IBM System Storage N series

Solaris Host Utilities 6.0 Installation and Setup Guide

GC52-1348-01

Contents

Preface

Supported features

IBM System Storage 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 on the N series support website (accessed and navigated as described in *Websites* on page 8).

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:
  www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:
  www.ibm.com/storage/support/nseries/
  This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:
  www.ibm.com/systems/storage/network/interophome.html
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:
  publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

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 you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure they are connected.
- Check the power switches to make sure the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Refer to the N series support website (accessed and navigated as described in *Websites* on page 8) for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the N series support website (accessed and navigated as described in *Websites* on page 8).

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, ensure that you run the latest level of firmware. Any firmware updates are posted to the N series support website (accessed and navigated as described in *Websites* on page 8).

Note: If you do not see new firmware updates on the N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

How to send your comments

Your feedback helps us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, please send them by email to *starpubs@us.ibm.com*.

Be sure to include the following:

- Exact publication title
- Publication form number (for example, GC26-1234-02)
- Page, table, or illustration numbers
- A detailed description of any information that should be changed

Changes to this document: May 2012

Several changes have been made to this document since it was published for the Solaris Host Utilities 5.1 release.

This document has been updated to add the following information:

- A new `host_config` command that replaces the `basic_config` script for configuring systems. This change means that you need to enter `host_config` instead of `basic_config`, `mpxio_setup`, and/or `create_binding` to configure your host utilities. `basic_config`, `mpxio_set`, and `create_binding` have been removed.
- A new optional `collectinfo` script that collects host information to push to IBM N series controllers for improved product supportability.
- Diagnostic utilities for the Host Utilities have been replaced by nSANity. All of the *_info scripts have been removed.
- Documentation for support of Data ONTAP operating in Cluster-Mode has been added.

The Solaris Host Utilities

The Solaris Host Utilities are a collection of components that enable you to connect Solaris hosts to N series storage systems running Data ONTAP.

Once connected, you can set up logical storage units known as LUNs (Logical Unit Numbers) on the storage system.

Note: Previous versions of the Host Utilities were called FCP Solaris Attach Kits and iSCSI Support Kits.

The following sections provide an overview of the Solaris Host Utilities environments, and information on what components the Host Utilities supply.

What the Host Utilities contain

The Host Utilities bundle numerous software tools into a SAN Toolkit.

Note: This toolkit is common across all the Host Utilities configurations: MPxIO and Veritas DMP as well as FC and iSCSI. As a result, some of its contents apply to one configuration, but not another. Having a program or file that does not apply to your configuration does not affect performance.

The toolkit contains the following components:

- `san_version` command. This command displays the version of the SAN Toolkit that you are running.
- `sanlun` utility. This utility displays information about LUNs on the storage system that are available to this host.
- `host_config` command. This command modifies the SCSI retry and timeout values in the following files:
  - `/kernel/drv/sd.conf`
  - `/kernel/drv/ssd.conf`

  It also adds or deletes the symmetric-option and IBM VIP/PID in the `/kernel/drv/scsi_vhci.conf` file.
- `collectinfo` command. This optional command collects anonymous support information about system hosts such as HBA types, volume manager configuration, and operating system. When the command is executed, this information is pushed to the IBM N series controller. If the IBM N series controller has AutoSupport enabled, this information is part of the payload that is used to ensure future releases of the Host Utilities meet customer needs. This command must be initiated by the user with proper controller login credentials.
- The man pages for sanlun and the diagnostic utilities.

Note: Previous versions of the Host Utilities also included diagnostics programs. These programs have been replaced by the nSANity Diagnostic and Configuration Data Collector and are no longer installed with the Host Utilities. The nSANity program is not part of the Host Utilities. You should download, install, and execute it only when requested to do so by technical support.

- Documentation

  The documentation provides information on installing, setting up, using, and troubleshooting the Host Utilities. The documentation consists of:

  - This *Installation and Setup Guide*
  - *Release Notes*

    Note: The *Release Notes* are updated whenever new information about the Host Utilities is available. You should check the *Release Notes* before installing the Host Utilities to see if there is new information about installing and working with the Host Unities.
  - *Host Settings Changed by the Host Utilities*
  - *Quick Command Reference*

  You can download the documentation when you download the Host Utilities software.

Supported Solaris environments and protocols

The Host Utilities support several Solaris environments.

For details on which environments are supported, see the IBM N series interoperability matrix (accessed andnavigated as described in *Websites* on page 8). The following table summarizes key aspects of the two main environments.

