

IBM System Storage N series FC AIX Host Utilities 5.0 for Native OS and Veritas Installation and Setup Guide

GC26-7827-05 NA 210-04362_A0

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About this guide	This guide describes how to configure an AIX® host in a SAN environment. The host accesses data on an IBM® System Storage TM N series storage system that runs Data ONTAP® software with the Fibre Channel (FC) protocol.
	This document applies to host environments running Multiple Path I/O (MPIO) and to host environments running Veritas Storage Foundation TM . In addition, it supports host environments running the PowerVM (VIOS) environment.
Audience	This guide is for system installers and administrators who are familiar with the following:
	• AIX operating systems
	• MPIO or Veritas environments
	 VIO server environments
	 Configuring and administering a storage system
	• Using FC to store and retrieve data on a storage system
Supported features	IBM® System Storage TM N series storage systems are driven by NetApp® Data ONTAP® software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details. Information about supported features can also be found at the following Web site:
	www.1bm.com/storage/support/nas/
	A listing of currently available N series products and features can be found at the following Web site:
	www.ibm.com/storage/nas/
Getting information, help, and service	If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call	 Before you call, make sure that you have taken these steps to try to solve the problem yourself: Check all cables to make sure that they are connected properly. Check the power switches to make sure that the system is turned on. Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
	• Use an IBM discussion forum on the IBM web site to ask questions.
Using the documentation	Information about N series hardware products is available in printed documents and a documentation CD that comes with your system. The same documentation is available as PDF files on the IBM NAS support Web site:
	www.ibm.com/storage/support/nas/
	Data ONTAP software publications are available as PDF files on the IBM NAS support Web site:
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Supported servers and operating systems	IBM N series products attach to many servers and many operating systems. To determine the latest supported attachments, follow the link to the Interoperability Matrices from the following Web site: www.ibm.com/storage/nas/
Firmware updates	As with all devices, it is recommended that you run the latest level of firmware, which can be downloaded by visiting the following Web site: www.ibm.com/storage/nas/ Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support. See the <i>Data ONTAP Upgrade Guide</i> for your version of Data ONTAP for more information on updating firmware.
Terminology	 This guide uses the following terms: <i>FC</i> refers to Fibre Channel. <i>igroup</i> refers to a collection of unique identifiers, either FC WWPNs (World Wide Port Names) 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. <i>LUN</i> (Logical Unit Number) refers to a logical unit of storage identified by a number. <i>LUN ID</i> refers to the numerical identifier for a LUN. <i>Initiator</i> refers to the system component that originates an I/O command over an I/O bus or network. Storage systems that run Data ONTAP are sometimes also referred to as <i>filers, appliances, storage appliances,</i> or <i>systems</i>. The name of the graphical user interface for Data ONTAP (FilerView) reflects one of these common usages. <i>Target</i> refers to the storage system that receives an 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</i> type	 Words or characters that require special attention. Placeholders for information you must supply. For example, if the guide requires you to enter the fctest <i>adaptername</i> command, you enter the characters "fctest" 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.
Enter, enter	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.

What is in this guide	What it means
type	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.

Attention -

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

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About this chapter	This chapter provides a brief overview of the FC AIX Host Utilities for Native OS and Veritas.	
	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 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 "Supported AIX, Data ONTAP features, configurations" on page 5 "The stacks supported by the Host Utilities" on page 8 "FC AIX Host Utilities installation overview" on page 12 "Where to go for more information" on page 17 	
	 "Where to go for more information" on page 17 	

Important information about	The Host Utilities provide components that enable users to connect AIX hosts to storage systems. They support several different AIX environments:
Host Utilities	 Veritas. This environment uses Veritas Storage Foundation to provide volume management and multipathing. For multipathing, it uses Veritas Dynamic Multipathing (DMP).
	• Native OS. This environment uses features of the AIX operating system to provide volume management and multipathing. For multipathing, it uses Multiple Path I/O (MPIO) with IBM's default Path Control Module (PCM).
	 PowerVM. This environment uses the Virtual I/O (VIO) Server/Client. You must be running the Native OS stack to use PowerVM; you cannot use PowerVM and Veritas together.
	Note
	The term "VIO" was used to refer to PowerVM in earlier documentation.
	The tools contained in the Host Utilities apply to numerous components. Sometimes the same tools are used by Host Utilities for other operating systems. As a result, the Host Utilities version number and the tools version number do not match, even though the tools are part of that Host Utilities release. This is not issue.
Overview of the FC	The Host Utilities consist of the following components:
AIX Host Utilities	• The SAN Toolkit, which contains the following:
	 Configuration tools that help you configure host, HBA, and system files.
	Note
	You are not limited to using the Host Utilities tools to configure the host. You can also use HBA-provided tools or even a combination of the Host Utilities tools and tools provided by HBA vendors.
	 The sanlun utility that displays information about LUNs and the host HBA.

- Diagnostic scripts that provide diagnostic information about components in your configuration. Customer Support might ask for output from these scripts.
- Documentation that describes how to configure the AIX host. The documentation includes this setup guide, *Release Notes*, a quick command reference, and a guide to the host settings changed by the Host Utilities.

New components are qualified on an ongoing basis. For the most current information on the supported AIX Host Utilities stacks, see "Where to go for more information" on page 17.

Software tools provided by the Host Utilities

The FC AIX Host Utilities bundle the software tools into a SAN Toolkit. The toolkit contains the following components:

 aix_info script. This script collects configuration information about your host.

Note -

You use this script on AIX hosts that are running Native OS or Veritas environments. Do not use this script in PowerVM environments. Not all FC AIX Host Utilities stacks support PowerVM environments.

- (Native OS only) dotpaths utility. This utility lets you set path priorities in environments that are not using Asymmetric Logical Unit Access (ALUA).
- controller_info script and filer_info. This script collects information about the storage system.

Note -

At this time the Host Utilities support both the controller_info script and the filer_info script. Future releases of the Host Utilities may only support the controller_info script.

- (PowerVM environment only) ontap_collect. This is a snap extension that collects configuration information about your host just as the aix_info script does. VIO servers require you to run as the prime administrator (padmin) instead of root. To execute ontap_collect, you must be running as padmin.
- 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 the host. In a PowerVM environment,

you can only run the sanlun utility on the server; you cannot run it on a VIO client.

- Diagnostic scripts. In addition to the *_info scripts, you can use the following scripts 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.
 - mcdata_info collects information about McData switches installed in the network.
 - qlogic_info collects information about QLogic switches installed in the network.
- The man pages for sanlun and the diagnostic scripts.

Remove previous versions before installing Host Utilities This version of the FC AIX Host Utilities uses a different stack from previous versions of the Host Utilities. You should not have both products installed on the same host.

If you have an earlier version installed, you must remove it before you install this version. For more information, see "Uninstalling the Host Utilities software packages" on page 38.

Supported AIX, Data ONTAP features, configurations

Features supported by the Host Utilities	 The Host Utilities support a number of features and configurations available with AIX hosts and storage systems running Data ONTAP. Your specific environment affects what the Host Utilities support. Some of the supported features include: FC and iSCSI within the same AIX host and to the same target as long as they use different volume groups. 		
	 Multiple paths to the storage system when a multipathing solution is installed 		
	Dynamic Logical Partitioning		
	 (Native stack only) Asymmetrical Logical Unit Access 		
	 Cluster failover using single image mode only 		
	• PowerVM Live Partition Mobility on IBM System p		
	• IBM General Parallel File System (GPFS)		
	 VIO server/client environment 		
	Veritas Storage Foundation		
	SAN booting		
	For information on which features are supported with which configurations, see the IBM NAS support page at www.ibm.com/storage/support/nas/.		
About using multiple protocols on a single host	The Host Utilities support using both FC and iSCSI on the same host and pointing to the same target. Because you need to have a separate volume group for each protocol, you must use a separate LUN for each protocol. You cannot mix FC and iSCSI on the same volume group.		
	Note		
	This document discusses using Host Utilities in supported FC environments. For information on setting up the Host Utilities in an iSCSI environment, see the <i>iSCSI AIX Host Utilities Setup and Installation Guide</i> .		

About the HBAs	Do not use different HBA brands on a single host. The supported HBAs should be installed before you install the Host Utilities. See your HBA documentation for information on installing the HBAs.	
About multipathing	The FC AIX Host Utilities support different multipathing solutions based on your stack. Using multipathing allows you to configure multiple network paths between the host and storage system. If one path fails, FC traffic continues on the remaining paths. In order for a host to have multiple paths to a LUN, you must have multipathing enabled.	
	The SAN Toolkit sanlun command will show you the path policy to which the host has access.	
Dynamic LPAR is available	Dynamic Logical Partitioning (DLPAR) is an AIX 5.2 and 5.3 feature on IBM's pSeries servers. With DLPAR, you can move hardware resources such as processors, memory, and I/O slots from one logical partition to another without disruption. Refer to AIX documentation for details about DLPAR.	
(Native OS only) ALUA support with certain versions of Data ONTAP	The FC AIX Host Utilities for Native OS support both storage systems that have ALUA enabled and those that don't.	
	ALUA defines a standard set of SCSI commands for discovering and managing multiple paths to LUNs on Fibre Channel SANs. You still need to run MPIO on the host, but you do not need additional host-specific plug-ins.	
	To use ALUA, the storage system must be running a version of Data ONTAP® software that supports ALUA. Check the IBM NAS support page at www.ibm.com/storage/support/nas/to see which Data ONTAP software versions support ALUA and are supported by the Host Utilities. ALUA support was first available with Data ONTAP 7.2 and Single Image cluster failover mode (cfmode).	
The supported cluster failover mode	If you upgrade to Data ONTAP 7.2 or later and have an active/active configuration (also known as a <i>storage cluster</i>), you must migrate the cfmode setting of both systems in the configuration to single image mode. For information on doing this, see <i>Changing the Cluster cfmode Setting in Fibre Channel SAN Configurations</i> , which is available online at http://www.ibm.com/storage/support/nas.	

About GPFS	GPFS is an AIX feature that allows parallel applications simultaneous access to the same files, or different files, from any node that has the GPFS file system mounted while managing a high level of control over all file system operations.
	The Host Utilities support GPFS in certain configurations. Check the IBM NAS support page at www.ibm.com/storage/support/nas/ to see if your configuration supports this feature.
	For information on setting up GPFS, check your operating system documentation.
	Note
	At the time this document was prepared, IBM provided a GPFS library of documents at this location:
	http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp?topic=/com.ib m.cluster.gpfs.doc/gpfsbooks.html.
About Live Partition Mobility from PowerVM 1.5.2	PowerVM Live Partition Mobility on IBM System pSeries servers is an AIX feature that lets you quickly migrate AIX and Linux partitions that are running as well as their hosted applications from one physical server to another without disrupting the infrastructure services. The migration operation maintains complete system transactional integrity as it transfers the system environment, including processor state, memory, attached virtual devices, and connected users.
	The Host Utilities support PowerVM Live Partition Mobility in certain configurations. Check the IBM NAS support page at www.ibm.com/storage/support/nas/ to see if your configuration supports this feature.
	Note At the time this document was prepared, IBM provided a PowerVM Live Partition Mobility documents at this location: http://www14.software.ibm.com/webapp/set2/sas/f/pm/component.html.
About SAN booting	SAN boot is using a SAN-attached disk, like a LUN, as a boot device for an AIX
5	host. The Host Utilities support SAN booting in Native OS environments.

Finding the instructions for your AIX environment

Many of the instructions in this manual apply to all the AIX environments that the Host Utilities support. In some cases, the commands you use vary based on your AIX environment.

The following table summarizes some of the areas where you must use instructions specific to your AIX environment.

Task	Veritas stack	Native OS stack	PowerVM stack
Executing commands	Log in as root and use standard AIX and Veritas commands	Log in as root and use standard AIX commands	Run as padmin and use VIO commands. For some Host Utilities tasks, you must log in as padmin and enter the oem_setup_env command to change to root. See "Using a PowerVM environment with the Host Utilities (Native OS only)" on page 10.
Installing the Host Utilities host settings file for your environment	Use the file that is extracted to the SAN directory. This file provides the host setting used in Veritas environments. You must also install the SAN Toolkit software, which is in the SAN_Tool_Kit directory. See "Installing the Host Utilities software packages" on page 25.	Use the file that is extracted t file provides the host setting PowerVM environments. You must also install the SAN in the SAN_Tool_Kit directo See "Installing the Host Utili page 25.	to the MPIO directory. This used in Native OS and N Toolkit software, which is ry. ties software packages" on

Task	Veritas stack	Native OS stack	PowerVM stack
Special setup for your environment	You must install the ASL. In addition, if you are using Veritas Storage Foundation 5.0, you must also install the APM. See "Veritas: Installing the ASL and APM" on page 45.	If you are using a version of ALUA, you must have ALUA ALUA settings on the storage	Data ONTAP that supports A running. See "Check the e system" on page 107.
Working with LUNs	See "Veritas: Configuring and Managing LUNs" on page 71 for information on which commands to use when working in a Veritas environment.	See "Native OS, PowerVM: Configuring LUNs" on page 77 for information on which commands to use when working in a Native OS environment.	See "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83 for information on which commands to use when working in a PowerVM environment.
SAN booting	Not supported.	See "(Native OS) Configurin page 127 for more information	g SAN booting" on on.

Using a Veritas environment with the Host Utilities	The Veritas environment uses the commands and tools that are provided with the Veritas Storage Foundation Suite. For this environment you must install the Veritas Storage Foundation and the Array Support Library and Array Policy Module.	
	You must be root both to install the Host Utilities and then execute the sanlun utility.	
	To manage LUNS and volumes, you use the Veritas Volume Manager (VxVM) to manage the LUNs and volumes.	
	For multipathing, you use Veritas Dynamic Multipathing (DMP).	
Using a Native OS environment with	The Native OS environment uses the commands and tools that are provided with the AIX operating system.	
the Host Utilities	To install the Host Utilities and execute the sanlun utility, you run as root.	
	To manage the LUNs and volumes, use the Native AIX Logical Volume Manager (LVM).	

For multipathing, use MPIO. If your version of Data ONTAP supports ALUA, you can use ALUA to set the paths. If not, use the dotpaths utility that the Host Utilities provide.

Using a PowerVM environment with the Host Utilities (Native OS only)

If you are using AIX with a VIO server, make sure you have your PowerVM environment set up before you install the Host Utilities. PowerVM environments enable you to share physical I/O resources between logical partitions. You can use both physical and virtual LUNs. You can create virtual disks on both the server and the client.

VIO servers require that you run as padmin, not root. As a result, some of the commands you use in setting up your Host Utilities environment are different from the ones you use when running the Host Utilities on an AIX host using only the native stack. For example, to discover LUNs on VIO servers, you use the cfgdev command; on AIX hosts without PowerVM, you use the cfgmgr command.

Some other differences include the PowerVM:

- Installing the Host Utilities in PowerVM environments:
 - You must login as padmin and then use the oem_setup_env command to change to root. The Host Utilities require you to be root during the installation.

Note -

When you enter the oem_setup_env command, the system goes into the oem_setup_env command mode. While in this mode, you can perform activities such as installing the Host Utilities or running SAN Toolkit utility commands such as dotpaths or sanlun. To return to the normal operating mode for PowerVM environments, halt the oem_setup_env command mode by entering exit at the command prompt.

- You must install the SAN Toolkit software package on the VIO server. In addition, you should also install it on each VIO client. While you cannot run the sanlun utility on the client, you can run the diagnostic scripts that are installed as part of the SAN Toolkit.
- If you have LUNs presented to a VIO server from multiple third-party storage vendors, make sure that all the LUNs use the same maximum transfer size. A good way to do this is to pick the highest value for all the LUNs and then match the others to that value using the chdev command.

Example: In this example, hdisk61 has a maximum transfer size of 256KB (4000h).

```
#-> lsattr -El hdisk61 -a max_transfer
max transfer 0x40000 Maximum TRANSFER Size True
```

- Troubleshooting on VIO servers:
 - To collect information about the host, you must run the ontap_collect file, not the aix_info file.
 - If you have virtual SCSI LUNs set up, the sanlun utility does not recognize them. This is because the LUNs are identified as VID "IBM" and PID "VDASD."

Note-

For details on using VIO servers, please see the applicable IBM documentation. If you want to see which commands you can use with VIO servers, enter the help command and then use the man command to see details on each command.

Overview of Installing the FC AIX Host Utilities and setting up your system involves a Installing the Host number of steps that are performed on both the storage system and the host. The Utilities and setting following sections provide information about the tasks you need to perform. For up your system details on these tasks, Note_ Occasionally there are known problems that can affect your system setup. Please check the FC AIX Host Utilities Release Notes before you install the Host Utilities to make sure there are no issues affecting your system setup. Prerequisites Before you install the Host Utilities, you must perform the following tasks: **1.** Set up your configuration: Host OS, technology levels, and appropriate updates ٠ ✤ HBAs Drivers Volume management and multipathing, if used **Veritas environment only**: Veritas Storage Foundation, the Array ٠ Support Library (ASL) for the storage controllers, and, with Veritas Storage Foundation 5.0, Array Policy Module (APM) Note -You must install the Veritas Volume Manager (VxVM) before you install the ASL and APM software. These components are available from the Symantec web site. Storage system and Data ONTAP ٠ Switches, if used ٠ For information about the system requirements, see "Where to go for more information" on page 17. 2. Verify that your storage system is: Licensed correctly for the FC service and running it Using the recommended cfmode (single-image)

Configured to work with the target HBAs

- Set up to work with the AIX host and the initiator HBAs
- Set up to work with ALUA, if it is supported with your version of Data ONTAP

Note -

ALUA is not supported with Veritas Storage Foundation.

Set up with working volumes and qtrees (if desired)

Note -

You should 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
 - Cabled according to the instructions that came with the switch
- 4. Verify that:
 - The equipment is powered on in the correct order: switches, disk shelves, storage systems, and then the host.
 - The host and the storage system can communicate

Installing the Host Utilities involves the following tasks:

- 1. Get a copy of the compressed Host Utilities file, which contains the host settings package for your multipathing solution and the SAN Toolkit software package.
 - Download the compressed file containing the packages.
 - Copy the compressed file from the CD.
 - Extract the software packages from the file. There will be three packages, but you only need to install two of them: the host settings package for your multipathing solution (either MPIO or non-MPIO) and the SAN Toolkit package.
- 2. Install the software packages:
 - ✤ Login as root.

PowerVM environment only: If you are on a VIO server, login as padmin and then use the oem_setup_env command to change to root.

• Go to the directory containing the extracted software packages.

