it, keep the following in mind:

- ◆ As an experienced Solaris user, you may already know these commands. This is just a quick refresher of some of the key areas to check to avoid having problems.
For more information on any of the Solaris commands, see the man pages and operating system documentation.
For more information on the Data ONTAP commands, see the Data ONTAP documentation, in particular, the FCP and iSCSI Block Access Guide.
- ◆ You perform some of these checks from the host and others from the storage system. In some cases, you must have the Host Utilities SAN Toolkit installed before you perform the check. For example, the SAN Toolkit contains both the `basic_config` command and the `san lun` command.
- ◆ To make sure you have the current version of the system components, see the *Compatibility and Configuration Guide for NetApp FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>. Support for new components is added on an on-going basis. This online document contains a complete list of supported HBAs, platforms, applications, and drivers. These pages are updated on a regular basis to ensure that they always have information on the most current components.

Note

The examples that follow were accurate at the time this document was produced. They are not intended to show all the options available.

Remove MPxIO from a support kit installation

If you had installed an iSCSI Solaris Support Kit on your host, you must run `mpxio_set -d` before you configure the FCP Solaris Host Utilities.

```
# mpxio_set -d
```

Check the version of your host operating system

Make sure you have the correct version of the operating system.

Use the `cat /etc/release` command to display information about your operating system.

Example: The following is an example of checking your operating system version on a SPARC system.

```
$ cat /etc/release
Solaris 10 11/06 s10s_u3wos_10 SPARC
Copyright 2006 Sun Microsystems, Inc. All Rights Reserved.
Use is subject to license terms.
Assembled 14 November 2006
```

This example checks the operating system version on an x86/x64 (AMD) system:

```
$ cat /etc/release
Solaris 10 11/06 s10x_u3wos_10 X86
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Assembled 14 November 2006
```

Check the HBA

Supported HBAs should be installed before you install the Host Utilities. If you want to confirm that you have the supported HBAs, install the Host Utilities SAN Toolkit software package. Then use its `san lun` command to display information about HBAs on your system.

You can also use the `fcinfo hba-port` command to get information about the HBA.

Example: The following is an example of checking your HBA. This example uses a QLogic HBA.

```
# sanlun fcp show adapter -v
adapter name:      qlc0
WWPN:              21000003ba16dec7
WWNN:              20000003ba16dec7
driver name:       20060630-2.16
model:             2200
model description: 2200
serial number:     Not Available
hardware version:  Not Available
driver version:    20060630-2.16
firmware version:  2.1.144
Number of ports:   1
port type:         Private Loop
port state:        Operational
supported speed:   1 GBit/sec
negotiated speed:  1 GBit/sec
OS device name:    /dev/cfg/c1

adapter name:      qlc1
```

```

WWPN:                210000e08b88b838
WWNN:                200000e08b88b838
driver name:         20060630-2.16
model:               QLA2462
model description:   Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel
serial number:       Not Available
hardware version:    Not Available
driver version:      20060630-2.16
firmware version:    4.0.23
Number of ports:     1 of 2
port type:           Fabric
port state:          Operational
supported speed:     1 GBit/sec, 2 GBit/sec, 4 GBit/sec
negotiated speed:    4 GBit/sec
OS device name:      /dev/cfg/c2

```

```

adapter name:        qlc2
WWPN:                210100e08ba8b838
WWNN:                200100e08ba8b838
driver name:         20060630-2.16
model:               QLA2462
model description:   Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel
serial number:       Not Available
hardware version:    Not Available
driver version:      20060630-2.16
firmware version:    4.0.23
Number of ports:     2 of 2
port type:           Fabric
port state:          Operational
supported speed:     1 GBit/sec, 2 GBit/sec, 4 GBit/sec
negotiated speed:    4 GBit/sec
OS device name:      /dev/cfg/c3

```

Enable MPxIO on SPARC systems

You must manually enable MPxIO on SPARC systems. You can use the `stmsboot -e` to enable MPxIO, but keep in mind the command causes a system reboot.

Note

On x86/64 (AMD) systems, MPxIO is enabled by default.

Example: Enter the following command to enable MPxIO:

```
# stmsboot -e
```

Result: This command enables MPxIO by setting the `mpxio_disable=no` option in the `fp.conf` file. It updates `/etc/vfstab` and causes the system to reboot.

Check the Solaris Volume Manager

This version of the Host Utilities supports the Solaris Volume Manager (SVM). To quickly check the condition of SVM volumes, enter the following command:

```
# metastat -a
```

In a Sun Cluster environment, metaset and their volumes are only displayed on the node that is controlling the storage.

See your Solaris documentation for more information on working with the SVM.