Solaris Environment	Notes

Veritas DMP	• This environment uses Veritas Storage Foundation and its features.
	• Multipathing: Veritas Dynamic Multipathing (DMP) with either Solaris native drivers (Leadville) or iSCSI.
	• Volume management: Veritas Volume Manager (VxVM).
	• Protocols: Fibre Channel (FC) and iSCSI.
	• Software package: Install the software packages in the compressed download file for your processor.
	• Setup issues:
	  • You might need to perform some driver setup.
	  • The Symantec Array Support Library (ASL) and Array Policy Module (APM) might need to be installed. See the N series support website (accessed and navigated as described in *Websites* on page 8) for the most current information on system requirements.
	• Configuration issues:
	  • Systems using SPARC fcp require changes to the parameters in the `/kernel/drv/ssd.conf` file.
	  • Systems using SPARC iSCSI require changes to the parameters in the `/kernel/drv/sd.conf` file.
	  • All x86 systems require changes to the parameters in the `/kernel/drv/sd.conf` file.
	  Note: Asymmetric Logical Unit Access (ALUA) is supported with Veritas 5.1 and later.

Solaris Environment	Notes

MPxIO (Native OS)	• This environment works with features provided by the Solaris operating system. It uses Solaris StorEdge SAN Foundation Software.
	• Multipathing: Solaris StorageTek Traffic Manager (MPxIO) or the Solaris iSCSI Software Initiator.
	• Volume management: Solaris Volume Manager (SVM), ZFS, or VxVM.
	• Protocols: FC and iSCSI.
	• Prior to Data ONTAP 8.1.1, ALUA is only supported in FC environments. (It is also supported with one older version of the iSCSI Support Kit: 3.0.). Data ONTAP 8.1.1 supports ALUA in FC and iSCSI environments.
	• Software package: Download the compressed file associated with your system's processor (SPARC or x86/64) and install the software packages in that file.
	• Setup issues: None.
	• Configuration issues:
	  • Systems using SPARC processors require changes to the parameters in the `/kernel/drv/ssd.conf` file.
	  • Systems using x86 processors require changes to the parameters in the `/kernel/drv/sd.conf` file.

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

How to find instructions for your Solaris Host Utilities environment

Many instructions in this manual apply to all the environments supported by the Host Utilities. In some cases, though, commands or configuration information varies based your environment. To make finding information easier, this guide places a qualifier, such as "**Veritas DMP**," in the title if a section applies only to a specific Host Utilities environment.

That way you can quickly determine whether a section applies to your Host Utilities environment and skip the sections that do not apply.

If the information applies to all supported Solaris Host Utilities environments, there is no qualifier in the title.

This guide uses the following qualifiers to identify the different Solaris Host Utilities environments:

Qualifier	The section that follows applies to
(Veritas DMP)	Environments using Veritas DMP as the multipathing solution.
(Veritas DMP/native)	Veritas DMP environments that use Solaris native drivers.
(Veritas DMP/FC)	Veritas DMP environments that use the FC protocol.
(Veritas DMP/iSCSI)	Veritas DMP environments that use the iSCSI protocol.
(MPxIO)	Environments using MPxIO as the multipathing solution. Currently, all MPxIO environments use native drivers.
(MPxIO/FC)	MPxIO environments using the FC protocol.
(MPxIO/iSCSI)	MPxIO environments using the iSCSI protocol.
(FC)	Environments using the Fibre Channel protocol. **Note:** Unless otherwise specified, FC refers to both FC and FCoE in this guide.
(iSCSI)	Environments using the iSCSI protocol.

There is also information about using the Host Utilities in a Solaris environment in the *Release Notes* and the Solaris Host Utilities reference documentation. You can download all the Host Utilities documentation from the N series support website (accessed and navigated as described in *Websites* on page 8).

Planning the installation and configuration of the Host Utilities

Installing the Host Utilities and setting up your system involves a number of tasks that are performed on both the storage system and the host.

You should plan your installation and configuration before you install the Host Utilities. The following sections help you do this by providing a high-level look at the different tasks you need to perform to complete the installation and configuration of the Host Utilities. The detailed steps for each these tasks are provided in the chapters that follow these overviews.

Note: Occasionally there are known problems that can affect your system setup. Review the *Solaris Host Utilities Release Notes* before you install the Host Utilities. The *Release Notes* are updated whenever an issue is found and might contain information on the Host Utilities that was discovered after this manual was produced.