Installation overview

	 Use either the AIX System Management Interface Tool (SMIT) or the installp command to install the host settings software and the toolkit software. PowerVM environment only: If you are using a PowerVM environment, you should install the SAN Toolkit software on the server and each client. You do not need to install the host settings on the clients.
	3 Varify that the HPA initiator quant depth is appropriate for your system
	Use the lsattr -El command to check the queue depth.
	4. Check your cluster failover mode (cfmode):
	 If you have an active/active configuration, migrate your cfmode setting to single image mode.
	 If you have a direct-attached storage, verify that the media type is correct.
Configuration	Configure the LUNs by performing the following tasks:
overview	• 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. Specify aix as the value for the ostype attribute. You will need to supply a World Wide Port Name (WWPN) for each of the host's HBAs.
	 Native OS, PowerVM environments only: Enable ALUA, if you haven't already done so.
	• Native OS, PowerVM environments only: Set the path priorities. If you are not using ALUA, use the dotpaths utility that comes with the Host Utilities to set the path priorities.
	• Map the LUNs to the igroup.
	• Configure the host to discover the LUNs.
	• Get the host to discover the new LUNs.
	✤ Native OS, Veritas environments only: Use the cfgmgr command.
	 PowerVM environment only: Use the cfgdev command.
	 PowerVM environment only: If you have LUNs presented to a VIO server from multiple third-party storage vendors, make sure that all the LUNs use the same maximum transfer size. Use the lsatr -El <disk> -a max_transfer command.</disk>
	• Display information about the LUNs and HBA.

On an AIX host, you can use the sanlun command.

Note-

If you are using virtual LUNs, the sanlun command does not list them. This is because the virtual SCSI LUNs are identified as VID "IBM" and PID "VDASD", which the sanlun utility does not recognize.

For detailed information on these tasks

The chapters in this document provide more details about setting up your system, verifying your setup before you install the Host Utilities, installing and configuring the Host Utilities, creating igroups and LUNs, and displaying information on the LUNs and HBAs. The following list summarizes some of the information in the chapters. For details on what is in each chapter, go to that chapter.

- Chapter 2, "Installing the Host Utilities Software," on page 19
 - "Completing the pre-installation tasks" on page 20
 - "Obtaining the software packages" on page 22
 - "Installing the Host Utilities software packages" on page 25
 - "Verifying the HBA initiator queue depth" on page 37
- Chapter 3, "Veritas: Installing the ASL and APM," on page 45
 - "Installing the ASL and APM" on page 48
 - "Example of uninstalling and installing the ASL and APM" on page 54
 - "Obtaining multipathing information" on page 58
 - "Optimizing the Veritas DMP Restore Daemon" on page 60
- Chapter 4, "Basic Tasks for Working with LUNs," on page 63
 - "Creating and mapping igroups and LUNs" on page 66
 - "High level methods for discovering LUNs" on page 68
- Chapter 5, "Veritas: Configuring and Managing LUNs," on page 71
 - "Discovering LUNs on a host using VxVM and DMP" on page 72
 - "Working with LUNs and VxVM volumes" on page 74
- Chapter 6, "Native OS, PowerVM: Configuring LUNs," on page 77
 - "Discovering LUNs with native AIX LVM (no multipathing)" on page 78
 - "(Native OS only) Discovering LUNs with MPIO software" on page 80
 - "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83
 - "(Native OS only) Creating volume groups and file systems" on page 88

- Chapter 7, "Using sanlun to Display LUN, HBA Information," on page 93
 - "Using sanlun to display LUN information" on page 94
 - "Using sanlun to display host HBA information" on page 99
- Chapter 8, "Troubleshooting," on page 101
 - "Confirming that your configuration is set up correctly" on page 104
 - "Tools you can use to troubleshoot problems" on page 110
 - "SAN Toolkit diagnostic utilities" on page 111
 - "Changing HBA attributes such as queue depth" on page 118
 - "Changing the HBA queue depth with no LUNs mapped" on page 123
 - "Changing the value for the queue depths on the disk" on page 124
- Optional: Appendix A, "(Native OS) Configuring SAN booting," on page 127

In addition, the section "Where to go for more information" on page 17 provides pointers to other documents and Web sites that can help you in working with your system.

Host and storage system information The documents listed below contain information about host and storage system requirements, supported configurations, best practices, installation procedures and troubleshooting.

If you need information about	See the following product documentation
List of supported versions	The appropriate interoperability matrix for your N series product, available on the IBM support web site at http://www.ibm.com/storage/support/nas
General product information	The IBM product web page at http://www.ibm.com/storage/
Product support information	The IBM support web page at http://www.ibm.com/storage/support/nas/
Changing the cfmode	Changing the Cluster cfmode Setting in Fibre Channel SAN Configurations at http://www.ibm.com/storage/support/nas
Installing and configuring the HBA in your host	Refer to your HBA vendor documentation.
Your host operating system	Refer to your operating system documentation.

If you need information about	See the following product documentation
Working with Veritas	Refer to your Veritas documentation. In particular, the following documents in particular might be helpful:
	 Veritas Storage Foundation 5.0
	 Veritas Storage Foundation and High Availability Solutions 5.0 - Getting Started Guide (AIX)
	 Veritas Storage Foundation 5.0 - Installation Guide (AIX)
	 Veritas Storage Foundation for Oracle RAC 5.0 - Installation and Configuration Guide (AIX)
	 Veritas Storage Foundation 4.0
	 Veritas Storage Solutions 4.0 Getting Started Guide for AIX
	 Veritas Storage Foundation 4.0 Installation Guide/AIX
	 Veritas Storage Foundation 4.0 for Oracle RAC - Installation and Configuration Guide (AIX)
Working with PowerVM environments	Refer to your operating system documentation. Additional documentation on using PowerVM environments is available on the IBM web site.

About this chapter	This chapter describes procedures for installing the FC AIX Host Utilities.
Topics in this chapter	 This chapter discusses the following topics: "Completing the pre-installation tasks" on page 20 "Obtaining the software packages" on page 22 "Installing the Host Utilities software packages" on page 25 "Uninstalling the Host Utilities software packages" on page 38

Before you begin	 You need to have your operating system, drivers, HBAs, and multipathing set up before you install the Host Utilities. You also need to have any features specific to your AIX environment set up. Veritas environments: You must have Veritas Storage Foundation installed and set up before you install the Host Utilities. In addition, you should configure VxVM and, if you want to use multipathing, DMP. Depending on
	 your version of veritas, you may need to install the ASL and the APM. For more information, see "Veritas: Installing the ASL and APM" on page 45. Native OS and PowerVM environments: You must have MPIO set up. If you
	are using ALUA, you must have that setup.
	• PowerVM environments: You must have the PowerVM environment set up.
	Before you install the Host Utilities software, perform the following tasks:
	• Verify that your host system meets the system requirements. See "Where to go for more information" on page 17.
	• If you currently have an earlier version of the FC AIX Host Utilities or FC AIX Attach Kit installed, you must remove it. See "Uninstalling the Host Utilities software packages" on page 38.
	You should also have your storage system set up.
	• The storage system must be able to communicate with the host.
	• Active/active configurations (clustered) must use single image cfmode. If your system is not configured for single image, see <i>Changing the Cluster cfmode Setting in Fibre Channel SAN Configurations</i> , which is available online at http://www.ibm.com/storage/support/nas.
	• Direct-attached configurations must have the media type set to loop. See "Configuring the target HBA for direct-attached configuration" on page 21
	For information on verifying that your system setup, see "Confirming that your configuration is set up correctly" on page 104.
Configuring the target HBA for direct-attached configuration

Correct media type for direct-attached	If you use a direct-attached configuration, you must set the target HBA media type to loop. Use the fcp config command to set the media type.				
configuration	Note If you are disabled.	Note If you are using an active/active configuration (cluster), the media type setting is disabled.			
	You must also make sure that you do not have clustering licensed or the Interconnect Card installed. Remove both if they exist on your storage system.				
Setting the media type to loop	To set the media type to loop, perform the following steps.				
	Step	Action			
	1	Stop each adapter used in the direct attach configuration by entering the following command:			
		fcp config adapter down			
		adapter is the name of the Fibre Channel target adapter.			
	2	Set the media type to loop by entering the following command for each adapter:			
		fcp config adapter mediatype loop			
	3	Restart the adapter by entering the following command:			
		fcp config adapter up			
	4	Reboot the storage system and the host.			
	5	Verify the adapter ports are online by entering the following command:			
		fcp show adapter			
	6	Verify that the media type is now correctly set on each adapter port by entering the following command;			
		fcp config			

Software packages	The Host Utilities are packaged into a single compressed file. This file contains:
required for the Host Utilities	• Two host settings packages. There is settings package for environments that use DMP multipathing and one for environments that use MPIO. You only need to install the package for your environment. The host settings file contains FC device definitions, which are required for FC AIX configurations. This is an Object Data Manager (ODM) stanza LPP package.
	 The SAN Toolkit package. You install the same package regardless of your configuration. This software package contains the sanlun utility and diagnostic scripts. The sanlun utility displays configuration information about LUNs and HBAs. The diagnostic scripts collect information about your system if a problem occurs. Customer support might ask you to run the sanlun utility or a diagnostic script if a problem occurs.
	This document uses names for these packages in its examples to make the examples easier to read. The final names for these packages may differ from those used in examples. Do not be concerned if the names of the packages you actually have are different from the ones in this document. The names used on the download site and Host Utilities CD are correct.
Where to get the software	You can install the product software either from the physical media kit or from software updates available for download. Downloads are available only to entitled IBM N series customers who have completed the registration process on the IBM NAS support web site at www.ibm.com/storage/support/nas. Before you install the software, check the publication matrix page at www.ibm.com/storage/support/nas for important alerts, news, interoperability details, and other information about the product.
	Once your hour the file was must up a manage it to get the setting and because Te

Once you have the file, you must uncompress it to get the software packages. To install the software, make sure the software packages are in a working directory on your AIX host.

Obtaining the file from the CD-ROM

To obtain the compressed file from the CD-ROM, complete the following steps.

Obtaining the software packages

Step	Action		
1	Insert the CD-ROM into the CD-ROM drive.		
2	Change to the root directory of the CD-ROM:		
	<pre># cd <cdrom_mountpoint></cdrom_mountpoint></pre>		
3	Copy the compressed file from the CD-ROM's root directory to a temporary location on the host.		
	Example: If you mount the CD-ROM on /mnt and want to place the SAN Toolkit file in the /tmp directory, you might enter commands similar to the following:		
	<pre># mount -v cdrfs -o ro /dev/cd0 /mnt # cp /mnt/ ibm_aix_host_utilities_5.0.tar.Z /tmp # cd /tmp</pre>		

Downloading the software

To download the software, complete the following steps.

Step Action 1 Go to the IBM NAS support web site at www.ibm.com/storage/support/nas. 2 Sign in with your IBM ID and password. If you do not have an IBM ID or password, or if you are adding new N series machines and serial numbers to an existing registration: **1.** Click the Register link. 2. Follow the online instructions. 3. Sign in. Select the N series software you want to download, and then select 3 the Download view. Use the "Software Packages ..." link on the Web page presented and 4 follow the online instructions to download the software.

Uncompressing the To uncompress the software packages, complete the following steps. **software packages**

Step	Action			
1	Change to the directory containing the software file and enter the following commands to uncompress it.			
	 Note			
	<pre>#-> zcat ibm_aix_host_utilities_5.0.tar.Z tar xvf - x ibm_aix_host_utilities_5.0 x ibm_aix_host_utilities_5.0/SAN_Tool_Kit x ibm_aix_host_utilities_5.0/SAN_Tool_Kit/Ontap.SAN_toolkit, 1343488 bytes, 2624 tape blocks x ibm_aix_host_utilities_5.0/SAN x ibm_aix_host_utilities_5.0/SAN/Ontap.fcp_attach_kit, 24576 bytes, 48 tape blocks x ibm_aix_host_utilities_5.0/SAN/Ontap.iscsi_support_kit, 20480 bytes, 40 tape blocks x ibm_aix_host_utilities_5.0/MPIO x ibm_aix_host_utilities_5.0/MPIO/Ontap.mpio_attach_kit, 184320 bytes, 360 tape blocks</pre>			
2	Go to "Installing the Host Utilities software packages" on page 25.			

Installing the Host Utilities software packages

Methods for installing the software	You can install the host settings software and the SAN Toolkit software using either the AIX System Management Interface Tool (SMIT) or the installp command. Note This section uses SMIT as its installation example.		
	If you have an FC AIX Host Attach Kit or a previous version of the Host Utilities installed, you should remove it before you install a new version of the Host Utilities. See "Uninstalling the Host Utilities software packages" on page 38.		
	Veritas environments : If you have SANpath installed, you must remove it. You cannot use both Veritas and SANpath.		
The correct software for your environment	 You must install the correct software packages for your host environment. For Native OS and PowerVM environments running MPIO, use the software package that is extracted to the MPIO directory. For Veritas environments, use the software package that is extracted to the 		
	SAN environment. You must also install the SAN Toolkit. This software package is extracted to the SAN_Tool_Kit directory. You install the same software package regardless of whether you are using a Native OS, PowerVM, or Veritas environment.		
Using SMIT to install the software	To install the Host Utilities, you must install both the host setting software package and the SAN Toolkit software package. To do this using SMIT, complete the following steps.		
	Note This installation example installs the host settings software first. You then repeat the steps to install the SAN Toolkit. If you have a PowerVM environment, you must install the SAN Toolkit on each client.		

Step	Action			
1	Make sure you are logged in as root.			
	PowerVM environments only : If you are running PowerVM on your host and you have logged in as padmin, enter the oem_setup_env command to become root. Once you execute this command, you are in oem_setup_env command mode until you stop the mode by entering a command such as exit.			
	PowerVM example: The following is an example of becoming root on a VIO server.			
	vioserver\$ oem_setup_env			
2	Start SMIT by entering the following command:			
	# smit install			
3	At the screen that appears, select the option titled "Install and Update Software."			
	Example: When you start SMIT, it displays the following screen. On this screen, the "Install and Update Software" option is the first menu option.			
	<pre># smitty install</pre>			
	Software Installation and Maintenance Move cursor to desired item and press Enter.			
	Install and Update Software List Software and Related Information Software Maintenance and Utilities Software Service Management Network Installation Management EZ NIM (Easy NIM Tool) System Backup Manager Alternate Disk Installation EFIX Management			
	F1=HelpF2=RefreshF3=CancelEsc+8=ImageEsc+9=ShellEsc+0=ExitEnter=Do+			

Step	Action			
4	At the next screen, select the Install Software menu option.			
	Example: The following is an example of the Install and Update Software screen.			
	+ Install and Update Software			
	Move cursor to desired item and press Enter.			
	Install Software Update Installed Software to Latest Level (Update All) Install Software Bundle			
	Update Software by Fix (APAR) Install and Update from ALL Available Software			
F1=Help F2=Refresh F3=Cancel				
	Esc+8=Image			
ESC+9=Shell ESC+0=Exit Enter=Do				

Step	Action				
5	At the Install Software screen, specify the location of the software in one of the following ways:				
	• Manually enter the location by providing the following information.				
	 If you're installing from the CD-ROM, enter the CD-ROM drive. 				
	 If you're installing from the host machine, enter the path to the software package (for example, if you use MPIO for multipathing, you would enter /var/tmp/ibm_aix_mpio_5.0/Ontap.mpio_attach_kit). Press F4 to display a list of options. 				
	If you want to use the F4 method, complete the following steps:				
	1. Press F4.				
	 At the prompt for software to install, enter the name for the package you are installing, either Ontap.mpio_attach_kit or Ontap.veritas_attach_kit. At the prompt asking whether you want to continue or cancel, press Enter to complete the installation. Example 1: The following is an example of entering the path to the MPIO software package when you're at the Install Software screen. If you were using the Veritas environment, you would be installing the SAN package (ontap.SAN_attach_kit). 				
	++ Install Software				
	Type or select a value for the entry field. Press Enter AFTER making all desired changes.				
	[Entry Fields]				
	<pre>* INPUT device / directory for software [/var/tmp/ibm_aix_mpio_5.0/Ontap.mpio_attach_kit]+</pre>				
	F1=Help F2=Refresh F3=Cancel F4=List				
	Esc+5=Reset Esc+6=Command Esc+7=Edit				
	Esc+8=1mage Esc+9=Shell Esc+0=Exit Enter=Do				
	++				

Step	Action				
	Example 2: After you enter path to the software package, SMIT displays the following scree This is the screen where you enter name of the software package, Ontap.mpio_attach_kit, an press Enter.			ollowing screen. attach_kit, and	
	+ Install Software			+	
	Type or select values in entry fields. Press Enter AFTER making all desired changes.				
			[Entry Fi	elds]	
	* INPUT device / [/var/tmp/ibm_	directory for software aix_mpio_5.0/Ontap.mpio_attach_k	sit]	+	
	* SOFTWARE to install PREVIEW only? (install operation will NOT occur) COMMIT software updates?		[Ontap.mpio_	[Ontap.mpio_attach_kit] +	
			c) no –	+	
			yes	+	
	SAVE replaced f	iles?	no	+	
	AUTOMATICALLY 1	nstall requisite software?	yes	+	
	EXTEND file sys	tems if space needed?	yes	+	
	VERWRITE same	or newer versions?	no	+	
	VERIFI INStall Include correct	and check file sizes:	IIO	+	
	DETAILED output	2	yes	+	
	Process multipl	e volumes?	ves	+ +	
	ACCEPT new lice	nse agreements?	no	+	
	Preview new LIC	ENSE agreements?	no	+	
	F1=Help Esc+5=Reset	F2=Refresh H Esc+6=Command	F3=Cancel Esc+7=Edit	F4=List	
	Esc+8=Image				
	Esc+9=Shell	Esc+0=Exit	Enter=Do		
	+			+	

Step	Action				
6	SMIT displays a warning, asking you to confirm that you want to install the software. Press Enter to continue.				
	Example 1: The following is an example of entering the path to the software package when you're at the Install Software screen.				
	X*****************	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	****X	
	х	ARE YOU SURE?		х	
	X				
	x Continuing may delete information you may want			х	
	x to keep. This is your last chance to stop x			х	
	x before continuing. x			х	
	x Press Enter to continue.			х	
	x Press Cancel to re	turn to the application.		х	
	х			х	
	x F1x F1=Help F2=Refresh F3=Cancel				
	x Esx Esc+8=Image Esc+0=Exit Enter=Do				
	X*************************************			****X	