Check the Veritas Volume Manager

This version of the Host Utilities supports the Veritas Volume Manager (VxVM). To quickly check the VxVM disks, enter the `vxdisk list` command:

```
# vxdisk list
```

DEVICE	TYPE	DISK	GROUP	STATUS
Disk_0	auto:sliced	-	-	online
Disk_1	auto:sliced	-	-	online
Disk_2	auto:sliced	-	-	online
Disk_3	auto:sliced	-	-	online
Disk_4	auto:sliced	-	-	online

To view volume information, use the `vxprint` command:

```
# vxprint -g scdg
```

TY	NAME	ASSOC	KSTATE	LENGTH	PLOFFS	STATE	TUTIL0
PUTIL0							
dg	scdg	scdg	-	-	-	-	-
dm	disk00	Disk_49	-	10475520	-	-	-
dm	disk01	Disk_33	-	10475520	-	-	-
dm	disk02	Disk_51	-	10475520	-	-	-
dm	disk03	Disk_54	-	10475520	-	-	-
dm	disk04	Disk_17	-	10475520	-	-	-
dm	disk05	Disk_39	-	10475520	-	-	-
dm	disk06	Disk_58	-	10475520	-	-	-
dm	disk07	Disk_24	-	10475520	-	-	-
dm	disk08	Disk_11	-	10475520	-	-	-
dm	disk09	Disk_34	-	10475520	-	-	-
dm	disk10	Disk_35	-	10475520	-	-	-
dm	disk11	Disk_29	-	10475520	-	-	-
dm	disk12	Disk_53	-	10475520	-	-	-
dm	disk13	Disk_2	-	10475520	-	-	-
dm	disk14	Disk_12	-	10475520	-	-	-
dm	disk15	Disk_5	-	10475520	-	-	-
dm	disk16	Disk_44	-	10475520	-	-	-
dm	disk17	Disk_32	-	10475520	-	-	-
dm	disk18	Disk_10	-	10475520	-	-	-
dm	disk19	Disk_27	-	10475520	-	-	-
v	raw_vol	fsgen	ENABLED	209510400	-	ACTIVE	-
pl	raw_vol-01	raw_vol	ENABLED	209510400	-	ACTIVE	-
sd	disk00-01	raw_vol-01	ENABLED	10475520	0	-	-
sd	disk05-01	raw_vol-01	ENABLED	10475520	10475520	-	-
sd	disk10-01	raw_vol-01	ENABLED	10475520	20951040	-	-
sd	disk15-01	raw_vol-01	ENABLED	10475520	31426560	-	-
sd	disk01-01	raw_vol-01	ENABLED	10475520	0	-	-
sd	disk06-01	raw_vol-01	ENABLED	10475520	10475520	-	-
sd	disk11-01	raw_vol-01	ENABLED	10475520	20951040	-	-
sd	disk16-01	raw_vol-01	ENABLED	10475520	31426560	-	-
sd	disk02-01	raw_vol-01	ENABLED	10475520	0	-	-
sd	disk07-01	raw_vol-01	ENABLED	10475520	10475520	-	-
sd	disk12-01	raw_vol-01	ENABLED	10475520	20951040	-	-
sd	disk17-01	raw_vol-01	ENABLED	10475520	31426560	-	-
sd	disk03-01	raw_vol-01	ENABLED	10475520	0	-	-
sd	disk08-01	raw_vol-01	ENABLED	10475520	10475520	-	-
sd	disk13-01	raw_vol-01	ENABLED	10475520	20951040	-	-
sd	disk18-01	raw_vol-01	ENABLED	10475520	31426560	-	-
sd	disk04-01	raw_vol-01	ENABLED	10475520	0	-	-
sd	disk09-01	raw_vol-01	ENABLED	10475520	10475520	-	-
sd	disk14-01	raw_vol-01	ENABLED	10475520	20951040	-	-
sd	disk19-01	raw_vol-01	ENABLED	10475520	31426560	-	-

See your Veritas documentation for more information on working with the VxVM.

Check settings in `ssd.conf` or `sd.conf`

When you run the `basic_config -ssd_set` command on a SPARC system, it modifies the `/kernel/drv/ssd.conf` file.

On an x86/x64 (AMD) system you run the `basic_config -sd_set` command, which modifies the `sd.conf` file.

To confirm the file was correctly set up, check it to ensure that it contains the following:

```
ssd-config-list="NETAPP LUN", "netapp-ssd-config";
netapp-ssd-
config=1,0x9007,64,30,30,0,0,0,0,0,0,0,0,30,0,0,8,0,0;
```

Note

On an x86/x64 (AMD) system, the display reads “sd” instead of “ssd”.