Overview of prerequisites for installing and setting up the Host Utilities

As you plan your installation, keep in mind that there are several tasks that you should perform before you install the Host Utilities.

The following is a summary of the tasks you should perform before installing the Host Utilities:

1. Verify your system setup:
   - Host operating system and appropriate updates
   - HBAs or software initiators
   - Drivers
   - **Veritas environments only:** Veritas Storage Foundation, the Array Support Library (ASL) for the storage controllers, and if you are using Veritas Storage Foundation 5.0, the Array Policy Module (APM)

     Note: Make sure you have the Veritas Volume Manager (VxVM) installed before you install the ASL and APM software. The ASL and APM are available from the Symantec website.
   - Volume management and multipathing, if used.
   - Storage system with Data ONTAP installed.
   - **iSCSI environments only:** Record or set the host's iSCSI node name.
   - **FC environments only:** Switches, if used.

Note: For information about supported topologies, see the *SAN Configuration Guide (called Fibre Channel and iSCSI Configuration Guide in Data ONTAP 8.1 and earlier)* for your version of Data ONTAP, which is available online.

For the most current information about system requirements, see the N series support website (accessed and navigated as described in *Websites* on page 8).

2. Verify that your storage system is:
   - Licensed correctly for the protocol you are using and running that protocol service.
   - **For Data ONTAP operating in 7-Mode only:** Using the recommended cfmode (single-image).
   - Configured to work with the target HBAs, as needed by your protocol.
   - Set up to work with the Solaris host and the initiator HBAs or software initiators, as needed by your protocol.
   - **FC active/active environments only:** Set up to work with ALUA, if it is supported by your multipathing solution.

     Note: For Data ONTAP operating in 7-Mode, ALUA is not supported with iSCSI.
   - Set up with working volumes and qtrees (if desired).
3. **FC environments only:** If you are using a switch, verify that it is:
   - Set up correctly
   - Zoned
   - Cabled correctly
   - Powered on in the correct order: switches, disk shelves, storage systems, and then the host
4. Confirm that the host and the storage system can communicate.
5. If you currently have the Host Utilities installed, remove that software.

Related information

N series support website: www.ibm.com/storage/support/nseries/

Host Utilities installation overview

The actual installation of the Host Utilities is fairly simple. As you plan the installation, you need to consider the tasks you must perform to get the Host Utilities installed and set up for your environment.

The following is a high-level overview of the tasks required to install the Host Utilities. The chapters that follow provide details on performing these tasks.

1. Get a copy of the compressed Host Utilities file, which contains the software package for your multipathing solution and the SAN Toolkit software package.

- Download the compressed file containing the packages for your multipathing solution.
- Extract the software packages from the compressed file that you downloaded.

2. Install the Host Utilities software packages. You must be logged in as `root` to install the software.
   - From the directory containing the extracted software packages, use the `pkgadd -d` command to install the Host Utilities package for your stack.
   - Set the driver and system parameters. You do this using the `host_config` command.

     Note: You can also set the parameters manually.
3. Complete the configuration based on your environment.
   - **(iSCSI)** There are several tasks you need to perform to get your iSCSI environment set up. They include recording the iSCSI node name, setting up the initiator, and, optionally, setting up CHAP.
   - **(Veritas)** Make sure you have the ASL and APM correctly installed and set up if required for your Veritas version. See the N series support website (accessed and navigated as described in *Websites* on page 8) for the most current information on system requirements.

iSCSI configuration

If you are using the iSCSI protocol, then you must perform some additional configuration to set it up correctly for your environment.

1. Record the host's iSCSI node name.
2. Configure the initiator with the IP address for each storage system. You can use static, ISNS, or sendtargets.
3. **Veritas iSCSI environment only:** Make sure MPxIO is disabled. If you had an earlier version of the Host Utilities installed, you might need to remove the MPxIO settings that it set up and then reboot your host. To remove these settings, do one of the following:
   - Use the `host_config` command to remove both the IBM VID/PID and the symmetric-option from the `/kernel/drv/scsi_vhci.conf` file.
   - Manually edit the `/kernel/drv/scsi_vhci.conf` file and remove the VID/PID entries.
4. (Optional) Configure CHAP on the host and the storage system.

LUN configuration

To complete your setup of the Host Utilities, you need to create LUNs and get the host to see them.

Configure the LUNs by performing the following tasks:

- Create at least one igroup and at least one LUN and map the LUN to the igroup.

One way to create igroups and LUNs is to use the `lun setup` command. Specify `solaris` as the value for the `ostype` attribute. You will need to supply a WWPN for each of the host's HBAs or software initiators.