Step	Action				
7	SMIT displays information about the installation.				
	NoteBy default, the host settings software installs the filesets for both FC and iSCSI. This is not a problem. If you are using only FC, ignore the iSCSI fileset.				
	Example of a successful installation: The following is an example of output you might see when an installation using the MPIO fileset successfully completes.				
	COMMAND STATUS				
	Command: running stdout: yes stderr: no				
	Before command completion, additional instructions may appear below.				
	Ontap.mpio_attach_kit.pcmodm 5.0.0.0 Ontap.mpio_attach_kit.iscsi 5.0.0.0 Ontap.mpio_attach_kit.fcp 5.0.0.0 Ontap.mpio_attach_kit.config 5.0.0.0				
	<< Copyright notice for Ontap.mpioattach_kit >> (C) Copyright NetApp, Inc. 2003-2009. All rights reserved.				
	<< End of copyright notice for Ontap.mpio_attach_kit >>				
	Finished processing all filesets. (Total time: 5 secs).				
	0503-409 installp: bosboot verification starting installp: bosboot verification completed. 0503-408 installp: bosboot process starting				
	bosboot: Boot image is 23825 512 byte blocks. 0503-292 This update will not fully take effect until after a system reboot.				
	* * * A T T E N T I O N * * * System boot image has been updated. You should reboot the system as soon as possible to properly integrate the changes and to avoid disruption of current functionality.				

```
Step
     Action
     installp: bosboot process completed.
     +-----
                            Summaries:
     +-----+
     Installation Summary
     -----
                         Level Part Event Result
     Name
     _____
     Ontap.mpio attach kit.pcmod 5.0.0.0
                                    USR
                                                     SUCCESS
                                            APPLY
                                           APPLY SUCCESS
APPLY SUCCESS
     Ontap.mpio_attach_kit.iscsi 5.0.0.0 USR
Ontap.mpio_attach_kit.fcp 5.0.0.0 USR
                                   USR
     Ontap.mpio attach kit.confi 5.0.0.0
                                            APPLY
                                                     SUCCESS
     COMMAND STATUS
                    stdout: yes stderr: no
     Command: OK
     Before command completion, additional instructions may appear below.
     Ontap.mpio_attach_kit.config 5.0.0.0
     . . . . . << Copyright notice for Ontap.mpio attach kit >> . . . . . .
      (C) Copyright NetApp, Inc. 2003-2009.
     All rights reserved.
     . . . . << End of copyright notice for Ontap.mpio attach kit >>. . .
     Finished processing all filesets. (Total time: 5 secs).
     0503-409 installp: bosboot verification starting...
     installp: bosboot verification completed.
     0503-408 installp: bosboot process starting...
     bosboot: Boot image is 23825 512 byte blocks.
     0503-292 This update will not fully take effect until after a system reboot.
     installp: bosboot process completed.
     +-----+
                           Summaries:
     +-----+
     Installation Summary
```

Step	Action				
	<pre>* * * A T T E N T I O N * * * System boot image has been updated. You should reboot the system as soon as possible to properly integrate the changes and to avoid disruption of current functionality. installp: bosboot process completed.</pre>				
	+	Summaries:			+
	Installation Summary				+
	Name	Level	Part	Event	Result
	Ontap.mpio_attach_kit.pcmod Ontap.mpio_attach_kit.iscsi Ontap.mpio_attach_kit.fcp Ontap.mpio_attach_kit.confi	5.0.0.0 5.0.0.0 5.0.0.0 5.0.0.0	USR USR USR USR USR	APPLY APPLY APPLY APPLY APPLY	SUCCESS SUCCESS SUCCESS SUCCESS
	F1=Help Esc+8=Image	F2=Refresh Esc+9=Shell	F3=Cancel	Esc	c+6=Command Esc+0=Exit
8	This completes the installation of	f the host settings so	oftware.		
	If you want to check the installati These files are in the SMIT log d	on, you can look in irectory (\$HOME).	the SMIT log f	ile (smit.log a	and smit.script).
9	Repeat Steps 2 - 8 to install the SAN Toolkit software package. This package is Ontap.SAN_toolkit.				
	Note In a PowerVM environment, you should also install the SAN Toolkit on each client. You cannot run the sanlun utility on the client, but you can run the diagnostic scripts that the toolkit installs on the client.				

Using a command line to install the software

You can use a command line to install this software if you prefer. To use a command line, you must be:

- Logged on as root
- In the directory containing the installation package for your environment (either the MPIO or SAN). This is directory that is created when you

uncompress the Host Utilities file. From the directory containing the uncompressed files, go to /ibm_aix_host_utilities_5.0/{MPIO | SAN}directory.

Note-

If you are running in a PowerVM environment, use the oem_setup_env command to become root.

To install the host settings software for a Native OS environment, enter the command line:

```
# installp -aXd Ontap.mpio_attach_kit Ontap.mpio_attach_kit
```

To install the host settings software for a Veritas environment, enter the command line:

installp -aXd Ontap.SAN_attach_kit Ontap.SAN_attach_kit

To install the SAN Toolkit software, enter the command line:

installp -aXd Ontap.SAN_toolkit Ontap.SAN_toolkit

Example: The following is an example of installing the SAN Toolkit using the command line.

```
# installp -aXd Ontap.SAN toolkit Ontap.SAN toolkit
+-----
              Pre-installation Verification...
+-----
Verifying selections...done
Verifying requisites...done
Results...
SUCCESSES
_ _ _ _ _ _ _ _ _ _
 Filesets listed in this section passed pre-installation verification
 and will be installed.
 Selected Filesets
 _____
Ontap.SAN toolkit.sanlun 5.0.0.0
                              # SAN Toolki...
Ontap.SAN toolkit.scripts 5.0.0.0 # SAN Toolki...
 << End of Success Section >>
```

```
FILESET STATISTICS
2 Selected to be installed, of which:
   2 Passed pre-installation verification
 ----
  2 Total to be installed
+------
               Installing Software...
+-----
installp: APPLYING software for:
Ontap.SAN toolkit.scripts 5.0.0.0
Ontap.SAN toolkit.sanlun 5.0.0.0
. . . . . << Copyright notice for Ontap.SAN toolkit >> . . . . . . .
(C) Copyright NetApp, Inc. 2003-2009.
All rights reserved.
. . . . . << End of copyright notice for Ontap.SAN toolkit >>. . .
Finished processing all filesets. (Total time: 2 secs).
+-----+
                   Summaries:
+------
Installation Summary
-----
Name
                Level Part Event Result
_____
Ontap.SAN_toolkit.scripts 5.0.0.0
                                APPLY
                         USR
                                        SUCCESS
Ontap.SAN toolkit.sanlun 5.0.0.0 USR APPLY SUCCESS
#
```

Sample installation using installp on a VIO server

The following is an example of using the installp command to install the Host Utilities on a VIO server in a PowerVM environment.

```
vioserver$ oem_setup_env
# PS1="$(hostname)# "
vioserver# zcat ibm_aix_mpio_5.0.tar.Z | tar xvf -
x ./ibm_aix_mpio_5.0/Ontap.mpio_attach_kit, 195584 bytes, 382 media blocks.
vioserver# cd ibm_aix_mpio_5.0
vioserver# installp -aXd Ontap.mpio_attach_kit Ontap.mpio_attach_kit
```

-----+ Pre-installation Verification... +-----Verifying selections...done Verifying requisites...done Results... SUCCESSES Filesets listed in this section passed pre-installation verification and will be installed. Selected Filesets # Network Appliance MPIO PCM K... Ontap.mpio_attach_kit.config 5.0.0.0 Ontap.mpio attach kit.fcp 5.0.0.0 # Network Appliance MPIO PCM K... Ontap.mpio_attach_kit.iscsi 5.0.0.0# Network Appliance MPIO PCM K...Ontap.mpio_attach_kit.pcmodm 5.0.0.0# Network Appliance MPIO PCM K... << End of Success Section >> FILESET STATISTICS -----4 Selected to be installed, of which: 4 Passed pre-installation verification 4 Total to be installed 0503-409 installp: bosboot verification starting... installp: bosboot verification completed. +------Installing Software... +-----installp: APPLYING software for: Ontap.mpio attach kit.pcmodm 5.0.0.0 Ontap.mpio_attach_kit.iscsi 5.0.0.0 Ontap.mpio attach kit.fcp 5.0.0.0 Ontap.mpio attach kit.config 5.0.0.0 << Copyright notice for Ontap.mpio_attach_kit >> (C) Copyright NetApp, Inc. 2003-2009. All rights reserved. << End of copyright notice for Ontap.mpio attach kit >>. . . Finished processing all filesets. (Total time: 6 secs).

```
0503-409 installp: bosboot verification starting...
installp: bosboot verification completed.
0503-408 installp: bosboot process starting...
bosboot: Boot image is 30522 512 byte blocks.
0503-292 This update will not fully take effect until after a
      system reboot.
* * * ATTENTION * * *
   System boot image has been updated. You should reboot the
   system as soon as possible to properly integrate the changes
and to avoid disruption of current functionality.
installp: bosboot process completed.
+------
                        Summaries:
-----+
Installation Summary
-----
                    Level Part Event Result
Name
_____
                                        APPLY SUCCESS
APPLY SUCCESS
Ontap.mpio_attach_kit.pcmo 5.0.0.0USROntap.mpio_attach_kit.iscs 5.0.0.0USR
Ontap.mpio_attach_kit.fcp5.0.0.0USROntap.mpio_attach_kit.conf5.0.0.0USR
                                         APPLY
                                                   SUCCESS
                                         APPLY
                                                   SUCCESS
vioserver#
```

Verifying the HBA
initiator queue
depthBy default, the Host Utilities software sets the value of num_cmd_elems to 200 for
the HBAs and the value of queue_depth to 12 on the hdisk handles. Testing
showed that these defaults are a good starting point for the queue depths.Verify the value of the HBA initiator num_cmd_elems. and queue depth. To check
these values, use the lsattr -El command.Example: For HBA fcs0, you would enter the following command to check of

num_cmd_elems.

lsattr -El fcs0 -a num_cmd_elems
num_cmd_elems 200 Maximum number of COMMANDS to queue to the
adapter True

Uninstalling the Host Utilities software packages

Before you uninstall previous versions of software	 Before you uninstall a previous version of the software, make sure you do the following: Unmount the file systems that contain the volume groups mapped to storage system LUNs. Stop all I/O on the system and export the volume groups. Remove the existing Data ONTAP LUN handles. These procedures disconnect Data ONTAP LUNs from the host before you
Methods for uninstalling the software	You can uninstall the Host Utilities software using either SMIT or the installp command.
Uninstalling the software using SMIT	To uninstall the software using SMIT, complete the following steps.

Step	Action
1	Ensure that you are logged in as root.
2	Start SMIT by entering the following command:
	# smit

Step	Action			
3	At the screen that appears, select the "Software Installation and Maintenance" menu option. Example: When you start SMIT, it displays the following screen. On this screen, the "Software Installation and Maintenance" option is the first menu option.			
	++ root> # smit System Management			
	Move cursor to desired item and press Enter.			
	Software Installation and Maintenance Software License Management Devices System Storage Management (Physical & Logical Storage) Security & Users			
	Communications Applications and Services Print Spooling Problem Determination Performance & Resource Scheduling			
System Environments Processes & Subsystems Applications Cluster System Management				
	Using SMIT (information only)			
	F1=Help F2=Refresh F3=Cancel Esc+8=Image			
	Esc+9=Shell Esc+0=Exit Enter=Do			

Step	Action				
4	At the screen that appears, select the Software Maintenance and Utilities menu option.				
	Example: The following is an example of the Software Installation and Maintenance screen.				
	+Software Installation and Maintenance				
	Move cursor to desired item and press Enter.				
	Install and Update Software List Software and Related Information Software Maintenance and Utilities Network Installation Management System Backup Manager				
	F1=Help F2=Refresh F3=Cancel Esc+8=Image				
	Esc+9=Shell +	Esc+0=Exit	Enter=Do		

Step	Action				
5	At the next screen, select the Remove Installed Software menu option.				
	Example: The following is an example of the Software Maintenance and Utilities screen.				
	++				
	Software Maintenance and Utilities				
	Move cursor to desired item and press Enter.				
	Commit Applied Software Updates (Remove Saved Files) Reject Applied Software Updates (Use Previous Version) Remove Installed Software				
	Copy Software to Hard Disk for Future Installation Check Software File Sizes After Installation Verify Software Installation and Requisites Clean Up After Failed or Interrupted Installation				
	F1=HelpF2=RefreshF3=CancelEsc+8=ImageEsc+9=ShellEsc+0=ExitEnter=Do+				

Step	Action			
6	Remove the software in one of the following ways:			
	• Enter the packa sure that the "P	ge name (either Ontap.mpio_atta review only" option is set to no.)	ach_kit or Ontap.veritas_att	ach_kit). (Make
	• Press F4 to disp	lay a list of names.		
	If you use F4, complete the following steps:			
	1. Press F4.			
	2. Scroll down the	list of names until you reach the	e name for the host Utilities	package.
	3. Select that name	e and press Enter.		
	4. At the prompt a uninstall.	sking whether you want to conti	nue or cancel, press Enter to	o complete the
	are removing the Host Utilities software package for environments using MPIO for multipathing. Note By default PREVIEW only? is set to yes. You must change it to no if you want to uninstall.			for to uninstall.
	++ Remove Installed Software			
	Type or select va Press Enter AFTEF	alues in entry fields. R making all desired change	s.	
			[Entry Fie	lds]
	* SOFTWARE name		[Ontap.mpio_attac	ch_kit.config
	Ontap.mpio_attach	n_kit.fcp Ontap.mpio_attach	_Ontap.mpio_attach_kit_	> +
	PREVIEW only? (remove operation will NOT of	occur) no	+
	REMOVE depender	it software?	no	+
	DETAILED output	?	no no	++
	1			
	ri=Heip Faci5-Pecot	F2=Keiresn	F3=Cancel	F4=L1St
	Egg+8-Image	ESC+0=COllinatio	TPC-1-DUIC	
	Esc+9=Shell	Esc+0=Exit	Enter=Do	
	+			+

)	Action				
	Example of successful uninstall: The following output appears when you successfully uninstall the software for an MPIO environment.				
	Command: running stdout: ye Before command completion, additi 0503-409 installp: bosboot verif installp: bosboot verification c	s onal instruc ication star completed.	stderr: no ctions may cting	o appear belo	м.
	+ Deinstalling Software				
	<pre>+</pre>				
	installp: bosboot process completed.				
	S	ummaries:			т
	++ Installation Summary				+
	Name Level	. I	Part	Event	Result
	Ontap.mpio_attach_kit.confi 5.0.0 OOntap.mpio_attach_kit.fcp 5.0.0. Ontap.mpio_attach_kit.iscsi 5.0.0 Ontap.mpio_attach_kit.pcmod 5.0.0	0 T 0 U 0 T 0 T	JSR JSR JSR JSR	DEINSTALL DEINSTALL DEINSTALL DEINSTALL	SUCCESS SUCCESS SUCCESS SUCCESS

Step	Action	
7	You must reboot your system for the changes to take effect.	
	Note If you do not reboot your system, the changes will not take effect.	

Using a command
line to uninstall the
softwareYou can use a command line to uninstall this software if you prefer. You must be
logged on as root to do this. To uninstall the host settings software fromSoftware◆ Native OS and PowerVM environments running MPIO, enter the command

 Native OS and PowerVM environments running MPIO, enter the command line:

installp -u Ontap.mpio*

• Veritas environments, enter the command line:

installp -u Ontap.san*

To uninstall the SAN Toolkit software, enter the command line:

installp -u Ontap.SAN_toolkit*

About this chapter	If you are using Veritas Storage Foundation for multipathing, you must install and configure the Symantec Array Support Library (ASL) and Array Policy Module (APM). This chapter describes how to install and configure the ASL and APM and how these components affect multipathing and failover.			
	Note ————————————————————————————————————			
	With Veritas Storage Foundation 5.0 or 4.0 with MP4, you must install both the ASL and the APM.			
Topics in this	This chapter discusses the following topics:			
chapter	 "Overview of the Array Support Library and Array Policy Module" on page 46 			
	 "Installing the ASL and APM" on page 48 			
	• "Uninstalling the ASL and the APM" on page 53			
	 "Obtaining multipathing information" on page 58 			
	 "Optimizing the Veritas DMP Restore Daemon" on page 60 			
	 "Understanding ASL error message types" on page 62 			

Overview of the Array Support Library and Array Policy Module

What the Array Support Library is	The Array Support Library (ASL) is a Data ONTAP-qualified library that provides information about storage array attribute configuration to the Device Discovery Layer (DDL).
	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. The ASL in turn "claims" a device based on vendor and product identifiers. The claim associates the storage array model and product identifiers with the device.
	You can add or remove ASLs from a running VxVM system. You do not need to reboot the host.
	Note
	In a Veritas Storage Foundation RAC cluster, you must stop clustering on a node before you remove the ASL.
Using storage with the ASL	You cannot use storage systems simultaneously as Just a Bunch of Disks (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 excludearray command.
	By using the ASL, you obtain the following information about the LUNs:
	• Enclosure name. VxVM's enclosure-based naming feature creates disk names based on the name of its enclosure, or disk array, and not a raw device name.
	• Array Type. The storage systems are accessed as an A/A-NETAPP disk array. All primary (active) paths can be used for I/O concurrently. When all primary paths to a LUN are unavailable in a clustered storage configuration, the secondary (standby) paths are used.

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.
What the Array Policy Module is	The Array Policy Module (APM) is a kernel module that defines I/O error handling, failover path selection, and other failover behavior for a specific array. The APM is customized to optimize I/O error handling and failover path selection for the N-series environment. When the ASL detects the N-series storage array, it sets the array type to A/A-NETAPP. This instructs Veritas software to use the APM to handle I/O and path failures for the storage array.

Installation overview	 Installing the ASL and APM involves the following tasks: Verifying that your configuration meets system requirements. To locate information on system requirements, see "Where to go for more information" on page 17. Determining the ASL version if it is currently installed. Obtaining the ASL and the APM. Installing the ASL and APM. If you currently have the ASL installed, use the Veritas vxddladm listversion command to determine its version.			
Determining the ASL version				
	command	s output from the vxdd.	ladm listversion	
	# vxddladm listversion			
	LIB_NAME	ASL_VERSION	Min. VXVM version	
	libvxshark.so	vm-5.0-rev-1	5.0	
	libvxcscovrts.so	vm-5.0-rev-1	5.0	
	libvxhitachi.so	vm-5.0-rev-1	5.0	
	libvxibmds6k.so	vm-5.0-rev-1	5.0	
	libvxvpath.so	vm-5.0-rev-1	5.0	
	libvxxp256.so	vm-5.0-rev-1	5.0	
	libvxibmds4k.so	vm-5.0-rev-2	5.0	
	libvxemc.so	vm-5.0-rev-2	5.0	
	libvxCLARiiON.so	vm-5.0-rev-1	5.0	
	libvxhds.so	vm-5.0-rev-1	5.0	
	libvxhdsalua.so	vm-5.0-rev-1	5.0	
	libvxhds9980.so	vm-5.0-rev-1	5.0	
	libvxibmds8k.so	vm-5.0-rev-1	5.0	
	libvxpurple.so	vm-5.0-rev-1	5.0	
	libvxhdsusp.so	vm-5.0-rev-2	5.0	
	libvxhpalua.so	vm-5.0-rev-1	5.0	
	libvxibmsvc.so	vm-5.0-rev-1	5.0	
	libvxvscsi.so	vm-4.0-rev-1	5.0	
	libvxnetapp.so #	vm-5.0-rev-1	5.0	

Obtaining the ASL and APM	 The ASL and APM are not distributed with the Host Utilities. You obtain the ASL and APM from the Symantec web site. Veritas Storage Foundation 4.0 with MP3: The APM is distributed as a point patch to Volume Manager 4.0.3.3 (Point-Patch_3) so you only need to install the ASL software once you have VxVM installed.
	 Veritas Storage Foundation 5.0 and Veritas Storage Foundation 4.0 with MP4: the ASL download file contains the software packages for both the ASL and the APM. You must extract these software packages and then install each one separately.
	Note Before you begin, make sure you obtain the ASL TechNote, which you can review at the Symantec Web site. The TechNote contains Symantec's instructions for installing the ASL
Upgrading the ASL and APM when running Storage Foundation 5.0	If you are using Veritas Storage Foundation 5.0, you need to install the ASL and the APM. If you already have these installed from an earlier version, you must first remove them. For more information on uninstalling the ASL, see "Uninstalling the ASL and the APM" on page 53.