Check that MPxIO and ALUA are working on the host

Confirm that you have MPxIO and ALUA working on the host. You can use the `luxadm display` command to check for multipathing and the `san lun lun show -p` command to check for ALUA.

Note

You must enable ALUA before you map the LUNs. If you do not enable ALUA, MPxIO will not work. For more information on using ALUA, see the Data ONTAP® Block Access Management Guide for FCP at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml. In particular, see the section “*Enabling ALUA for a Fibre Channel igroup.*”

Example of checking for MPxIO: If MPxIO and ALUA are correctly set up, you should see some primary and secondary paths when you run the `luxadm display` command and the state of these paths should be listed as online. (To make this information easier to locate in the following example, these lines are shown in bold.)

```
# luxadm display /dev/rdisk/c2t60A98000686F646E4B5A34784A477668d0s2
DEVICE PROPERTIES for disk:
/dev/rdisk/c2t60A98000686F646E4B5A34784A477668d0s2
Vendor:                NETAPP
Product ID:            LUN
Revision:              0.2
Serial Num:            hodnKZ4xJGvh
```

```

Unformatted capacity: 1024.000 MBytes
Read Cache:          Enabled
  Minimum prefetch:   0x0
  Maximum prefetch:   0x0
Device Type:          Disk device
Path(s):
/dev/rdisk/c2t60A98000686F646E4B5A34784A477668d0s2
/devices/scsi_vhci/ssd@g60a98000686f646e4b5a34784a477668:c,raw
Controller            /devices/pci@1d,700000/fibre-
channel@2,1/fp@0,0
  Device Address          500a098185447022,9
  Host controller port WWN 10000000c94be343
  Class                   secondary
  State                   ONLINE
Controller              /devices/pci@1d,700000/fibre-channel@2/fp@0,0
  Device Address          500a098195447022,9
  Host controller port WWN 10000000c94be342
  Class                   primary
  State                   ONLINE

```

Example of checking for ALUA on the host: If ALUA is correctly set up, this information should appear when you run the `sanlun lun show -p` command. If ALUA is not set up correctly, this command does not produce any output.

```

# sanlun lun show -p
ONTAP_PATH:shf820-01:/vol/vol1/san_sol1
LUN:0
LUN Size:      20g (21474836480)
Host Device:/dev/rdisk/c4t600A09804F6443496434345435586476d0s2
lun state: GOOD Filer_CF_State: Cluster Enabled
Multipath_Policy: Native Multipath-provider: Sun Microsystems
Filer Status: TARGET PORT GROUP SUPPORT ENABLED
Target Port Group : 0x1
Target Port Group State: Active/optimized
Vendor unique Identifier : 0x0 (Other FC)
Target Port Count: 0x4
  Target Port ID : 0x1
  Target Port ID : 0x2
  Target Port ID : 0x3
  Target Port ID : 0x4
Target Port Group : 0x2
Target Port Group State: Active/non-optimized
Vendor unique Identifier : 0x0 (Other FC)
Target Port Count: 0x4
  Target Port ID : 0x101
  Target Port ID : 0x102
  Target Port ID : 0x103
  Target Port ID : 0x104

```

Check the storage system setup

You need to have your storage system correctly set up. For information on what needs to be done, see the list of storage system requirements in the section “[Pre-requisites](#)” on page 7.

Check the cfmode setting on the storage system

This version of the Host Utilities only supports the cluster failover mode (cfmode) of single image (SSI). To check the cfmode settings on your storage system, enter the `fcpx show cfmode` command.

Example: The following command line checks the cfmode on the storage system.

```
filerA# fcpx show cfmode
fcpx show cfmode: single_image
```

Check the ALUA settings on the storage system

You must have ALUA set on the storage system to work with igroups. To make sure you have ALUA set for your igroup, use the `igroup show -v` command.

Example: The following command line displays information about the cfmode on the storage system and shows that ALUA is enabled. (To make the information on ALUA easier to locate, it is shown in bold.)

```
filerA# igroup show -v
shsun07 (FCP):
  OS Type: solaris
  Member: 10:00:00:00:c9:4b:e3:42 (logged in on: 0c)
  Member: 10:00:00:00:c9:4b:e3:43 (logged in on: vtic)
  ALUA: Yes
```

Note

For more information on ALUA, see the *Data ONTAP® Block Access Management Guide for FCP* at http://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml. In particular, see the section “*Enabling ALUA for a Fibre Channel igroup.*”

Verify that the switch is installed and configured

If you have a fabric-attached configuration, check that the switch is set up and configured as outlined in the Installation and Setup instructions that shipped with your hardware. You should have completed the following tasks:

- ◆ Installed the switch in a system cabinet or rack.
- ◆ Checked that the switch firmware is supported with this Host Utility. See the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.
- ◆ Turned on power to the switch.
- ◆ Configured the network parameters for the switch, including its serial parameters and IP address.