- **MPxIO FC environments only:** Enable ALUA, if you have not already done so.
- Configure the host to discover the LUNs.
  - **Native drivers:** Use the `/usr/sbin/cfgadm -c configure c`*x* command, where *x* is the controller number of the HBA where the LUN is expected to be visible.
- Label the LUNs using the Solaris format utility (`/usr/sbin/format`).
- Configure the volume management software.
- Display information about the LUNs and HBA.
  You can use the `sanlun` command to do this.

(FC) Information on setting up the drivers

For Emulex branded HBAs, the Emulex Utilities are required to update the firmware and bootcode. These utilities can be downloaded directly from Emulex.

General information on getting the driver software

You can get the driver software from the company website for your HBA.

To determine which drivers are supported with the Host Utilities, check the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8).

- Emulex HBAs with Solaris native drivers: The Emulex software, including the Emulex utility programs and documentation, is available from the Solaris OS download section on the Emulex site.
- QLogic-branded HBAs: The QLogic SANsurfer CLI software and documentation are available on the QLogic support site. QLogic provides a link to its IBM partner sites. You only need this software if you have to manipulate the FCode versions on QLogic-branded HBAs for SAN booting.
- Oracle-branded HBAs: You can also use certain Oracle-branded HBAs. For more information on working with them, see the patch Readme file that Oracle provides.

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

Emulex partner site

QLogic partner site

Downloading and extracting the Emulex software

The following steps tell you how to download and extract the Emulex software and firmware.

About this task

If your HBA uses an earlier version of the firmware than is supported by the Host Utilities, you need to download new firmware when you download the rest of the Emulex software. To determine which firmware versions are supported, check the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8).

Steps

1. On the Solaris host, create a download directory for the Emulex software, such as: `mkdir /tmp/emulex`, and change to that directory.
2. To download the Emulex driver and firmware, go to the location on the Emulex website for the type of drivers you are using:
   - For Emulex HBAs using Solaris native drivers, go to the Solaris OS download section.
3. Follow the instructions on the download page to get the driver software and place it in the `/tmp/emulex` directory you created.
4. Use the `tar xvf` command to extract the software from the files you downloaded.

   Note: If you are using Emulex Utilities for Solaris native drivers, the .tar file you download contains two additional .tar files, each of which contains other .tar files. The file that contains the EMLXemlxu package for native drivers is emlxu_kit-<version>-sparc.tar.

The following command line show how to extract the software from the files for the Emulex Utility bundle for use with Solaris Native drivers:

```
tar xvf solaris-HBAnyware_version-utlity_version-subversion.tar
```

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html/

Solaris drivers for Emulex HBAs (emlxs)

The Host Utilities supports Emulex HBAs with Solaris native drivers. The Emulex software for these drivers is provided as .tar files. You need the .tar files containing the Emulex Fibre Channel Adapter (FCA) Utilities (EMLXemlxu).

The FCA utilities manage the firmware and FCode of the Emulex HBAs with Solaris native drivers. To install and use these utilities, follow the instructions in the Emulex *FCA Utilities Reference Manual*.

The sections that follow contain information on what you need to do to set up these drivers for the Host Utilities' Veritas DMP environment.

Installing the EMLXemlxu utilities

After you extract the EMLXemlxu utilities, you must install the EMLXemlxu package.

Step

1. Run the `emlxu_install` command to install the EMLXemlxu package:

   ```
   # ./emlxu_install
   ```

   Note: For more information on installing and using these utilities, see the Emulex *FCA Utilities Reference Manual*.

Determining the Emulex firmware and FCode versions for native drivers

Make sure you are using the Emulex firmware recommended for the Host Utilities when using Emulex-branded HBAs.

About this task

To determine which version of firmware you should be using and which version you are actually using, complete the following steps:

Steps

1. Check the N series support website (accessed and navigated as described in *Websites* on page 8) to determine the current firmware requirements.
2. Run the emlxadm utility. Enter:

   ```
   /opt/EMLXemlxu/bin/emlxadm
   ```

   The software displays a list of available adapters.
3. Select the device that you want to check.

   The software displays a menu of options.
4. Exit the emlxadm utility by entering `q` at the `emlxadm>` prompt.

Upgrading the firmware for native drivers

If you are not using the Emulex firmware recommended for the Host Utilities using native drivers, you must upgrade your firmware.

About this task

Note: Oracle-branded HBAs have the proper firmware version pushed to the card by the native driver.