Installing the ASL To install the ASL and APM, complete the following steps. and APM

Step	Action
1	Make sure you are logged into the host as the root user.
2	If you have VxVM installed, stop all applications using VxVM volumes. Make sure that there are no VxVM volumes open, mounted, or in use.

Step	Action
3	For each host HBA (fscsiX), enable the AIX FastFail feature.
	Note Enabling the FastFail feature is a requirement when you Veritas Storage Foundation. The FastFail feature improves I/O failover handling in the N-series environment.
	Example:
	chdev -l fscsi0 -a fc_err_recov=fast_fail -P chdev -l fscsi1 -a fc_err_recov=fast_fail -P
4	For each host HBA (fscsiX), enable Dynamic Tracking.
	Example:
	chdev -l fscsi0 -a dyntrk=yes -P chdev -l fscsi1 -a dyntrk=yes -P
5	Install the ASL according to the directions provided in the ASL TechNote on the Symantec Web site.
	Note
	if you have Veritas Storage Foundation 5.0 or 4.0 with MP4, you must also install the APM.
6	If you have Veritas Storage Foundation 4.0 with MP3, install the Volume Manager point patch that contains the APM. Use the procedures documented in the README file that ships with the point patch.
	If you have Veritas Storage Foundation 5.0 or 4.0 with MP4, skip this step.
7	Reboot the host.
	Note If you do not reboot the host, the changes will not take effect.

Step	Action		
8	Verify that FastFail and Dynamic Tracking are enabled by entering the following command for each HBA:		
	lsattr -El fscsiX		
	X is the controller/HBA	ID.	
	Output Example: The value=yes) and the FastF	following output indicates that Dynamic Tracki ail feature is enabled (fc_err_recov=fast_fail):	ng is on (dyntrk
	attach switch dyntrk yes fc_err_recov fast_fa: scsi_id 0x10400 sw_fc_class 3	How this adapter is CONNECTED Dynamic Tracking of FC Devices il FC Fabric Event Error RECOVERY Policy Adapter SCSI ID FC Class for Fabric	False True True False True
9	Verify that the ASL is in vxddladm listsupport	stalled by entering the following command.	
	Result: The libyxnetap	o.so library is listed in the command output. See	the example below:
	# vxddladm listsuppo: LIBNAME	rt VID	
	libvxshark.so		
	libvxcscovrts.so	CSCOVRTS	
	libvxhitachi.so	HITACHI	
	libvxibmds6k.so	IBM	
	libvxvpath.so	IBM	
	libvxxp256.so	HP	
	libvxiDmas4k.so	IBM IBM	
	libyyhdsusp so	нттаснт	
	libvxhds.so	HITACHI	
	libvxhdsalua.so	HITACHI	
	libvxhds9980.so	HITACHI	
	libvxibmds8k.so	IBM	
	libvxpurple.so	SUN	
	libvxCLARiiON.so	DGC	
	libvxhpalua.so	HP, COMPAQ	
	LIDVXIDMSVC.SO	TRW	
	libyxnetapp so	ALA NETAPP	
	TTDATHECaph. 20	METALL	

Step	Action				
10	Enter the vxdmpadm	listapm all command	to verify that th	e APM is installed.	
	Result: The output of have not yet been det example below.	displays the Array Type ected by the host, the st	as A/A-NETAF ate of the APM	PP. If the storage contribution is Not-Active. See th	roller disks e output
	Module Name	APM Name	APM Version	Array Types	State
	======================================	dmpaa	1	A/A	Active
	dmpap	dmpap	1	A/P	Active
	dmpap	dmpap	1	A/P-C	Active
	dmpapf	dmpapf	1	A/PF-VERITAS	Not-Active
	dmpapf	dmpapf	1	A/PF-T3PLUS	Not-Active
	dmpapg	dmpapg	1	A/PG	Not-Active
	dmpapg	dmpapg	1	A/PG-C	Not-Active
	dmpjbod	dmpjbod	1	Disk	Active
	dmpjbod	dmpjbod	1	APdisk	Active
	dmpnetapp	dmpnetapp	1	A/A-NETAPP	Not-Active
	dmpsvc	dmpsvc	1	A/A-IBMSVC	Not-Active

Next steps

After you install the ASL and APM, complete the following procedures:

- If you have Data ONTAP 7.2 or later, you should change the cfmode setting of your active/active configuration to single image and then reconfigure your host to discover the new paths to the disk.
- On the storage system, create LUNs and map them to igroups containing the WWPNs of the host HBAs. See "Creating and mapping igroups and LUNs" on page 66.
- On the host, discover the new LUNs and configure them to be managed by VxVM. See "Discovering LUNs on a host using VxVM and DMP" on page 72.

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 and APM support. This is also true for arrays or disks in the OTHER_DISKS category. OTHER_DISKS are local non-FC-attached disks. Volumes created on these arrays remain accessible because they do not have multiple paths.

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 and the APM, complete the following steps. and APM

Step	Action
1	Ensure that you are logged in as root.
2	Stop all I/O to the LUNs.
	Note In a Veritas Storage Foundation RAC cluster, you must also stop clustering on a node before you remove the ASL.
3	Use either SMIT or the command line to remove the ASL package.
	For more information on removing the ASL, see the appropriate Veritas documentation.
4	Use either SMIT or the command line to remove the APM package.
	For more information on removing the APM, see the appropriate Veritas documentation.
	Note For Veritas Storage Foundation 4.0, please contact Symantec for instructions on removing the APM

ASL and APM examples	If you are using Veritas Storage Foundation 5.0, you need to install the ASL and the APM. If you already have these installed, you must first remove them.
	This section contains examples that show how you remove the ASL and APM and then how you install the new version of these components. The examples assume you have already gotten the software packages from Symantec.

Uninstalling the
ASL and the APMThe following is a sample uninstall of the ASL and the APM. If you were
actually doing this, your output would vary slightly based on your system setup.

#-> lslpp -l VRTSNTAPapm Fileset	VRTSNTAPasl Level	State	Description
Path: /usr/lib/obirepos			
VRTSNTAPapm	5.0.0.0	COMMITTED	Veritas NetApp Array Policy Module
VRTSNTAPasl	5.0.3.0	COMMITTED	VERITAS NetApp Array Support Library (1.0)
Path: /etc/objrepos			
VRTSNTAPapm	5.0.0.0	COMMITTED	Veritas NetApp Array Policy Module
VRTSNTAPasl	5.0.3.0	COMMITTED	VERITAS NetApp Array Support Library (1.0)
#-> installp -u VRTSNTAPa	pm VRTSNTAPa	sl	
+Pre-de	einstall Ver	ification	+
+ Verifying selectionsdo Verifying requisitesdo Results SUCCESSES	ne ne		+
Filesets listed in this and will be removed.	section pas	sed pre-dei	nstall verification

```
Selected Filesets
 -----
                              # Veritas NetApp Array Policy ...
 VRTSNTAPapm 5.0.0.0
 VRTSNTAPasl 5.0.3.0
                              # VERITAS NetApp Array Support...
 << End of Success Section >>
FILESET STATISTICS
2 Selected to be deinstalled, of which:
    2 Passed pre-deinstall verification
 ----
  2 Total to be deinstalled
+------
                 Deinstalling Software...
+------
installp: DEINSTALLING software for:
    VRTSNTAPapm 5.0.0.0
Check if Module is loaded
Unloading the Module
Module is busy: Cannot remove the package
 WARNING: deinstal: Problem executing ./VRTSNTAPapm.unconfig d.
     Continuing...
Filesets processed: 1 of 2 (Total time: 2 secs).
installp: DEINSTALLING software for:
     VRTSNTAPasl 5.0.3.0
Unloading the library
Finished processing all filesets. (Total time: 3 secs).
+------
                     Summaries:
+------
Installation Summary
-----
Name
                  Level Part Event Result
_____
                  5.0.0.0
                           ROOT
                                   DEINSTALL SUCCESS
VRTSNTAPapm
VRTSNTAPapm
                  5.0.0.0
                            USR
                                    DEINSTALL SUCCESS
                                  DEINSTALL SUCCESS
                            ROOT
VRTSNTAPasl
                  5.0.3.0
VRTSNTAPasl
                  5.0.3.0
                            USR
                                    DEINSTALL SUCCESS
```

Installing the ASL and the APM The following is a sample installation of the ASL and the APM when you have Veritas Storage Foundation 5.0. If you were actually doing this, your output would vary slightly based on your system setup.

```
#-> installp -aXYd . VRTSNTAPapm VRTSNTAPasl
+-----
             Pre-installation Verification...
+-----
Verifying selections...done
Verifying requisites...done
Results...
SUCCESSES
_ _ _ _ _ _ _ _ _ _
 Filesets listed in this section passed pre-installation verification
 and will be installed.
 Selected Filesets
 -----
 VRTSNTAPapm 5.0.0.0
                             # Veritas NetApp Array Policy ...
 VRTSNTAPasl 5.0.3.0
                             # VERITAS NetApp Array Support...
 << End of Success Section >>
+------
           BUILDDATE Verification ...
+-----
Verifying build dates...done
FILESET STATISTICS
_____
  2 Selected to be installed, of which:
     2 Passed pre-installation verification
  2 Total to be installed
+------
                Installing Software...
+-----
installp: APPLYING software for:
    VRTSNTAPasl 5.0.3.0
. . . . . << Copyright notice for VRTSNTAPasl >> . . . . . . .
Copyright ? 1990-2006 Symantec Corporation. All rights reserved.
```
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Chapter 3: Veritas: Installing the ASL and APM

Information provided by the ASL		For ONTAP storage systems, the ASL reports the array type as A/A-NETAPP to the device discovery layer (DDL). All primary (active) paths can used for I/O concurrently. When all primary paths to a LUN are unavailable in a clustered storage configuration, the secondary (standby) paths are used.	
		For additional information, see the following documents:	
		• Veritas Array Support Library Developer's Guide for details about load balancing.	
		• Veritas Volume Manager Administrator's Guide for details about system management.	
How the storage system's FC failover mode corresponds to array types		The ASL also supports direct attached, non-clustered configurations, including NearStore models. These configurations have no cfmode settings. ASL reports these configurations as Active/Active (A/A) array types. For more details about array types, see the <i>Veritas Array Support Library Developer's Guide</i> .	
How sanlun displays the array type		The Host Utilities SAN Toolkit includes the sanlun utility in the /opt/ontap/santools/bin directory. You use the sanlun utility to display information about paths to LUNs on the storage system. When the ASL is installed and the LUN is controlled by VxVM, the output of the sanlun command displays the Multipath_Policy as A/A-NETAPP.	
Using VxVM to display available paths		To obtain information about available paths to a LUN using VxVM, complete the following steps.	
Step	Action		
1	Enter the follow	wing command to view all devices:	
	vxdisk list		
	Result: The V status. It also sl	'xVM management interface displays the vxdisk device, type, disk, group and hows which disks are managed by VxVM.	

Step	Action	
2	2 On the host console, enter the following command to display path information for the device yo want:	
	vxdmpadm getsubpaths dmpnodename= <device> where <device> is the name listed under the output of the vxdisk list command.</device></device>	
3	Enter the following command to obtain path information for a host HBA:	
	vxdmpadm getsubpaths ctlr= <controller_name></controller_name>	
	controller_name is the controller displayed under "CTRL-NAME" in the output of the vxdmpadm getsubpaths dmpnodename command you entered in Step 2.	
	Result: The output displays information about the paths to the storage system (whether the path is a primary or secondary path). The output also lists the storage system that the device is mapped to.	

Using sanlun to	To obtain multipathing information by using the sanlun command, complete
obtain multipathing	the following step.
information	

Step	Action
1	On the host command line, enter the following command:
	sanlun lun show -p all
	Result: sanlun displays path information for each LUN. For LUNs managed by VxVM, the output displays the Veritas multipathing policy (A/A-NETAPP) and the path I/O policy.

The Veritas DMP restore daemon requirements	You should set the restore policy of the Veritas DMP restore daemon and specify a polling interval based on the recommended values. These settings determine the frequency that the Veritas daemon checks paths between the host and the storage system. By default, the restore daemon checks disabled paths every 300 seconds.
Setting the restore daemon interval	You must set the restore daemon interval value to 60 seconds. Doing this improves I/O failover handling.

To set the vxrestore daemon, complete the following steps.

Step	Action
1	Stop the restore daemon.
	/usr/sbin/vxdmpadm stop restore
2	Change the restore daemon setting to 60.
	/usr/sbin/vxdmpadm start restore policy=check_disabled interval=60
	Note
	This step reconfigures and restarts the restore daemon without the need for an immediate reboot.

Step	Action		
3	Veritas Storage Foundation 5.0 MP1 and earlier: If you are using one of these versions of Veritas Storage Foundation, perform these steps to ensure that new restore daemon interval persists across reboots.		
	 Edit the /etc/init.d/vxvm-sysboot file to set the interval to 60 seconds. restore_daemon_opts="interval=60 policy=check_disabled" By default, the restore daemon options are: restore_daemon_opts="interval=300 policy=check_disabled" Save and exit the /etc/init d/vxvm-sysboot file 		
	For Veritas Storage Foundation 5.0 MP3: Enter the following command to change the restore daemon interval to 60 seconds: vxdmpadm settune dmp_restore_interval=60 When you use the vxdmadm command to make the change, it persists across reboots.		
4	Verify the changes. /usr/sbin/vxdmpadm stat restored Result: The command output shows the status of the vxrestore daemon, as shown by the output example below: The number of daemons running : 1 The interval of daemon: 60 The policy of daemon: check_disabled		

Understanding The ASL v	vorks silently and seamlessly with the VxVM DDL. If an error,
error message misconfig	ration, or malfunction occurs, messages from the library are logged to
severity the console and definit	e using the host's logging facility. The following table lists the severity ion of these messages.

If have a problem or don't understand the error message, call Symantec Technical Support for help.

Message severity	Definition
Error	Indicates that an ERROR status is being returned from the ASL to the VxVM DDL that prevents the device (LUN) from being used. The device might still appear in vxdisk list, but it is not usable.
Warning	Indicates that an UNCLAIMED status is being returned. Unless claimed by a subsequent ASL, dynamic multipathing is disabled. No error is being returned but the device (LUN) might not function as expected.
Info	Indicates that a CLAIMED status is being returned. The device functions normally with DMP enabled, but the results seen by the user might not be what is expected. For example, the enclosure name might change.

About this chapter This chapter provides a high level look at the tasks involved in creating and working with LUNs. It provides pointers to chapters containing instructions on configuring and managing LUNs that are specific to one AIX environment (Veritas, Native OS, or PowerVM).

Topics in this chapter

This chapter provides information on the following topics:

- "Overview of LUN configuration and management" on page 64
- "Creating and mapping igroups and LUNs" on page 66
- "High level methods for discovering LUNs" on page 68

Overview of LUN configuration and management

Task overviewLUN configuration and management is involves a number of tasks. The
following table summarizes the tasks for all the supported AIX environments. If a
task does not apply to all environments, then the table specifies which
environments it does apply to. You only need perform the tasks that are specific
to your environment.

Task	Discussion	Additional information
 Create, configure, 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 and configure LUNs on the storage system and map the LUNs to the igroup.	For complete information, refer to your version of the <i>Data</i> <i>ONTAP® Block Access</i> <i>Management Guide for ISCSI and</i> <i>FCP.</i>
2. Native OS, PowerVM environments: Enable ALUA	If you are using Data ONTAP 7.2 or later, you must have ALUA set up to work with igroups. To see if ALUA is set up for your igroup, use the igroup show -v command.	Refer to "Check the ALUA settings on the storage system" on page 107.
3. Discover and configure LUNs	 You can discover LUNs using the following commands: Veritas: cfgmgr followed by vxdctl enable Native OS cfgmgr PowerVM cfgdev 	Refer to "High level methods for discovering LUNs" on page 68 for an overview of these tasks.

Task	Discussion	Additional information
4. (Optional) Create volume groups and file systems	You can create volume groups and file systems using the Veritas or AIX tools that you normally use for these tasks.	Veritas environments: Refer to "Working with LUNs and VxVM volumes" on page 74. Native OS environments: Refer to "(Native OS only) Creating volume groups and file systems" on page 88.
5. Display information about the LUNs and the HBAs	You can use the sanlun utility to display information about the LUNs and the HBAs.	Refer to "Using sanlun to Display LUN, HBA Information" on page 93.

Tasks needed to create and map LUNs	Before you can complete the configuration, you must perform the following tasks:Create an igroup.	
	Note If you have an active/active configuration, you must create a separate igroup on each system in the configuration.	
	• Create one or more LUNs and map the LUNs to an igroup.	
Methods for creating igroups	 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.	
	For detailed information about creating and managing LUNs, see the <i>Data</i> ONTAP® Block Access Management Guide for iSCSI and FCP.	
Best practices for creating igroups	 As you create the igroups and LUNs, keep the following best practices in mind: Disable scheduled snapshots. 	
and LUNs	 Each igroup should map to an application and should include all the initiators used by the application to access its data. (Multiple applications may be using the same initiators.) 	
	 Do not put LUNs in the storage system's root volume. The default root volume is /vol/vol0. 	
	• Ensure that the LUNs are at the root of a qtree in a volume.	
	• Enable space reservations on the LUNs you create.	
	• If you have an active/active configuration, use different LUN IDs on each storage system in the configuration.	

Discovering LUNs on the host	The next task you must complete involves discovering the LUNs. LUN discovery procedures vary depending on your multipathing requirements and the software you use.			
	• Veritas environments: If your configuration uses DMP, refer to refer to "Discovering LUNs on a host using VxVM and DMP" on page 72.			
	Note Before you configure LUNs to be managed by VxVM, make sure you installed the ASL and APM according to the procedures in "Veritas: Installing the ASL and APM" on page 45.			
	• Native OS environments: If your configuration has no multipathing requirements, refer to "Discovering LUNs with native AIX LVM (no multipathing)" on page 78.			
	• Native OS environments: If your configuration includes multipathing, refer to "(Native OS only) Discovering LUNs with MPIO software" on page 80			
	• Native OS, PowerVM environments: If you have a VIO server, refer to "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83.			
	 Native OS environments: If you are unsure of your configuration and software, refer to "(Native OS only) Creating volume groups and file systems" on page 88. 			
Utility for displaying information	The sanlun utility, which is included in the Host Utilities, provides information about paths to your devices and how they map to LUNs on the storage system. It also displays information about the host HBAs.			
	For more information, see:			
	"Using sanlun to display LUN information" on page 94			
	• Using samue to display nost HBA information on page 99			
Additional tasks	Once you've set up your LUNs, you may want to configure the new storage. For example, you can create a new volume group, add the hdisk to an existing volume group, create logical volume groups, or create file systems. You can also configure data access (raw, jfs, or jfs2 file system).			