Determine whether to use switch zoning

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

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

- ◆ Configuring the host is simplified.
- ◆ Information becomes more manageable. The output from the host tool `iostat` is easier to read because fewer paths are displayed.

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

It is recommended that your configuration have no more than eight paths per LUN. For more information about zoning, see the *Compatibility and Configuration Guide for NetApp's FCP and iSCSI Products* at <http://now.netapp.com/NOW/knowledge/docs/docs.shtml>.

Power up equipment in the correct order

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 follow, this is the order you must use when powering on the equipment:

- ◆ Configured Fibre Channel switches
It can take several minutes for the switches to boot.
- ◆ Disk shelves
- ◆ Storage systems
- ◆ Host

Verify that the host and storage system can communicate

Once your setup is complete, make sure the host and the storage system can communicate.

You can verify that the host can communicate with the storage system by issuing a command from:

- ◆ Storage system's console
- ◆ A remote login that you established from the host

Using Diagnostic Utilities

Diagnostic utilities

The SAN Toolkit includes several command-line utilities that provide diagnostic information you can use for troubleshooting.

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

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

- ◆ `filer_info`. See “[Collecting storage system information](#)” on page 79 for more information.
- ◆ `solaris_info`. See “[Collecting Solaris information](#)” on page 81 for more information.
- ◆ `<switch>_info`, where `<switch>` is the brand of switch you are using (for example, `brocade_info`). See “[Collecting switch information](#)” on page 82 for more information.

General steps for executing the programs

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

Step	Action
1	Change to the <code>opt/NTAP/SANToolkit/bin</code> directory: <code>cd /opt/NTAP/SANToolkit/bin</code>
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 compressed file.

Collecting storage system information

When to run the diagnostic script

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

Collecting storage system diagnostics

Complete the steps below to collect storage system information.

Step	Action
1	On the Solaris host, change to the <code>/opt/NTAP/SANToolkit/bin</code> directory: <code>cd /opt/NTAP/SANToolkit/bin</code>

Step	Action
2	At the host command prompt, enter the following command: <pre>filer_info [-d <i>path_and_file_name</i>] [-l <i>passwd</i>] -n <<i>storage_system_name</i>> -f</pre> -d enables you to specify a different path in which to place the resulting output. -l <i>passwd</i> allows you to specify a password to access the storage system. -n <<i>storage_system_name</i>> specifies the target of the command, where <i>storage_system_name</i> is the name of IP address of the storage system accessed. -f automatically overwrites an existing <<i>storage_system_name</i>> file in the default output directory. You might have an existing file in this directory if you previously ran the script. If you do not use the -f option, and you have an existing file, the <code>filer_info</code> script tells you to delete or rename the file. Result: The output of various status commands are placed in the output directory, where <i>storage_system_name</i> is replaced by the storage system name or IP address. The contents of this directory are placed in a tarred and compressed file named storage_system_<<i>storage_system_name</i>>.tar.Z.
3	Send the resulting compressed file to Customer Support for analysis.

Collecting Solaris information

When to run the diagnostic script

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

Collecting Solaris diagnostics

To execute `solaris_info`, complete the following steps:

Step	Action
1	On the Solaris host, change to the <code>/opt/NTAP/SANToolkit/bin</code> directory: <code>cd /opt/NTAP/SANToolkit/bin</code>
2	At the command prompt, enter the following command: <code>solaris_info [-d <directory>] [-n <file_name>] -f</code> -d <directory> specifies the location for the file that <code>solaris_info</code> creates. -n <file_name> specifies the name for the output file and directory names. -f automatically overwrites an existing .tar.Z file in the default output directory. You might have an existing file in this directory if you previously ran the script. If you do not use the -f option, and you have an existing file, the script tells you to delete or rename the file. Result: When you run <code>solaris_info</code> , the utility gathers information about your Solaris configuration and places it in a .tar.Z file. It also creates a directory and populates it with files containing output from numerous commands run on the Solaris system and contents of the <code>/var/adm/message</code> file.
3	Send the resulting file to Customer Support for analysis.

Collecting switch information

When to run the diagnostic script

If you are having a problem, Customer Support might ask you to run the switch utility script that is provided when you install the SAN Toolkit software. A utility is provided for each switch that is supported for the FCP Solaris Host Utilities. The utility name is `<switch>_info`, where *switch* is the brand of the switch (for example, if you have a McDATA switch, the file name would be `mcdata_info`). This utility collects switch configuration information. You should only run this utility when requested to do so by Customer Support.