Steps

1. Run the emlxadm utility. Enter:

   ```
   /opt/EMLXemlxu/bin/emlxadm
   ```

   The software displays a list of available adapters.
2. At the `emlxadm>` prompt, enter:

   ```
   download_fw filename
   ```

   The firmware is loaded onto the selected adapter.
3. Exit the emlxadm utility by entering `q` at the `emlxadm>` prompt.
4. Reboot your host.

Updating your FCode HBAs with native drivers

If you are not using the correct FCode for HBAs using native drivers, you must upgrade it.

Steps

1. Run the emlxadm utility. Enter:

   ```
   /opt/EMLXemlxu/bin/emlxadm
   ```

   The software displays a list of available adapters.
2. Select the device you want to check.

   The software displays a menu of options.
3. At the emlxadm> prompt, enter:

   ```
   download_fcode filename
   ```

   The FCode is loaded onto the selected adapter.
4. Exit the emlxadm utility by entering `q` at the `emlxadm>` prompt

Solaris drivers for QLogic HBAs (qlc)

The Host Utilities support QLogic-branded and Oracle-branded QLogic OEM HBAs that use the native driver (qlc) software. The following sections provide information on setting up these drivers.

Downloading and extracting the QLogic software

If you are using QLogic drivers, you must download and extract the QLogic software and firmware.

Steps

1. On the Solaris host, create a download directory for the QLogic software. Enter:

   ```
   mkdir /tmp/qlogic
   ```

2. To download the SANsurfer CLI software, go to the QLogic website (www.qlogic.com) and click the Downloads link.
3. Under "OEM Models," click IBM.
4. Click the link for your card type.
5. Choose the latest multiflash or bios image available and save it to the `/tmp/qlogic` directory on your host
6. Change to the /tmp/qlogic directory and uncompress files that contain the SANsurfer CLI software package. Enter:

   ```
   uncompress scli-version.SPARC-X86.Solaris.pkg.Z
   ```

Installing the SANsurfer CLI package

After you extract the QLogic files, you need to install the SANsurfer CLI package.

Steps

1. Install the SANsurfer CLI package using the `pkgadd` command. Enter:.

   ```
   pkgadd -d /tmp/qlogic/scli-version.SPARC-X86.Solaris.pkg
   ```

2. From the directory where you extracted the QLogic software, unzip the FCode package. Enter:

   ```
   unzip fcode_filename.zip
   ```

3. For instructions about updating the FCode, please see the "Upgrading the QLogic FCode" on page 44.

Related tasks

Upgrading the QLogic FCode on page 26

Determining the FCode on QLogic cards

If you are not using the FCode recommended for the Host Utilities, you must upgrade it.

Steps

1. Check the N series support website (accessed and navigated as described in *Websites* on page 8) to determine the current FCode requirements.
2. Run the scli utility to determine whether your FCode is current or needs updating. Enter:

   `/usr/sbin/scli`

   The software displays a menu.
3. Select option `3` (HBA Information Menu).

   The software displays the HBA Information Menu.
4. Select option `1` (Information).

   The software displays a list of available ports.
5. Select the adapter port for which you want information.

   The software displays information about that HBA port.
6. Write down the FCode version and press Return.

   The software displays a list of available ports.
7. Repeat steps 5 and 6 for each adapter you want to query. When you have finished, select option `0` to return to the main menu.

   The software displays the main menu.
8. To exit the scli utility, select option `13` (Quit).

Upgrading the QLogic FCode

If you are not using the correct FCode for HBAs using QLogic, you must upgrade it.

Steps

1. Run the scli utility. Enter:

   `/usr/sbin/scli`

   The software displays a menu.
2. Select option `8` (HBA Utilities).

   The software displays a menu.
3. Select option `3` (Save Flash).

The software displays a list of available adapters.

4. Select the number of the adapter for which you want information.

   The software displays a file name to use.

5. Enter the name of the file into which you want to save the flash contents.

   The software backs up the flash contents and then waits for you to press Return.

6. Press Return.

   The software displays a list of available adapters.

7. If you are upgrading more than one adapter, repeat steps 4 through 6 for each adapter.
8. When you have finished upgrading the adapters, select option 0 to return to the main menu.
9. Select option `8` (HBA Utilities).

   The software displays a menu.

10. Select option `1` ((Update Flash).

    The software displays a menu of update options.

11. Select option `1` (Select an HBA Port)

    The software displays a list of available adapters.

12. Select the appropriate adapter number.

    The software displays a list of Update ROM options.