Commands for discovering and	The commands you use to discover and configure LUNs on the host depend on your system environment:				
configuring LUNs	 Native OS environments without multipathing using Native AIX Logical Volume Manager (LVM) 				
	 Veritas environments using VxVM and DMP 				
	Native OS with MPIO				
	 Native OS with VIO servers and MPIO 				
Discovering LUNs	To configure LUNs using native AIX LVM:				
with native AIX LVM (no multipathing)	1. Use cfgmgr to get the host to discover the new LUNs.				
	Note				
	If you have a VIO server, you must use the cfgdev command instead of the cfgmgr command.				
	Refer to "Discovering LUNs with native AIX LVM (no multipathing)" on page 78 for additional information.				
Configuring LUNs	To configure LUNs using VxVM and DMP:				
with Veritas software (DMP	1. Use cfgmgr to get the host to discover the new LUNs.				
multipathing)	2. Use vxdctl enable to allow VxVM to recognize AIX hdisks.				
	3. Use VxVM tools (VEA, vxdiskadm, CLI) or smit to add disks to the VxVM disk group and initialize them for use by VxVM.				
	4. Use VxVM tools (VEA, CLI) or smit to create a volume				
	5. Use VxVM tools (VEA,CLI) or smit to configure data access (raw or file system)				
	Refer to "Discovering LUNs on a host using VxVM and DMP" on page 72 for additional information.				

Non-PowerVM hosts: configuring LUNs with native AIX LVM (MPIO multipathing)

To configure LUNs using native AIX LVM with MPIO on hosts that are not running PowerVM:

1. Use cfgmgr to get the host to discover the new LUNs.

Note -

If you have a VIO server, you must use the cfgdev command instead of the cfgmgr command.

- **2.** After the command completes, use the lsdev command to verify that the hdisk MPIO devices were created.
- 3. Use the lsattr -El hdisk2 command to check the system setup.
- **4.** If you are using Data ONTAP 7.2 or later with ALUA enabled, ALUA automatically sets the path priorities. If you are not using ALUA, you must run the dotpaths utility on all the disks to order and prioritize the paths to the storage system.
- 5. Run the sanlun lun show -p command.

Refer to "(Native OS only) Discovering LUNs with MPIO software" on page 80 for additional information.

VIO servers: configuring LUNs with native AIX LVM (MPIO multipathing)

While the steps for working with LUNs on VIO servers are similar to those on hosts using MPIO without PowerVM, some of the commands are different. This is because VIO servers use the padmin login instead of a root login.

To configure LUNs using native AIX LVM with MPIO on VIO servers, you need to change some of the commands you use:

- 1. Use cfgdev to get the host to discover the new LUNs.
- 2. After the command completes, use the lsdev command to verify that the hdisk MPIO devices were created.
- 3. Use the lsdev -dev hdisk2 -attr command to check the system setup.
- 4. Run the oem_setup_env command. This changes the mode to allow you to run Host Utilities tools such as dotpaths and sanlun.
- 5. If you are using Data ONTAP 7.2 or later with ALUA enabled, ALUA automatically sets the path priorities. If you are not using ALUA, you must run the dotpaths utility on all the disks to order and prioritize the paths to the storage system.

- 6. Run the sanlun lun show -p command (you must run the oem_setup_env command before the sanlun command).
- 7. Halt the oem_setup_env command mode by entering a command such as exit.
- **8.** Configure the new storage as desired. For example, you can create virtual disks, create a new volume group, add the hdisk to an existing volume group, create logical volume groups, or create file systems.

Refer to "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83 for additional information.

About this chapter	This chapter describes how to enable a host running Veritas Storage Foundation to discover LUNs on the storage system. It also describes how to manage LUNs on hosts utilizing Veritas and the Veritas Volume Manager (VxVM).			
	Note For general information on working with LUNs, see "Basic Tasks for Working with LUNs" on page 63.			
Topics in this chapter	 This chapter discusses the following topics: "Discovering LUNs on a host using VxVM and DMP" on page 72 "Working with LUNs and VxVM volumes" on page 74 			

Discovering LUNs on a host using VxVM and DMP

Discovering the new LUNs

To get the host and VxVM to discover the new LUNs, complete the following steps.

Note ----

Step	Action					
1	Log in as root on the	Log in as root on the host.				
2	Execute the cfgmgr	command on t	he AIX host to disco	over the newly created	l LUNs:	
	# cfgmgr					
	Result: The cfgmgr command causes initiators to log into the fabric, the system to check for new devices, and the system to create new device entries.					
3	Enter lsdev -Cc disk to verify that the host has discovered the LUNs.					
4	Enter vxdctl enabl	e to enable V	VM to recognize ea	ich known hdisk.		
	Result: The vxdctl utility recognizes and assigns names to LUNs on the storage system.					
5	Verify that the ASL has detected the new devices by entering the vxdmpadm listenclosure all command. In the output, verify that the model names of your storage systems are listed as the ENCLR_NAME and ENCLR_TYPE. Verify that the ARRAY_TYPE is A/A-NETAPP.					
	Example: The vxdmpadm listenclosure all command displays the following output.					
	vxdmpadm listenc] ENCLR_NAME	losure all ENCLR_TYPE	ENCLR_SNO	STATUS	ARRAY_TYPE	
	Disk	Disk	DISKS	CONNECTEI	Disk	
	F9601	960 960	1024916 1024915	CONNECTED CONNECTED	a/a-netapp A/A-netapp	

Step	Action						
6	Enter the vxdmpadm listapm all command to verify that the APM is active.						
	Output example: The following output example shows that the APM is active.						
	Module Name	APM Name	APM Version	Array Types	State		
	dmpaa	dmpaa	1	A/A	Active		
	dmpap	dmpap	1	A/P	Active		
	dmpap	dmpap	1	A/P-C	Active		
	dmpapf	dmpapf	1	A/PF-VERITAS	Not-Active		
	dmpapf	dmpapf	1	A/PF-T3PLUS	Not-Active		
	dmpapg	dmpapg	1	A/PG	Not-Active		
	dmpapg	dmpapg	1	A/PG-C	Not-Active		
	dmpjbod	dmpjbod	1	Disk	Active		
	dmpjbod	dmpjbod	1	APdisk	Active		
	dmpnetapp	dmpnetapp	1	A/A-NETAPP	Active		
	dmpsvc	dmpsvc	1	A/A-IBMSVC	Not-Active		

Adding the disk to a disk group

Adding a disk to a disk group makes the disk space available when you create a VxVM volume. Disks that you add must be uninitialized or free. If the disk is uninitialized, you must initialize it before you add it to the group.

Adding a disk to a disk group involves specifying how you want to configure the disks. Be sure to have answers to the following questions before you begin:

- Are you adding single or multiple disks?
- Do you want to add disks associated with a specific controller or target?
- Which disks do you want to add?
- Do you want to add the disk to a free disk pool?
- To which disk group will you add the disk?

There are several methods for adding a disk to a disk group. Complete the steps for the method you prefer. Refer to Veritas documentation for additional information.

Method	Action
VEA	1. Select the disk to add or the disk group to expand.
	2. Select Actions and Add Disk to Dynamic Disk Group.
	3. Indicate the disk group that you want.
	4. Indicate the disks you want to add.
vxdiskadm	1. Enter the vxdiskadm command to activate the vxdiskadm interface.
	2. Select option 1 Add or initialize one or more disks and follow screen directions.
CLI	• To configure private and public regions on a VxVM disk, enter the vxdisksestup command.
	• To add one or more disks to a disk group, enter vxdg addisk.
SMIT	Enter smit vxvmdiskadmadd to add disks using smit

Creating a volume Veritas volumes span data across multiple disks. Creating a volume with VxVM involves selecting the disk group and disks and also specifying the volume layout.

Complete the steps for the method you prefer. Refer to Veritas documentation for additional information.

Method	Action		
VEA	1. Expand the disk group and select the disk group you want.		
	2. Select Actions and New Volume.		
	3. Specify the volume characteristics that meet your requirements.		
CLI	• Enter the following:		
	vxassist -g diskgroup make volume_name length attributes		
	• To add one or more disks to a disk group, enter vxdg addisk.		
SMIT	1. Enter smit vxvm.		
	2. Select VxVM Volumes.		
	3. Select Add a VxVM Volume.		
	4. Select the layout that meets your requirements.		
	5. Select the volume characteristics.		

Access storage on
the Veritas volumeYou can access storage on a Veritas Volume using a raw Veritas volume or a
Veritas File System (VxFS). You cannot configure a volume for both raw and
VxFS access.

Complete the steps for the method you prefer. Refer to Veritas documentation for additional information.

Method	Action	
VEA	1. Select the volume that will contain the file system.	
	2. Specify Actions, File System, and New File System.	
	3. Specify the file system requirements.	

Method	Action	
CLI	 To create the file system, enter: mkfs -V vxfs /dev/vx/rdsk/diskgroup/volume To mount the file system, enter: mount -V vxfs /dev/vx/dsk/diskgroup/volume mount_point 	
smit	Enter the smit crvxfslvstd command.	

Increasing the size
of a LUNIf you are using Veritas Storage Foundation 5.0, you can use Dynamic LUN
Expansion (DLE) to increase the size of the LUN. You can use the vxdisk
resize command to automatically update the disk information.

On the storage system, you must run the lun resize command.

The only requirement for the DLE operation is that the disk group have at least two disks. This is because the DLE operation temporarily removes the disk from the disk group. It is not possible to remove the last disk from the disk group, so the operation fails if there is only one disk group.

For more information on DLE, see the Veritas documentation. For information on increasing the size of LUNs, see the *Data ONTAP*® *Block Access Management Guide for iSCSI and FCP.*

This chapter describes how to make LUNs visible to the host that is using a Native OS or PowerVM environment. It also describes performing tasks such as creating volume groups and file systems.			
Note For general information on working with LUNs, see "Basic Tasks for Working with LUNs" on page 63.			
 This chapter discusses the following topics: "Discovering LUNs with native AIX LVM (no multipathing)" on page 78 "(Native OS only) Discovering LUNs with MPIO software" on page 80 			
 "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83 			

• "(Native OS only) Creating volume groups and file systems" on page 88

Discovering LUNs with native AIX LVM (no multipathing)

Getting the host to discover the new LUNs

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

Note_

Step	Action		
1	Log in as root on the host.		
2	Execute the cfgmgr command on the AIX host to discover the newly created LUNs:		
	# cfgmgr		
	Result: The cfgmgr command causes the AIX system to complete the follow tasks:		
	• Log into the fabric and to check for new devices.		
	• Create new device entries.		

Step	Action					
3	Enter sanlun lun show to verify that the host has discovered the LUNs.					
	Example: This example shows typical output of sanlun lun show that for a direct-attached configuration.					
	# sanlun lun show					
	filer: lun-pathname	device filename	adapter	lun		
	systemX: /vol/aix/hostA-systemX-lun0 (209715200) GOOD	hdisk2	fcs0	200m		
	<pre>systemX: /vol/aix/hostA-systemX-lun1 (1258291200) GOOD</pre>	hdisk3	fcs0	1.2g		
	systemX: /vol/aix/hostA-systemX-lun2 (2306867200) GOOD	hdisk4	fcs0	2.1g		
	<pre>systemX: /vol/aix/hostA-systemX-lun3 (3355443200) GOOD</pre>	hdisk5	fcs0	3.1g		
	<pre>systemY: /vol/aix/hostA-systemY-lun4 (524288000) GOOD</pre>	hdisk6	fcs1	500m		
	systemY: /vol/aix/hostA-systemY-lun5 (2147483648) GOOD	hdisk7	fcs1	2g		
	<pre>systemY: /vol/aix/hostA-systemY-lun6 (1073741824) GOOD</pre>	hdisk8	fcs1	1g		
	<pre>systemY: /vol/aix/hostA-systemY-lun7 (3221225472) GOOD</pre>	hdisk9	fcs1	3g		
	systemY: /vol/aix/hostA-systemY-lun8 (4294967296) GOOD	hdisk10	fcs1	4g		

(Native OS only) Discovering LUNs with MPIO software

Getting a host using MPIO to discover the new LUNs

If you are using the Native OS environment with MPIO, you can get a host to discover the new LUNs, complete the following steps.

These steps do not apply to a host that is running PowerVM. For those steps, see "(PowerVM only) Discovering LUNs with MPIO on VIO servers" on page 83.

Note ____

Step	Action			
1	Log in as root on the host.			
2	Execute the cfgmgr command on the AIX host to discover the newly created LUNs:			
	# cfgmgr			
	Result: The cfgmgr command causes the AIX system to complete the following tasks:			
	• Log into the fabric and to check for new LUNs.			
	• Map the new LUNs as MPIO devices using the default PCM.			
3	Execute lsdev to verify that the hdisk MPIO devices were created. Write down the hdisk instance numbers to use when you perform the path configuration in Step 5.			
	Example: The following is the type of output you would see when you run this command. # lsdev -Ccdisk			
	hdiskO Available 08-08-00-5,0 16 Bit LVD SCSI Disk Drive			
	hdiski Available 08-08-00-8,0 16 Bit LVD SCSI Disk Drive hdisk2 Available 04-08-02 MPIO Ontap FCP Default PCM Disk			
	hdisk3 Available 04-08-02 MPIO Ontap FCP Default PCM Disk			
	hdisk4 Available 04-08-02 MPIO Ontap FCP Default PCM Disk			
	MAISKS AVAILADIE 04-08-02 MPIO ONCAP FCP DETAULT PCM DISK			
4	Execute the lsattr command to get information about your setup.			

Step	Action				
5	Order and prioritize the paths to the storage system LUNs.				
	• If you are running a version of Data ONTAP that supports ALUA, you must have ALUA set on the storage system. ALUA automatically sets the paths. To determine if ALUA is enabled, see "Check the ALUA settings on the storage system" on page 107.				
	• If you are not running ALUA, you must execute the dotpaths utility to set the path priorities. The dotpaths utility is installed when you install the Host Utilities.				
	If you enter dotpaths without any options, it sets the priority for all Data ONTAP LUNs.				
	This utility has the following format:				
	dotpaths [-hqv] [hdiskN]				
	You can use the command line options for the following tasks:				
	 Specify a set of disks for which you want to set the priority. When you enter a list of hdisk names, the utility sets the priority only for those disks. 				
	 Display all the priorities. Enter the -v option to enable verbose mode. 				
	• Query all or individual disk priorities. Enter the -q option to perform this task.				

Step	Action						
6	Execute th	Execute the sanlun lun show -p command to get information about your setup.					
	Example	The following	is the ty	pe of o	utput you would	d see when you run this command.	
	<pre># sanlun lun show -p ONTAP_PATH: sh3020-07:/vol/lun7 LUN: 7 LUN Size: 2g (2147483648) Host Device: hdisk9 LUN State: GOOD Controller_CF_State: Cluster Enabled Controller Partner: sh3020-08 Multipath Provider: AIX Native Multipathing Algorithm: round_robin</pre>						
	MPIO path status	Controller path type	AIX MPIO path	host HBA	Controller target HBA port	AIX MPIO path priority	
	Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled	primary secondary primary secondary primary secondary primary secondary primary secondary primary secondary primary secondary primary secondary	path0 path1 path2 path3 path4 path5 path6 path7 path8 path9 path10 path11 path12 path13 path14 path15	fcs0 fcs0 fcs1 fcs1 fcs1 fcs1 fcs2 fcs2 fcs2 fcs2 fcs3 fcs3 fcs3 fcs3	1a 1a 1b 1b 1a 1a 1b 1b 1a 1a 1b 1b 1a 1a 1b 1b 1b 1a 1a 1b 1b	255 1 255 1	

Determine which device to use as the physical volume

You must determine which device to use as the physical volume for the LVM before you create a volume group. You can use the lsdev -Cc disk command to determine which host disk device MPIO uses as the I/O access device for the LUN.

(PowerVM only) Discovering LUNs with MPIO on VIO servers

Getting a VIO server to discover the new LUNs

To get a VIO server to discover the new LUNs, complete the following steps.

Note_

Step	Action			
1	Log in to the host as padmin.			
2	Execute the cfgdev command on the AIX host to discover the newly created LUNs.			
	Result: This command causes the VIO server to complete the following tasks:			
	• Log into the fabric and to check for new LUNs.			
	• Map the new LUNs as MPIO devices using the default PCM.			
	Example: On a VIO server, use the cfgdev command to discover the LUNs.			
	vioserver\$ cfgdev			

Step	Action		
3	Enter the lsdev	-type disk co	ommand to verify that the hdisk MPIO devices were created.
	Write down the h	disk instance i	numbers for path configuration.
	Example: The f	ollowing is the	e type of output you would see when you run this command.
	vioserver\$ lsd	ev -type dis	k
	name	status	description
	hdisk0	Available	16 Bit LVD SCSI Disk Drive
	hdisk1	Available	16 Bit LVD SCSI Disk Drive
	hdisk2	Available	MPIO Ontap FCP Default PCM Disk
	hdisk3	Available	MPIO Ontap FCP Default PCM Disk
	hdisk4	Available	MPIO Ontap FCP Default PCM Disk
	hdisk5	Available	MPIO Ontap FCP Default PCM Disk
	hdisk6	Available	MPIO Ontap FCP Default PCM Disk
	hdisk7	Available	MPIO Ontap FCP Default PCM Disk
	hdisk8	Available	MPIO Ontap FCP Default PCM Disk
	hdisk9	Available	MPIO Ontap FCP Default PCM Disk
	hdisk10	Available	MPIO Ontap FCP Default PCM Disk
	hdisk11	Available	MPIO Ontap FCP Default PCM Disk
	hdisk12	Available	MPIO Ontap FCP Default PCM Disk
	hdisk13	Available	MPIO Ontap FCP Default PCM Disk
	hdisk14	Available	MPIO Ontap FCP Default PCM Disk
	hdisk15	Available	MPIO Ontap FCP Default PCM Disk
	hdisk16	Available	MPIO Ontap FCP Default PCM Disk
	hdisk17	Available	MPIO Ontap FCP Default PCM Disk
	hdisk18	Available	MPIO Ontap FCP Default PCM Disk
	hdisk19	Available	MPIO Ontap FCP Default PCM Disk
	hdisk20	Available	MPIO Ontap FCP Default PCM Disk
	hdisk21	Available	MPIO Ontap FCP Default PCM Disk
	hdisk22	Available	MPIO Ontap FCP Default PCM Disk
	hdisk23	Available	MPIO Ontap FCP Default PCM Disk
	vioserver\$		
4	Execute the lade	v command to	get information about your setup.
-	Execute the 15de	· command to	Set mornation about your setup.