Collecting switch diagnostics

To execute the utility, complete the following steps.

Step	Action
1	Change to the <code>/opt/NTAP/SANToolkit/bin</code> directory: <code>cd /opt/NTAP/SANToolkit/bin</code>

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

Known issues with the Host Utilities

sanlun doesn't show all adapters

Symptom: The `sanlun lun show` command does not display all the adapters.

```

hostA# sanlun lun show
filer:                lun-pathname                device filename
adapter protocol      lun size      lun state
fas3020-rtp22:  /vol/vol14/lun45
/dev/rdisk/c7t60A9800043346859444A36554A4D6E53d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol13/lun44
/dev/rdisk/c7t60A9800043346859444A36554A4D5765d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol11/lun42
/dev/rdisk/c7t60A9800043346859444A36554A4C775Ad0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol10/lun41
/dev/rdisk/c7t60A9800043346859444A36554A4C642Fd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol9/lun40
/dev/rdisk/c7t60A9800043346859444A36554A4C4B75d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol8/lun39
/dev/rdisk/c7t60A9800043346859444A36554A4B7175d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol7/lun38
/dev/rdisk/c7t60A9800043346859444A36554A4B6243d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp2:   /vol/vol6/lun37
/dev/rdisk/c7t60A9800043346859444A36554A4B486Ed0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol4/lun35
/dev/rdisk/c7t60A9800043346859444A36554A4A684Bd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol2/lun33
/dev/rdisk/c7t60A9800043346859444A36554A4A3736d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol1/lun32
/dev/rdisk/c7t60A9800043346859444A36554A496B6Bd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp22:  /vol/vol0/lun31
/dev/rdisk/c7t60A9800043346859444A36554A494662d0s2  qlc1      FCP      20g

```

```

(21474836480)    GOOD
fas3020-rtp21:  /vol/sanboot/sun280r-rtp15boot
/dev/rdsd/c7t60A98000433468656834375172756F78d0s2  qlc1      FCP      23g
(24696061952)    GOOD
fas3020-rtp21:  /vol/vol15/lun15
/dev/rdsd/c7t60A9800043346865683436554971754Ed0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol14/lun14
/dev/rdsd/c7t60A9800043346865683436554971612Fd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol13/lun13
/dev/rdsd/c7t60A98000433468656834365549714773d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol12/lun12
/dev/rdsd/c7t60A98000433468656834365549707559d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/
vol11/lun11      /dev/rdsd/c7t60A98000433468656834365549706348d0s2  qlc1
FCP      20g (21474836480)    GOOD
fas3020-rtp21:  /vol/vol10/lun10
/dev/rdsd/c7t60A98000433468656834365549704530d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol9/lun9
/dev/rdsd/c7t60A980004334686568343655496F734Fd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol8/lun8
/dev/rdsd/c7t60A980004334686568343655496F6156d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol7/lun7
/dev/rdsd/c7t60A980004334686568343655496F4850d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol6/lun6
/dev/rdsd/c7t60A980004334686568343655496E7A2Fd0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol5/lun5
/dev/rdsd/c7t60A980004334686568343655496E6666d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol4/lun4
/dev/rdsd/c7t60A980004334686568343655496E4E37d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol3/lun3
/dev/rdsd/c7t60A980004334686568343655496E3673d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol2/lun2
/dev/rdsd/c7t60A980004334686568343655496D6F49d0s2  qlc1      FCP      20g
(21474836480)    GOOD
fas3020-rtp21:  /vol/vol1/lun1
/dev/rdsd/c7t60A980004334686568343655496D5464d0s2  qlc1      FCP      20g
(21474836480)    GOOD

```

Explanation: When you use MPxIO, there are multiple paths. MPxIO controls the path over which the `san lun` SCSI commands are sent. This means that the adapter name can vary each time you issue the `san lun lun show` command.

What to do: To display information on all the adapters, issue the `san lun lun show -p` command. Use the `luxadm display -v device_name` command, where *device_name* is the name of the device you are checking.

**Solaris log
message says data
not standards
compliant**

Symptom: The Solaris log contains a message stating:

WARNING: Page83 data not standards compliant

Explanation: This Solaris log message sometimes occurs when you are executing the FCP Solaris Host Utilities for Native OS. It is Solaris bug and has been reported to Sun. The Solaris initiator implements an older version of the SCSI Spec.

What to do: The NetApp SCSI target is standards compliant, so ignore this message.

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