Step	Action					
5	Enter oem_setup_env mode so that you can execute the Host Utilities commands dotpaths (if necessary) and sanlun. To get into this mode, enter the following command:					
	oem_setup_env					
	Note					
	Once you enter the oem_setup_env command, you stay in that mode until you halt it by using a command such as exit.					
	Example: When you enter the oem_setup_env mode, the command line prompt changes from a dollar sign to a pound sign.					
	vioserver\$ oem_setup_env # PS1="\$(hostname)# "					
6	Order and prioritize the paths to the storage system LUNs.					
	• If you are running a version of Data ONTAP that supports ALUA, you must have ALUA set on the storage system. ALUA automatically sets the paths. To determine if ALUA is enabled, see "Check the ALUA settings on the storage system" on page 107.					
	• If you are not running ALUA, you must execute the dotpaths utility to set the path priorities. The dotpaths utility is installed when you install the Host Utilities.					
	If you enter dotpaths without any options, it sets the priority for all Data ONTAP LUNs.					
	This utility has the format:					
	dotpaths [-hqv] [hdiskN]					
	You can use the command line options to complete the following tasks:					
	 Specify a set of disks for which you want to set the priority. When you enter a list of hdisk names, the utility sets the priority only for those disks. 					
	 Display all the priorities. Enter the -v option to enable verbose mode. 					
	 Query all or individual disk priorities. Enter the -q option to perform this task. 					
	The following is an example of using the dotpaths utility.					
	<pre>vioserver# dotpaths -v hdisk2 (path 0): Optimized path - Setting priority to 255 hdisk2 (path 1): Optimized path - Setting priority to 255 hdisk2 (path 2): Unoptimized path - Current priority of 1 is correct hdisk2 (path 3): Unoptimized path - Current priority of 1 is correct</pre>					
	 Path priority set and/or verified for 22 disks, 86 total paths. vioserver#					

Step	Action		
7	Execute the sanlun lun show -p command to get information about your setup.		
	Example: The following is the type of output you would see when you run this command. The output from this command has been truncated. This example also includes the sanlun lun show -d hdisk9 -v command to display information about hdisk9.		
	<pre>vioserver# sanlun lun show -p ONTAP_PATH: sh960-01:/vol1/vioserver_7 LUN: 7 LUN Size: 250m (262144000) Host Device: hdisk9 LUN State: GOOD Controller_CF_State: Cluster Enabled Controller Partner: sh960-02 Multipath Provider: AIX Native Multipathing Algorithm: round_robin</pre>		
	MPIO Controller AIX Controller AIX MPIO path path MPIO host target HBA path status two path Port priority		
	StatuscypepathhbkportpriorityEnabledprimary path0fcs04a255Enabledprimary path1fcs04b255Enabledsecondary path2fcs04a1Enabledsecondary path3fcs04b1		
	<pre>vioserver# sanlun lun show -d hdisk9 filer: lun-pathname device filename adapter protocol lun size lun state sh960-01: /vol/vol1/vioserver_7 hdisk9 fcs0 FCP 250m (262144000) GOOD Serial number: VrHqko8bg72t Filer FCP nodename:500a098083e152d9 Filer FCP portname:500a098193e152d9 Filer adapter name: v.4a Filer IP address: 10.60.240.66 Filer volume name:vol1 FSID:0xe10152d9 Filer qtree name:/vol/vol1 ID:0x0 Filer snapshot name: ID:0x0</pre>		
	vioserver#		

Determine which device to use as the physical volume

You must determine which device to use as the physical volume for the Logical Volume Manager (LVM) before you create a volume group. You can use the lsdev command to display information about the available disks.

(Native OS only) Creating volume groups and file systems

Creating a volume
groupYou can use whichever tool you normally use to create volume groups. The
following steps use SMIT.

Note-

See the appropriate AIX documentation for information on managing volume groups, logical volumes, and file systems.

Step	Action					
1	Once you have deter you can use the AIX	Once you have determined which device to use as the physical volume for the volume manager, you can use the AIX System Management Interface Tool (SMIT) to create a volume group.				
	Use the smit vg co	mmand to start the tool.				
2	Enter a volume grou Add a Volume Grou	p name and the informatio p screen.	n required to set	up the volume grou	o at the SMIT	
	Add a Volume Grou Type or select va Press Enter AFTE	up alues in entry fields. R making all desired cl	hanges.			
	VOLUME GROUP na Physical partit	ame tion SIZE in megabytes		[Entry Fields] [newvg] 4	+	
	* PHYSICAL VOLUM Activate volume at system res	E names e group AUTOMATICALLY start?		[hdisk6] yes	+ +	
	Volume Group Mi Create VG Concu	AJOR NUMBER urrent Capable?		[] no	+# +	
	Auto-varyon in LTG Size in kby	Concurrent Mode? /tes		no 128	+ +	
	LTG Size in kby	rtes		128 =Help		
	F2=Refresh F5=Reset	F3=Cancel F6=Command	F4=List F7=Edit	F8=Ima	age	
	F9=Shell	F10=Exit	Enter=Do			

Step	Action					
3	Press Enter.					
	COMMAND STATUS					
	Command: OK	stdout: yes	stderr: no			
	Before command	completion, additiona	al instructions may a	ppear below.		
	0516-1254 mkvg: newvg	Changing the PVID in	the ODM.			
	F1=Help F8=Image n=Find Next <f10 exits="" smit<="" th=""><th>F2=Refresh F9=Shell</th><th>F3=Cancel F10=Exit</th><th>F6=Command /=Find</th></f10>	F2=Refresh F9=Shell	F3=Cancel F10=Exit	F6=Command /=Find		
4	Press F10 to exit S	SMIT.				
5	Check the information	tion on the new volume g	group.			
	<pre># lsvg newvg VOLUME GROUP: 000f3bca00004c0 VG STATE: VG PERMISSION: MAX LVs: LVs: OPEN LVs: TOTAL PVs: STALE PVs: ACTIVE PVs: MAX PPs per PV: LTG size: HOT SPAPE.</pre>	newvg 000000f8267ba452 active read/write 256 0 0 1 1 0 1 1016 128 kilobyte(s)	VG IDENTIFIER: PP SIZE: TOTAL PPs: FREE PPs: USED PPs: QUORUM: VG DESCRIPTORS: STALE PPs: AUTO ON: MAX PVs: AUTO SYNC:	<pre>16 megabyte(s) 639 (10224 megabytes) 639 (10224 megabytes) 0 (0 megabytes) 2 2 2 0 yes 32 no</pre>		

Accessing storage on a volume group

You can access storage space on a volume group using any of the methods you normally use. These can include using jfs, jfs2, or a raw logical volume.

Creating a fileYou can use whichever tool you normally use to create a file system. Thesystemfollowing steps use SMIT.

Step	Action		
1	To use SMIT to set up a file s	ystem, enter the following co	mmand:
	smit fs		
2	Enter the information to set u	p the file system at the SMIT	Add a Journaled File System screen.
	>Add / Change / Show /	Delete File Systems>Jo	urnaled File Systems> Add a -
	>Add a Standard Jo	urnaled File System	
		Add a Journaled File	System
	Move cursor to desired item and press Enter.		
	Add a Standard Journal Add a Compressed Journ Add a Large File Enable	ed File System aled File System ed Journaled File System	
	+		+
		Volume Group Name	
	Move cursor to desired	item and press Enter.	
	 rootvg newvg		
	 F1=Help	F2=Refresh	F3=Cancel
	F8=Image	F10=Exit	Enter=Do
	Fl=H /=Find	n=Find Next	F9=S
	+		+

Step	Action			
3	Select the volume group	you created in the section	n "Creating a volume gro	up" on page 88.
	Add a Standard Journ	naled File System		
	Type or select value Press Enter AFTER ma	es in entry fields. Aking all desired chan	ges.	
			[Entry	y Fields]
	Volume group name		newvg	
	* SIZE of file syste	m (in 512-byte blocks)	[2140000]	#
	* MOUNT POINT		[/newfs]	
	Mount AUTOMATICALI	JY at system restart?	yes	+
	PERMISSIONS		read/write	e +
	Mount OPTIONS		[]	+
	Start Disk Account	ing?	no	+
	Fragment Size (byt	es)	4096	+
	Allocation Group S	er inode	4096	+
	Allocation Group a	SIZE (MBYCES)	0	+
	F1=Help	F2=Refresh	F3=Cancel	F4=List
	F5=Reset	F6=Command	F7=Edit	F8=Image
	F9=Shell	F10=Exit	Enter=Do	5
4	Press Enter.			
		COMMAN	D STATUS	
	Command: OK	stdout: yes	stderr: no	
	Before command comp	letion, additional ins	tructions may appear	below.
	Based on the paramet is limited to a max:	ters chosen, the new / imum size of 134217728	newfs JFS file syster (512 byte blocks)	n
	New File System size	e is 2162688		
	F1=Help	F2=Refresh	F3=Cancel	F6=Command
	F8=Image	F9=Shell	F10=Exit	/=Find
	n=Find Next			

Step	Action		
5	Press F10 to exit SMIT.		
6	Mount the new file system.		
	<pre># mount /newfs # df -k /newfs</pre>		
	Filesystem 1024-blocks Free %Used Iused %Iused Mounted on /dev/lv01 1081344 1047356 4% 17 1% /newfs		
About this chapter	This chapter provides information on how to use the sanlun utility to display information about LUNs and host HBAs.		
------------------------	---	--	--
	The sanlun utility provides information about paths to your devices and how they map to LUNs on the storage system. You can also use this tool to display information about the host HBAs.		
Topics in this chapter	 This chapter discusses the following topics: "Using sanlun to display LUN information" on page 94 "Using sanlun to display host HBA information" on page 99 		

7

Displaying host
LUN informationTo use sanlun to display information about the LUNs connected to the host,
complete the following steps.

Step	Action
1	Log in as root on the host and go to the /opt/ontap/SANToolkit/bin directory.
2	At the host command line, use the sanlun lun show command to display LUN information:
	sanlun lun show [-v] [-d host device filename all storagesystem name storagesystem name:storagesystem pathname] -p
	-v produces verbose output (you cannot use the $-v$ on the same command line as the $-d$).
	-d is the device option and can be one of the following:
	• <i>host device filename</i> specifies the special device file on the host.
	• all lists all LUNs attached to the host.
	• <i>storagesystem name</i> is the host name of the storage system.
	• <i>storagesystem pathname</i> is the path name of the LUN on the storage system.
	(Multipathing environments only) -p provides information about the primary and secondary paths. You cannot use the -d option if you use -p. Use the following format:
	sanlun lun show -p [storagesystem name:storagesystem pathname storagesystem name all]
	If you enter sanlun lun show, sanlun lun show -p, or sanlun lun show -v without any parameters, the utility responds as if you had included the all parameter.

Action		
For example, you might enter:		
◆ sanlun lun show -p		
to display a listing of all the paths associated with the LUN. This information is useful if you need to set up path ordering or troubleshoot a problem with path ordering.		
♦ sanlun lun show -d /dev/hdisk <x></x>		
to display the summary listing of the LUN(s) associated with the host device /dev/hdisk $< x^{2}$ (x is the number of the hdisk; for example, you might have hdisk1 or hdisk4).		
◆ sanlun lun show -v all		
to display verbose output for all the LUN(s) currently available on the host.		
♦ sanlun lun show toaster		
to display a summary listing of all the LUNs available to the host served by the storage system called toaster.		
 sanlun lun show toaster:/vol/vol0/lun0 		
to display a summary listing of all the LUNs available to the host served by lun0 on toaster		
Note		
When you specify either the sanlun lun show <storage_system_name> or the sanlun lun show <storage_system_name> or the sanlun lun show <storage_system_name:storage_system_pathname> command, the utility displays onl the LUNs that have been discovered by the host. LUNs that have not been discovered by the host are not displayed.</storage_system_name:storage_system_pathname></storage_system_name></storage_system_name>		

Interpreting sanlun The sanlun lun show -p command provides the following information: lun show -p path state—Whether the path is enabled or disabled. ٠ output ٠

- path type—Whether the path to the LUN is primary, secondary, or standby.
 - Primary paths communicate directly using the adapter on the local storage system.
 - Secondary paths are proxied to the partner storage system over the * configuration interconnect.
- device filename—The special device file name for the disk on AIX that • represents the LUN.
- host HBA—The name of the initiator HBA on the host. •
- local storage system port—The port that provides direct access to a LUN. • This is always a primary path.

• partner storage system port—The port that provides passive path failover. This is always a secondary path.

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

- multipathing policy—The multipathing policy is one of the following:
 - A/A (Active/Active)—DMP uses more than one path concurrently for traffic. The A/A policy indicates that the B ports on the storage system HBAs are in standby mode and become active only during a takeover. This means that there are two active paths to the configuration at any given time.
 - A/A-NETAPP—Groups of LUNs connected to a single controller failover as a single failover entity. Failover occurs at the controller level and not at the LUN level.
 - The primary and secondary controllers are each connected to a separate group of LUNS. If a single LUN in the primary controller's LUN group fails, all LUNs in that group fail over to the secondary controller's passive LUN group. This array type allows load balancing of I/O across multiple primary paths. Refer to Veritas documentation for details about load balancing.

Examples of using The following are examples of using the sanlun lun show -p command and the type of output it displays.

Veritas example: This example displays sanlun lun show -p output for a system with Veritas multipathing.

sanlun lun show -p tester:/vol/norm 1 2/norm vx-aix01 lun6 (LUN 8) DMP NODE: 30200 80 10g (10737418240) lun state: GOOD Filer CF State: Cluster Enabled Multipath Policy: A/A-NETAPP Multipath-provider: VERITAS DMP host filer primary partner Veritas device host filer filer path I/0 path path state type filename HBA port port policy _____ ____ primaryhdisk95 fcs0 0dMinimumQprimaryhdisk9 fcs0 0cMinimumQsecondaryhdisk611 fcs10bMinimumQsecondaryhdisk525 fcs10aMinimumQsecondaryhdisk39 fcs00dMinimumQsecondaryhdisk439 fcs00dMinimumQprimaryhdisk267 fcs10bMinimumQprimaryhdisk181 fcs10aMinimumQ up up up up up up up up tester:/vol/nate 1 2/norm vx-aix01 lun4 (LUN 7) DMP NODE: 30200 79 10g (10737418240) lun state: GOOD Filer CF State: Cluster Enabled Multipath Policy: A/A-NETAPP Multipath-provider: VERITAS DMP host filer primary partner Veritas hostfilerprimary partner Veritaspathpathdevice host filerfilerstatetypefilename HBA portportpolicy Primaryhdisk94 fcs0 0dMinimumQprimaryhdisk8 fcs0 0cMinimumQsecondaryhdisk610 fcs10bMinimumQsecondaryhdisk524 fcs10aMinimumQsecondaryhdisk352 fcs00dMinimumQsecondaryhdisk352 fcs00cMinimumQprimaryhdisk266 fcs10bMinimumQprimaryhdisk180 fcs10aMinimumQ up up up up up up up up

MPIO example: This abbreviated example displays the type of output you might see if you executed the sanlun lun show command with the -p option on a system with MPIO multipathing. Keep in mind as you look at the output that the following is true:

- A path type of primary indicates a direct path to the storage.
- A path type of secondary indicates a proxy path through a second storage system.
- The Controller target HBA port column always refers to the port on the storage system on which the LUN resides. It always represents a primary path.

```
# sanlun lun show -p
ONTAP_PATH: filerA:/vol lun7
LUN: 7
LUN Size: 2g (2147483648)
Host Device: hdisk9
LUN State: GOOD
Controller_CF_State: Cluster Enabled
Controller Partner: filerB
Multipath Provider: AIX Native
Multipathing Algorithm: round_robin
```

MPIO path status	Controller path type	AIX MPIO path	host HBA	Controller target HBA port	AIX MPIO path priority
Enabled	primary	path0	fcs0	1a	255
Enabled	secondary	path1	fcs0	1a	1
Enabled	primary	path2	fcs0	1b	255
Enabled	secondary	path3	fcs0	1b	1
Enabled	primary	path4	fcs1	1a	255
Enabled	secondary	path5	fcs1	1a	1
Enabled	primary	path6	fcs1	1b	255
Enabled	secondary	path7	fcs1	1b	1
Enabled	primary	path8	fcs2	1a	255
Enabled	secondary	path9	fcs2	1a	1
Enabled	primary	path10	fcs2	1b	255
Enabled	secondary	path11	fcs2	1b	1
Enabled	primary	path12	fcs3	1a	255
Enabled	secondary	path13	fcs3	1a	1
Enabled	primary	path14	fcs3	1b	255
Enabled	secondary	path15	fcs3	1b	1

Using sanlun to display host HBA information

Displaying host
HBA informationTo use sanlun to display the host HBA information, complete the following
steps.

Step	Action		
1	Log in as root on the host.		
2	At the host command line, use the sanlun command to display host HBA information:		
	sanlun fcp show adapter [-c [-v] [<i>adapter name</i> all]]		
	-v produces verbose output.		
	-c gives configuration information that you can use to create igroups.		
	all lists information for all FC adapters.		
	adapter name lists adapter information for the adapter you specify.		
	Example 1: The following example displays the type of output you see with the sanlun fcp show adapter command line. This example simply displays information on the adapters. The next one includes the -v option, which provides more information on the adapter.		
	<pre># sanlun fcp show adapter fcs0</pre>		

Step	Action			
	Example 2: This example adds the -v option to the sanlun fcp show adapter command line.			
	The -v option provide	s more information on the adapter.		
	# sanlun fcp show adapter -v			
	fcs0	WWPN:1000000abcde123		
	WWNN:	2000000c936268b		
	driver name:	/usr/lib/drivers/pci/efcdd		
	model:			
	model description:	FC Adapter		
	serial number:	1E32909972		
	driver version:			
	firmware worgion.	5.1.0.50 CD2021		
	Number of ports.	1		
	number of poics.	I Fabric		
	poit type.	Operational		
	supported speed.	2 GBit/sec		
	regotiated speed.	1 GBit/sec		
	OS device name.	f GDIC/ Sec		
	ob device name.	1000		
	fcs1	WWPN:1000000c9362687		
	WWNN:	2000000c9362687		
	driver name:	/usr/lib/drivers/pci/efcdd		
	model:	df1000f9		
	model description:	FC Adapter		
	serial number:	1E32909970		
	hardware version:	not available		
	driver version:	5.1.0.50		
	firmware version:	CD382A1		
	Number of ports:	1		
	port type:	Fabric		
	port state:	Operational		
	supported speed:	2 GBit/sec		
	negotiated speed:	1 GBit/sec		
	OS device name:	fcs1		
	#			

Troubleshooting

About this chapter	This chapter describes how to troubleshoot software installation problems and HBA and LUN management problems.
Topics covered in this chapter	 This chapter discusses the following topics: "Troubleshooting checklists" on page 102 "Confirming that your configuration is set up correctly" on page 104 "Installation fails because system does not meet requirements" on page 109 "Tools you can use to troubleshoot problems" on page 110 "SAN Toolkit diagnostic utilities" on page 111 "Changing HBA attributes such as queue depth" on page 118 "Changing the HBA queue depth with no LUNs mapped" on page 123 "Changing the value for the queue depths on the disk" on page 124 "General troubleshooting" on page 125

Connectivity problems	 Because applications on AIX systems do not typically handle I/O errors gracefully, read/write failures can cause applications to hang, crash, or fail to return requested information. You can minimize I/O application error on AIX systems by using highly available, multipathing configurations that provide continuous I/O with no single point of failure. If you continue to experience I/O errors, check the following areas for connectivity problems: 				
	 Switch setup Storage system setup 				
	♦ Host setup				
	• Storage system connectivity to the switch				
	• FC connectivity to the host				
Storage system checklist	The following is a checklist of items that pertain to storage system setup. Make sure that the following situations are true:				
	• The storage system FC cfmode is correctly set for your configuration.				
	♦ FC is running.				
	You can check the status of your FC service with the fcp status command.				
	• All the target ports are in a good state.				
	• The igroups have the ostype set to AIX.				
	• The LUNs are:				
	 mapped to host igroups. 				
	 in a good state as indicated by the output from the sanlun lun show -p command or the lspath command. 				
	 using AIX as their operating system type. 				
Host setup checklist	The following is a checklist of items that pertain to the host setup. You should make sure that the following is true:				
	• The system meets the FC AIX Host Utilities requirements.				

The installation fails if your system does not meet the requirements.

• The HBAs are working.

Check the output from the sanlun fcp show adapter -v command.

- The host is seeing all of the LUNs and LUN paths that it should.
 You can confirm this by running the lsdev command or, if you have multipathing, sanlun lun show -p.
- Native OS, VIO environments: The paths priorities have been set. If your environment does not use ALUA, you must run the dotpaths utility to set the path priorities after having the host discover the LUNs.
- Native OS, VIO environments: Use MPIO commands to check your path state and device availability.
- Veritas environments: Use Veritas commands to check your path state and device availability.

Confirming that your configuration is set up correctly

About the sections that follow	If you have any problems with the Host Utilities, you should make sure your configuration 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 AIX 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 AIX commands, see the man pages and appropriate operating system documentation.			
	For more information on the Data ONTAP commands, see the Data ONTAP documentation, in particular, the <i>Data ONTAP® Block Access Management Guide for iSCSI and FCP</i> .			
	• 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 dotpath utility and the sanlun command.			
	• To make sure you have the current version of the system components, see the IBM NAS support page at http://www.ibm.com/storage/support/nas. Support for new components is added on an ongoing basis. This online information contains a complete list of supported HBAs, platforms, applications, and drivers. It is updated on a regular basis to ensure the timeliness of component information.			
	Note			
	The examples that follow were accurate at the time this document was produced. They are not intended to show all the options available.			
Check your operating system	If you are not sure you have a supported version of the operating system, enter the following command:			
version	oslevel -s			

	Result: Information about your operating system and maintenance or technology level appears. This command gives you basic information about the operating system level, but it may not be complete. You may need additional filesets.			
	Example: This command displays information on your operating system level.			
	# oslevel 5.3.0.0			
Check the version	Use the lslpp command to check the filesets. The command format is:			
of the prerequisite	lslpp -L fileset_name			
11103013	-L displays information about filesets installed on the host.			
	<i>fileset_name</i> displays information about that fileset on the host.			
	Result: The output from this command tells you which filesets are installed on the host or provides information about a fileset on the host.			
	Example: The following example displays information about the fileset devices.pci.df1000f7.com.			
	<pre># lslpp -L devices.pci.df1000f7.com Fileset Level State Type Description (Uninstaller)</pre>			
	<pre>devices.pci.df1000f7.com 5.2.0.40 C F Common PCI FC Adapter Device Software State codes: A Applied. B Broken. C Committed. E EFIX Locked. 0 Obsolete. (partially migrated to newer version) ? Inconsistent StateRun lppchk -v. Type codes: F Installp Fileset P Product C Component T Feature R RPM Package</pre>			

Verifying the correct host HBA is installed

Supported HBAs should be installed before you install the software package. Complete the following steps to display information about HBAs on your system and, if necessary, to install an HBA.

Step	Action
1	To display HBA information, enter:
	lsdev -Cc adapter
	Example: The system displays information similar to the following. In this case, fcs0 and fcs1 are fibre channel adapters.
	# lsdev -Cc adapter
	ent0 Available 03-08 2-Port 10/100/1000 Base-TX PCI-X Adapter (14108902)
	ent1 Available 03-09 2-Port 10/100/1000 Base-TX PCI-X Adapter (14108902)
	fcs0 Available 05-08 FC Adapter
	fcs1 Available 09-08 FC Adapter
	ide0 Available 07-08 ATA/IDE Controller Device
	sisscsia0 Defined 04-08 PCI-X Dual Channel Ultra320 SCSI Adapter
	sisscsia1 Available 08-08 PCI-X Dual Channel Ultra320 SCSI Adapter
	usbhc0 Available 02-08 USB Host Controller (33103500)
	usbhc1 Available 02-09 USB Host Controller (33103500)
	vsa0 Available LPAR Virtual Serial Adapter
	vsal Available LPAR Virtual Serial Adapter
2	If you need to install an HBA, refer to the documentation that came with your HBA.

Verifying that the storage system is configured

Before you configure initiator groups and LUNs on the storage system, make sure you have completed the following:

- 1. Set up the AIX host and the initiator HBAs.
- 2. Configured the storage system and target HBAs (if needed).
- **3.** Cabled the storage to the fabric according to your configuration topology.
- 4. Licensed and enabled the FC protocol on the storage system.
- 5. Created working volumes and qtrees (if desired) on the storage system.

Note —

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

	Refer to "Where to go for more information" on page 17 for a list of useful documents and web sites.
Check the ALUA settings on the storage system	If you are running a version of Data ONTAP that supports ALUA, 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.)
	<pre>filerA# igroup show -v filerA (FCP): OS Type: aix Member: 10:00:00:c9:4b:e3:42 (logged in on: 0c) Member: 10:00:00:c9:4b:e3:43 (logged in on: vtic) ALUA: Yes</pre>
	For more information on setting up and working with ALUA, see the <i>Data ONTAP</i> ® <i>Block Access Management Guide for iSCSI and FCP</i> . In particular, see the section " <i>Enabling ALUA for a Fibre Channel igroup</i> ."
Setting up ALUA after installing the Host Utilities	If you need to set up ALUA after you have installed the Host Utilities, you must remove the existing Data ONTAP LUN handles for the device. To do this, enter the following command for each device:
	rmdev -dl device_name
	Now you can set up ALUA.
	Example: This example removes the hdisk2 LUN handles.
	# rmdev -dl hdisk2
Verifying 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 one of the versions supported with the Host Utilities. See the IBM NAS support page at http://www.ibm.com/storage/support/.

• Turned on power to the sy	witch.
-----------------------------	--------

• Configured the network parameters for the switch, including its serial parameters and IP address.

Determining whether to use	If you have a fabric-attached configuration, determine whether switch zoning is appropriate for your system setup.
switch zoning	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 host tools such as iostat and lsdev 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.
	Your configuration should have no more than eight paths per LUN.
Correct order for powering up the equipment	The different pieces of hardware communicate with each other in a prescribed order, which means that problems occur if you turn on power to the equipment in the wrong order. Throughout the procedures that follow, this is the order you must use when powering on the equipment:
	1. Configured Fibre Channel switches
	1 can take several minutes for the switches to boot.2 Disk shalves
	2. DISK Sherves
	A Host
	 1105t
Verifying the host and storage system can communicate	To verify that the host can issue commands to the storage system through the storage system's console or command line, issue a command from the host to the storage system.
	One way to do this is to use a remote login, such as telnet, to connect with the storage system. Once you have logged in, enter a command at the storage system prompt.

Installation fails because system does not meet requirements

Installation checks for system requirements

The installation process requires certain minimum system requirements. If it finds a problem with your system requirements, the installation fails.

Reinstalling the software

If the installation fails because your system does not meet the system requirements, complete the following steps.

Step	Action
1	Check the installation logs to determine why the install failed.
	The most common problems include missing the required filesets, such as devices.common.IBM.fc.hba-api fileset.
2	Correct the problem described in the log.
3	Run SMIT to install the software.
	Note

Tools you can use to troubleshoot problems

There are several commands and utilities you can use to check your system and look for problems. The following commands and utilities are especially useful in tracking down problems:		
The SAN Toolkit sanlun utility		
• The AIX 1sdev command		
• Veritas environments: The Veritas commands vxdmpadm and vxdisk list		
You can use the sanlun utility to perform the following tasks:		
• Check the status of the		
♦ HBA		
✤ LUN		
 Paths to the LUN 		
• Discover whether a path is up or down		
When you have a direct-attached configuration, use the sanlun lun show command to get information about your system.		
With a multipathing configuration, use the sanlun lun show -p 'command, which includes information about the paths to LUNs.		
The lsdev -Cc disk command provides information about the devices and		

Diagnostic utilities	The SAN that Cust	Toolkit provides several utilities that provide diagnostic information omer support can use can use for troubleshooting.
	When you different place it in you can s	u run these utilities, they gather configuration information about aspects of your system. They automatically collect information and a directory. Then they create a gzipped .tar file of that directory that send to technical support.
	You only utilities i	use these utilities when requested to do so by Customer Support. The nclude the following:
	♦ cont infor	roller_info and filer_info. See "Collecting storage system mation" on page 112 for more information.
	Note	
	The rsh.	controller_info utility uses ZAPI while the filer_info utility uses
	♦ aix_	info. See "Using the AIX data-collection tool" on page 113.
	 ♦ onta inste 	p_collect. This is a snap plug-in that you use in a VIO environment ad of aix_info. See "Using the AIX data-collection tool" on page 113.
	♦ swit exan	ch_info, where switch is the brand of switch you are using (for nple, brocade_info). See "Collecting switch information" on page 115.
General steps for executing the programs	Although use, the g	some of the scripts have different arguments that you might want to general steps for executing these scripts are the same.
	Step	Action
	1	Go to the directory /opt/Ontap/santools/bin:

cd /opt/Ontap/santools/bin

Step	Action
2	Enter the utility name.
	If the utility you are using includes arguments, you can enter them as well.
	Result: The configuration information that the utility gathers is placed in a gzipped .tar file.

Collecting storage system information

If you are having a problem, Customer Support might ask you to run controller_info or filer_info to collect storage system configuration information. To execute the utility, complete the following steps.

Note_

This utility runs in command-line mode only.

Step	Action
1	Go to the directory /opt/Ontap/santools/bin:
	cd /opt/Ontap/santools/bin

Step	Action
2	At the host command prompt, enter the following command:
	<pre>controller_info [-d path_and_file_name] [-l user] -n <storage_system_name></storage_system_name></pre>
	The -d option enables you to specify a different path in which to place the resulting output. The default path is /tmp/Ontap/ontap_filer_< <i>storage_system_name</i> >.
	The -1 user option allows the choice of a user name and password on the switch.
	The target of the command is specified by -n <pre><storage_system_name< pre="">, where storage_system_name is the name of IP address of the storage system.</storage_system_name<></pre>
	Result: The output of various status commands are placed in the e output directory named ontap_filer_< <i>storage_system_name</i> >, where <i>storage_system_name</i> is the storage system name or IP address.
	The contents of this directory are placed in a tarred and gzipped file named filer_< <i>storage_system_name</i> >.tar.gz.
	Example: The following command line checks system_1, logging on to it as the user root.:
	host1> controller_info -d /opt/Ontap/santools -l root -n system_1
	The information from system_1 is placed in a gzipped file with the directory path /opt/Ontap/santools/filer_filer1.tar.gz as its name.
3	Send the resulting gzipped file to Customer Support for analysis.

Using the AIX data-collection tool

Veritas and Native OS environments: If you are having a problem, Customer Support might ask you to run <code>aix_info</code> to collect configuration information on your AIX system.

Note-

PowerVM environments: In VIO server and client environments, you run the ontap_collect tool instead of aix_info. The ontap_collect tool is a snap plug-in that creates a file you can send to Customer Support. You execute it the same way you execute any other snap plug-in. For example, you can run it by entering a snap ontap_collect command.

To execute aix_info, complete the following steps:

Step	Action
1	Change to the /opt/Ontap/santools/bin directory:
	cd /opt/Ontap/santools/bin

Step	Action
2	At the command prompt, enter the following command: aix_info [-d <directory>] [-n <file_name>] -d <directory> specifies the location for the gzipped file that aix_info creates. The default location is /tmp/ontap.</directory></file_name></directory>
	-n <file_name> specifies the name for the output file and directory names. The default pathname is /tmp/ontap/ontap_aix_info.tar.gz.</file_name>
	Note Ensure that you have at least 64MB of free storage in the output directory
	Result: When you run aix_info, the utility gathers information about your AIX configuration and places it in a tarred, gzipped file. It also creates a directory and populates it with files containing output from numerous commands run on the AIX system and copies of logs such as the output of the errpt command.
	Example: Depending on the options you specify, you see output similar to the following when you run this utility:
	<pre># aix_info Collecting aix_info(collecting AIX snap may take several minutes) AIX system info is in directory /tmp/ontap/ontap aix info</pre>
	Compressed file is /tmp/Ontap/ontap_aix_info.tar.Z Please send this file to Customer Support for analysis
3	Send the resulting gzipped file to Customer Support for analysis.

Collecting switch information If you are having a problem, Customer Support might ask you to run the switch utility the SAN Toolkit supplies when you install the toolkit software. The SAN Toolkit provides a utility for each switch it supports for this 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 of the utility name would be mcdata_info). This utility collects switch configuration information. You should only run this utility when asked to do so by Customer Support.

To execute the utility, complete the following steps.

Note _____

This utility runs in command-line mode only.

Step	Action
1	Go to the directory /opt/Ontap/santools/bin:
	cd /opt/Ontap/santools/bin

Step	Action
2	At the host command prompt, enter the following command:
	<switch_brand>_info [-d path_and_file_name] [-1 user:password] -n <switchname></switchname></switch_brand>
	<i><switch_brand></switch_brand></i> is the name 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 specific a different path in which to place the resulting output. The default path is /tmp/ontap/< <i>switch_brand</i> >_switch_ <i>switch_name</i> >.
	The -1 <i>user:password</i> option allows the choice of a user name and password on the switch. If this option is not specified, the switch default login and password settings are used.
	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.
	Result: The output of various status commands on the switch are placed in a directory named <i><switch_brand>_switch_switch_switch_and</switch_brand></i> , 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 tarred and gzipped file named < <i>switch_brand>_switch_switchname</i> .tar.gz.
	Example: This example uses the brocade_info file. The switch brcd1 is connected with the user "john" and the password "smith".
	<pre>hostl>brocade_info -d /opt/ontap/santools -l john:smith - n brcd1</pre>
	The information is placed in a tarred, gzipped file that has the pathname /tmp/ontap/brocade_switch_brcd1.tar.gz.
3	Send the resulting gzipped file to Customer Support for analysis.

Methods for changing the host HBA attributes

If you want to change information, such as the queue depth on the host HBA, you must change the host HBA's attributes. If you have LUNs mapped to the host, there are two methods you can use to change these attributes. One method requires you to reboot the host for the change to take effect. The other method does not require a reboot, but you must temporarily unload all the HBA's child devices.

Note-

You must unload the child devices manually even if you are using SMIT. SMIT does not unload these devices automatically.

If you don't have any LUNs mapped to the host, you can use a shorter way to change such attributes as the HBA queue depth (see "Changing the HBA queue depth with no LUNs mapped" on page 123).

Changing the host HBA queue depth and rebooting

If you only change the host HBA's attributes in the ODM, you must reboot your host. To change the queue depth this way, complete the following steps.

Step	Action	
1	Enter the following command:	
	<pre># chdev -P -l adapter_name -a num_cmd_elems=val adapter_name is the name of the HBA whose attributes you want to change.</pre>	
	<i>val</i> is the value to which you want to set the queue depth.	
	Example: The following example sets the queue depth on the FC HBA device named fcs1 to 400.	
	<pre># chdev -P -l fcs1 -a num_cmd_elems=400</pre>	
2	Reboot the host.	

Changing the host HBA queue depth without rebooting

If you don't want to reboot the host, you can change the host HBA attributes by temporarily unloading all the HBA child devices. To use this method to change the queue depth, complete the following steps.

Note-

The commands in these steps provide an example of changing the queue depth. Depending on how your system is set up, you would probably see different output if you executed these commands on your system.

Step	Action
1	Use the lsdev command to find the HBA's child device. This is a device instance of SCSI over the FC driver. If this command does not return any child devices, go to step 11. In this case, you will stop at step 12.
	Example: In this example, the lsdev command reports one FC device:
	# lsdev -C -F "name parent" awk '\$2~/^fcs1\$/ { print \$1 }'
	fscsil
2	Now that you have a name for the FC device, use the lsdev command to locate that device's child devices. These devices are among the LUN disk devices. If this command doesn't display any child devices, go to step 10 and stop after step 13.
	Example: In this example, the lsdev command displays four child devices:
	<pre># lsdev -C -F "name parent" awk '\$2~/^fscsil\$/ { print \$1 }' hdisk2 hdisk3 hdisk6 hdisk7</pre>
3	Use the 1spv command to find all the volume groups that contain at least one disk device that is a child of the FC device. If the command does not report any volume groups, skip to step 8 and stop after step 14.

Step	Action
4	Find all the mounted file systems that belong to those volume groups and the applications that are currently accessing logical volumes in those volume groups. If there aren't any, skip to step 7 and stop after step 15.
5	Disable any applications that are accessing logical volumes in the volume groups.
6	 Unmount the file systems. Veritas environments: Unmount any file systems and deactivate all disk groups using the vxdg deport command. Native OS environments: Vary off all the volume groups and unmount any file systems. Veritas example: In this example, the vxdg deport command unmounts the file systems that contain the disk groups called my_disk_groups and deactivates the disk groups: # vxdg deport my_disk_groups Native OS example: To vary off the volume group called my_vg, you would enter the following command: # varyoffvg my_vg
7	Unload all the protocol's child devices. You need to keep the definition of these devices. Example: This example unloads the child devices that were discovered in step 2: # rmdev -1 hdisk2 hdisk2 Defined # rmdev -1 hdisk3 hdisk3 Defined # rmdev -1 hdisk6 hdisk6 Defined # rmdev -1 hdisk7 hdisk7 Defined

Step	Action
8	Unload the FC device that you discovered in step 1.
	Example: This example unloads the FC device fscsi1:
	# rmdev -l fscsi1 fscsi1 Defined
9	Change the value of the attribute.
	Example: This example changes the queue depth value to 400:
	# chdev -l fcs1 -a num_cmd_elems=400 fcs1 changed
10	Reload the HBA device to enable the new setting.
	Example: This example reloads the FC device fscs1:
	# mkdev -l fcs1 fcs1 Available
11	If necessary, reload the FC device fscsi1.
	Example: The following command line reloads the FC device fscsi1:
	# mkdev -l fscsi1 fscsi1 Available
12	If necessary, reload the child devices of the FC device.
	Example: The following command line reloads the child device that you unloaded in step 9:
	<pre># mkdev -l hdisk2 hdisk2 Available # mkdev -l hdisk3 hdisk3 Available # mkdev -l hdisk6 hdisk6 Available # mkdev -l hdisk7 hdisk7 Available</pre>

Step	Action	
13	Restore the volume groups (see Step 6).	
	• Veritas environments: Import the disk groups that you deported earlier.	
	• Native OS environments : Vary on any volume groups that you varied off.	
	Veritas example: To import the disk group called my_disk_group, enter the following command:	
	# vxdg import my_disk_groups	
	Native OS example: To vary on the volume group called my_vg, enter the following command:	
	# varyonvg my_vg	
14	Remount any file systems that you unmounted.	
15	Restart any applications that you disabled.	

Changing the HBA queue depth with no LUNs mapped

Changing the HBA queue depth

If you need to change the HBA queue depth and you don't have any LUNs mapped to the host, complete the following steps.

Note-

If you have LUNs mapped to the host, you must perform the steps listed in "Changing the host HBA queue depth without rebooting" on page 119.

Step	Action
1	Unload the child FC device by using the rmdev -1 command.
	Example: For HBA fscsi0, you would enter the following command:
	# rmdev -l fscsi0
2	Change the value of the queue depth using the chdev -l command, which has the following format:
	<pre># chdev -l fcs0 -a num_cmd_elems=val</pre>
	<i>val</i> is the value to which you want to set the queue depth.
	Example: To change the value to 48, you would enter the following command:
	<pre># chdev -l fcs0 -a num_cmd_elems=48</pre>
3	Reload the HBA device using the mkdev -1 command.
	Example: The following command line reloads the fcs0 HBA.
	# mkdev -l fcs0
4	Reload the child FC device using the mkdev -1 command.
	Example: The following command line reloads the child FC device:
	# mkdev -l fscsi0

Changing the value for the queue depths on the disk

Setting the value of the queue depths	The installation automatically sets the queue depths for the disk to 12, which is the recommended value. If your system needs to use a different queue depth, change this value using the chdev -l command. This command has the following format:
	# chdev -l hdiskx -a queue_depth= <i>val</i>
	hdiskx is the device for which you want to change the depth. The x specifies the number for this device.
	val is the value to which you want to set the queue depth.
	Note
	You should only change the queue depth if you are familiar with performance tuning on your system.
Example of	This example sets the queue depth for the hdisk6 to 12.
changing the queue depth	<pre># chdev -1 hdisk6 -a queue_depth=12</pre>

Basic operations
take a long timeProblem: There are no errors and everything appears to be correctly connected,
but basic operations are taking exceptionally long times; in some cases, hours
instead of minutes.Explanation: If there are no other problems, this could mean that one of the
connectors is not firmly attached. This can be the case even when it has a link and
is reporting information such as the correct speed.What to do: Disconnect the connectors and reconnect them. Check for faulty

What to do: Disconnect the connectors and reconnect them. Check for faulty optical cabling. Also, check the Fibre Channel switch for excessive line errors.

About this chapter	This chapter describes of what you need to do to configure SAN booting on an AIX host running the Native OS. It also provides detailed procedures.
	Currently, SAN booting is not supported for Veritas.
	Note
	Solutions and components are qualified on an ongoing basis. To verify that SAN booting is supported in your configuration, see the IBM support page at http://www.ibm.com/storage/support/.
Topics in this	This chapter discusses the following tonics:
chapter	"SAN boot overview" on page 128
-	 Shirt boot overview on page 120 "Setting up a SAN Boot LUN" on page 130
	 "Cloning the root volume group" on page 137

What is SAN booting	SAN booting is using a SAN-attached disk, such as a LUN, as a boot device for a host. Configuring SAN booting allows you to:
	• Remove the hard drives from your servers and use the SAN for your boot needs. This eliminates the costs associated with maintaining and servicing hard drives.
	 Use the SAN for both storage and boot needs, thereby consolidating and centralizing storage.
Contents of this chapter	This chapter provides an example of setting up a boot LUN. The example uses a host running the AIX B 5L. You can apply this procedure to most configurations.
	The procedure described here is just one example of creating a bootable LUN. This chapter does not describe other examples, such as using the AIX Alternate Disk Install, which allows you to install the OS while it is up and running.
	Refer to the appropriate AIX documentation for details about additional configuration methods.
Important notes	Before you start, make sure the following is true:
about creating a SAN boot LUN	 You are running the correct version of the operating system and your host and storage system are configured properly.
	• You are logged in as root.
	• You have checked the Release Notes to ensure that SAN boot steps have not changed since the manual was produced.
	When you create the SAN boot LUN, make sure you set it so that you do not have more than four paths to the boot LUN.
Configuration	Configuring SAN booting involves the following tasks:
overview	1. Configuring the igroup and SAN boot LUN.
	a Determine the size of the boot LUN
	D. Create two igroups (one for the boot LUN and one for the data LUNs).
	c. Create the boot LUN and any data LUNs.
- **d.** Map the boot LUN to its igroup and the data LUNs to the other igroup.
- 2. Setting up your system
 - **a.** Create a portset for at least one target port and a failover port to an igroup that will be used only for the boot LUN.

Note ----

Limit the number of paths to one.

- **b.** Bind the portset to an igroup that is used **only** for the boot LUN.
- **3.** Installing the OS on the boot LUN.
 - **a.** Install the operating system and reboot.
 - **b.** Install the Host Utilities software on the boot LUN and reboot.
 - **c.** Remove the SCSI-2 reservation placed on the boot LUN from the initial installation by halting the operating system and executing the online and offline command on the LUN.

Note -

If you are using an older storage system, you can add ports back to the portset to bring it up to the four-path maximum.

- **d.** Power on the server and boot from the LUN.
- e. Use the rmdev command to clean up any left over ghost devices.
- **f.** Set the path priorities. ALUA automatically handles this. If you are not using ALUA, run the dotpaths utility to set the path priorities.
- **g.** Invalidate the current bootlist and reset it to use the primary boot devices.

Importa informa creating	nt tion about j boot LUNs	 Creating a boot LUN requires the following: The correct operating system and technology levels. A limit of four paths to the boot LUN. Your data LUNs can use all four paths to the storage array.
Creating a boot LUN		Creating a boot LUN involves several tasks that you must perform on the host and on the storage system. To create the boot LUN, complete the following steps.
		Note The steps for installing the operating system are ones you would use if you were installing from a CD-ROM. For information on cloning the operating system, see "Cloning the root volume group" on page 137.
Step	Action	
1	Determine the	size of the boot LUN.

You must create a LUN that is large enough to provide space for the AIX operating system version you are using. See the appropriate AIX product documentation to determine how much disk space is required.

Step	Action	
2	Create two igroups. One igroup is for the boot LUN and the other is for any data LUNs you create.	
	You must be at your host logged in as root to create an igroup. You perform some steps on the host (Host) and some steps on the storage system (Storage system). You can use a second session on the host to telnet to the storage system. To create an igroup, perform the following steps.	
	1. (Host) Get the World Wide Port Name (WWPN) for each of the host's HBAs. You can get this off of the adapter or, if the host is powered up, by running local disk commands or the sanlun fcp show adapter -c command.	
	2. Run the igroup create command to get information necessary to create the igroup.	
	Example: If you had an AIX system called boothost with two HBAs, this command produce the following output on the console:	
	igroup create -f -t aix "boothost" 100a0b000010a700 100a0b000010a606	
	3. (Storage system) Copy the output from the igroup create command and paste it onto the command line of the storage system you telnetted to.	
	4. (Storage system) Press enter. The storage system creates an igroup using the name of the AIX host. For example, the command line in step 1 creates an igroup called boothost.	
	5. (Storage system) Use the igroup show command line to verify that the igroup was created.	
	Example: If you had set up an igroup based on the command line in step 1, the igroup show command would produce the following result:	
	<pre>filerA> igroup show -v boothost boothost (FCP) (ostype: aix): 10:00:00:00:c9:40:56:23 (logged in on: vtic, 1a, 0c) 10:00:00:c9:40:56:e9 (logged in on: vtic, 1b, 0d)</pre>	
	For details on creating igroups, see the <i>Data ONTAPTM Block Access Management Guide for i</i> SCSI and FCP.	
3	Create the boot LUN and map it to the igroup you created for it. If you have data LUNs, map them to the igroup you created.	
	You can use the lun setup command to perform these tasks. This command steps you through the process. For complete information, see the <i>Data ONTAPTM Block Access Management Guide for FCP</i> .	

Step	Action	
4	Use the lun show command to confirm that the boot LUN is mapped to the correct igroup.	
	Example: The lun show command displays information about the boot LUN called boothost.	
	filerA> lun show -g boothost /vol/sanboot/boothost 50g (53687091200) (r/w, online, mapped)	
5	On the storage system with the boot LUN, create a portset that has only one port on a primary path to the boot LUN. Do not include any other ports. This igroup can only be used for the boot LUN. You must create this portset on the storage system where you created the boot LUN. portset create -f PortSetName FilerName:PortName	
	<i>PortSetName</i> is the name of the portset you are creating. It can be up to 95 characters long.	
	FilerName:PortName is the name of the FC port.	
	Note	
	For details on creating portsets, see the <i>Data ONTAP Block Access Management Guide</i> .	
	Example: This example creates a portset called sanboot for the LUN.	
	filerA> portset create -f sanboot controllerA:4a	
6	Bind the portset to the igroup for the boot LUN. Use the command:	
	igroup bind <i>iGroupName PortSetName</i>	
	<i>iGroupName</i> is the name of the igroup you created; for example, boothost.	
	PortSetName is the name of the portset you created; for example, sanboot.	
	Example: This example creates a portset called sanboot for the LUN associated with target port 0c on filerA. It then uses the portset show command to confirm the port has been set up.	
	<pre>filerA> igroup bind boothost sanboot filerA> portset show sanboot (FCP): ports: filerA 0c igroups: boothost</pre>	
	<pre>filerA> igroup show boothost boothost (FCP) (ostype: aix): 10:00:00:c9:50:54:5a (logged in on: vtic, 0c) 10:00:00:c9:50:5f:8c (logged in on: 1b, vtic, 0d) Pset: sanboot</pre>	

Step	Action
7	Install the AIX operating system on the boot LUN and reboot.
	For details on installing the AIX operating system, follow the instructions in the appropriate AIX documentation.
8	Install the Host Utilities. For information on doing this, see "Installing the Host Utilities software packages" on page 25.
9	On the host, use the cfgmgr command to discover the Date ONTAP LUNs.
10	On the host, enter the bootinfo -b command to identify which device is bound to the boot LUN.
	Example: In this example, the boot LUN is the device hdisk0:
	AIX_host> bootinfo -b hdisk0
11	Change the boot LUN's reserve policy for MPIO by entering the following command:
	AIX_Host> chdev -Pl hdisk0 -a algorithm=fail_over -a reserve_policy=single_path
	This command prevents SCSI-2 Reserve conflicts by setting the reserve policy to single_path.
	Note
	You do not have to change the settings for data LUNs. Data LUNs can use the Host Utilities default settings.
12	Use the lsattr command to verify that the reserve_policy attribute is set to single_path and that the Algorithm attribute is set to fail_over.
	Example: The following command shows that both the reserve_policy attribute and
	algorithm attribute are correctly set:
	AIX_Host> # lsattr -El hdisk0 -a algorithm -a reserve_policy
	algorithm fail_over Algorithm True reserve policy single path Reserve Policy True
13	Restart the AIX server so that it boots from the boot I UN with the MPIO and SCSL2 Reserve
1.5	parameters you set in Step 11.

Step	Action
14	On the storage system, add host WWPNs to the boot LUN's igroup so that there is a maximum of four paths to the boot LUN.
	Example: The following example adds a WWPN to the boot LUN igroup. The igroup show command displays the WWPNs in the igroup and the igroup's portset:
	<pre>controllerA> igroup add SANboot 10:00:00:c9:50:5f:8c controllerA> igroup show SANboot BootLUN (FCP) (ostype: aix): 10:00:00:c9:40:56:23 (logged in on: 5a, 5b, vtic, 4b, 4a) 10:00:00:c9:50:5f:8c (logged in on: 5a, 5b, vtic, 4a, 4b) Pset: bootlun</pre>
15	Add the target port on the secondary path for the boot LUN to the igroup's port set. This port is on the partner in the active/active configuration. For example, if the primary path to the boot LUN is target port 4a on controllerA, then the secondary path is target port 4a on controllerA's partner.
	Example: The following example adds port 4a on both controllerA and its partner to the portset:
	<pre>contollerA> portset add bootlun 4a controllerA> portset show bootlun (FCP): ports: controllerA 4a controllerB 4a igroups: SANboot</pre>
16	On the host, use the cfgmgr command to verify that the boot LUN has only the recommended four paths.
	Example: This example uses the cfgmgr command and then displays the paths using the lspath command.
	AIX_Host> cfgmgr AIX_Host> # lspath -l hdisk0 Enabled hdisk0 fscsi0 Enabled hdisk0 fscsi1 Enabled hdisk0 fscsi1

Step	Action	
17	Use the lsdev command to identify any ghost devices left over from the ODM device overlay from MPIO to MPIO NetApp.	
	Example: The following example shows ghost devices with two different device handles: Defined and Unknown.	
	lsdev -Cc disk hdisk0 Available 02-08-01 MPIO NetApp FCP Default PCM Disk hdisk1 Defined 02-08-01 MPIO NetApp FCP Default PCM Disk hdisk2 Defined 03-08-01 MPIO NetApp FCP Default PCM Disk hdisk3 Unknown 05-08-01 MPIO NetApp FCP Default PCM Disk hdisk4 Unknown 06-08-01 MPIO NetApp FCP Default PCM Disk hdisk5 Available 02-08-01 MPIO NetApp FCP Default PCM Disk hdisk6 Available 03-08-01 MPIO NetApp FCP Default PCM Disk hdisk7 Available 05-08-01 MPIO NetApp FCP Default PCM Disk hdisk8 Available 06-08-01 MPIO NetApp FCP Default PCM Disk	
18	Remove the ghost devices using either the odmdelete command or the rmdev command, depending on whether your device handles were marked Unknown or Defined.	
	Example (Unknown): For device handles marked as Unknown, use the odmdelete command:	
	odmdelete -q name=hdisk3 -o CuDv 0518-307 odmdelete: 1 objects deleted	
	Example (Defined): For device handles marked as Defined, use the rmdev command:	
	rmdev -dl hdisk1 hdisk1 deleted	
19	Use the cfgmgr command to rescan the bus for MPIO FC devices.	
20	If you are not using ALUA, set the path priorities by running the dotpaths utility that comes with the Host Utilities.	
	Example: This example runs the dotpaths utility in verbose mode:	
	AIX_Host> /usr/sbin/dotpaths -v	

Step	Action	
21	Invalidate the current bootlist and create a bootlist that boots only from the primary paths of the boot LUN. You can use the following commands to perform these steps:	
	bootinfo -b	
	bootlist -m normal -i	
	bootlist -m normal <bootdevicehandle></bootdevicehandle>	
	These commands perfom the following tasks:	
	• Return information on the last boot device.	
	• Invalidate the normal mode boot list	
	• Set a the new boot device to a normal boot list.	
	Note	
	This procedure helps prevent a common boot issue where the boot list becomes filled with paths that cannot be used during the boot cycle.	

Cloning the operating system Another way to install the AIX operating system is to clone the root volume. You use the alt_disk_install command to clone the volume and then you use bootlist and bootinfo commands to get information about the new boot device and set it to the boot list.

To clone a volume, complete the following steps.

Step	Action
1	Enter the alt_disk_install command and specify the root volume that you want to clone.
	Example: The following command clones hdisk1.
	-> alt_disk_install -C hdisk1 +
	+
	ATTENTION: calling new module /usr/sbin/alt_disk_copy. Please see the
	alt_disk_copy man page and documentation for more details.
	Executing command: /usr/sbin/alt_disk_copy -d "hdisk1"
	+
	Calling mkggfile to greate new /image data file
	Checking disk sizes
	Creating cloned rootyg volume group and associated logical volumes.
	Creating logical volume alt hd5.
	Creating logical volume alt hd6.
	Creating logical volume alt hd8.
	Creating logical volume alt_hd4.
	Creating logical volume alt_hd2.
	Creating logical volume alt_hd9var.
	Creating logical volume alt_hd3.
	Creating logical volume alt_hd1.
	Creating logical volume alt_hd10opt.
	Creating logical volume alt_sysdump_dev.
	Creating /alt_inst/ file system.
	Creating /alt_inst/nome file system.
	Creating /alt_inst/opt file system.
	Creating /alt_inst/usr file system.
	Creating /alt_inst/usr file system
	Generating a list of files
	for backup and restore into the alternate file system

Step	Action
	<pre>Backing-up the rootvg files and restoring them to the alternate file system Modifying ODM on cloned disk. Building boot image on cloned disk. forced unmount of /alt_inst/var forced unmount of /alt_inst/usr forced unmount of /alt_inst/tmp forced unmount of /alt_inst/opt forced unmount of /alt_inst/home forced unmount of /alt_inst forced unmount of /alt_inst Changing logical volume names in volume group descriptor area. Fixing LV control blocks Fixing file system superblocks Bootlist is set to the boot disk: hdisk1</pre>
2	Reboot the server.
3	 Use the bootlist command to create a new boot list that boots only from the primary paths of the boot LUN. Example: The following example contains commands to perform the following tasks: Create a boot list in normal mode that says to boot off logical volume hd5 on disk hdisk1 and displays information about the boot. Return information on the last boot device. Display a 1 if the IPL code in the ROS on the machine running the command is capable of booting from a specified disk. > bootlist -m normal -o hdisk1 blv=hd5 > bootinfo -b hdisk1 > bootinfo -B hdisk1 1
4	Use the ipl_varyon command to varyon the root volume group. 5300-05-00] root@ibmbc-fak01-b4 / -> ipl_varyon -i PVNAME BOOT DEVICE PVID VOLUME GROUP ID hdisk0 YES 002006ca49c93e76000000000000000000000000000000000000

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IBM System Storage N series FC AIX Host Utilities 5.0 for Native OS and Veritas Installation and Setup Guide

Publication No. GC26-7827-05

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