13. Select option `1` (Update Option ROM).

    The software requests a file name to use.

14. Enter the file name of the multiflash firmware bundle that you extracted from the file you downloaded from QLogic. The file name should be similar to q24mf129.bin.

    The software upgrades the FCode.

15. Press Return.

    The software displays a menu of update options.

16. If you are upgrading more than one adapter, repeat steps 11 through 15 for each adapter.
17. When you have finished, select option `0` to return to the main menu.
18. To exit the scli utility, select option `13` (Quit).

The Solaris Host Utilities installation process

The Solaris Host Utilities installation process involves several tasks. You must make sure your system is ready for the Host Utilities, download the correct copy of the Host Utilities installation file, and install the software. The following sections provide information on tasks making up this process.

Key steps involved in setting up the Host Utilities

Setting up the Host Utilities on your system involves both installing the software package for your stack and then performing certain configuration steps based on your stack.

Before you install the software, confirm the following:

- Your host system meets requirements and is set up correctly. Check the interoperability matrix to determine the current hardware and software requirements for the Host Utilities.
- **(Veritas DMP)** If you are using a Veritas environment, make sure Veritas is set up. For some Veritas versions, you will need to install the Symantec Array Support Library (ASL) and Array Policy Module (APM) for ONTAP storage systems. See the online IBM interoperability matrix for specific system requirements.
- You do not currently have a version of the Solaris Host Utilities, Solaris Attach Kit, or the iSCSI Support kit installed. If you previously installed one of these kits, you must remove it before installing a new kit.
- You have a copy of the Host Utilities software.

When you have installed the software, you can use the `host_config` script it provides to complete your setup and configure your host parameters.

After you install the Host Utilities software, you will need to configure the host system parameters. The configuration steps you perform depend on which environment you are using:

- Veritas DMP
- MPxIO

In addition, if you are using the iSCSI protocol, you must perform some additional setup steps.

The software packages

There are two Host Utilities software distribution packages.

You only need to install the file that is appropriate for your system. The two packages are:

- **SPARC processor systems:** Install this software package if you have either a Veritas DMP environment or an MPxIO environment that is using a SPARC processor.

- **x86/64 systems:** Install this software package if you have either a Veritas environment or an MPxIO environment that is using an x86/64 processor.

Downloading the Host Utilities software

You can download the Host Utilities software package for your environment or you can install it from the physical media.

About this task

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 N series support website (accessed and navigated as described in *Websites* on page 8).

Both the FC protocol and the iSCSI protocol use the same version of the Host Utilities software.

Step

1. Check the publication matrix page at *www.ibm.com/systems/storage/network/interophome.html* for important alerts, news, interoperability details, and other information about the product before beginning the installation.
   - If you are installing the software from the Physical media kit, insert the CD-ROM into your host machine. You are now ready to proceed to the instructions for installing the software.
   - If you are installing the software from the Software updates available for download, go to the N series support website (accessed and navigated as described in *Websites* on page 8).

After you finish

Next you need to uncompress the software file and then install the software using a command such as `pkgadd` to add the software to your host.

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

Installing the Solaris Host Utilities software

Installing the Host Utilities involves uncompressing the files and adding the correct software package to your host.

Before you begin

Make sure you have downloaded the compressed file containing the software package for the Host Utilities or gotten it from the physical media.

In addition, it is a good practice to check the Solaris Host Utilities Release Notes to see if there have been any changes or new recommendations for installing and using the Host Utilities since this installation guide was produced.

Steps

1. Log in to the host system as root.
2. Place the compressed file for your processor in a directory on your host and go to that directory.

   At the time this documentation was prepared, the compressed files were called:

   - SPARC CPU: ibm_solaris_host_utilities_6_0_sparc.tar.gz
   - x86/x64 CPU: ibm_solaris_host_utilities_6_0_amd.tar.gz

     Note: The actual file names for the Host Utilities software might be slightly different from the ones shown in these steps. These are provided as examples of what the filenames look like and to use in the examples that follow. The files you download are correct.

   If you are installing the ibm_solaris_host_utilities_6_0_sparc.tar.gz file on a SPARC system, you might put it in the /tmp directory on your Solaris host.

   The following example places the file in that directory and then moves to the directory:

   ```
   # cp ibm_solaris_host_utilities_6_0_sparc.tar.gz /tmp
   # cd /tmp
   ```

3. Unzip the file using the `gunzip` command.

   The software unzips the tar.gz files. For example, you might enter the following command like to unzip files for a SPARC system.

   The following example unzips files for a SPARC system.

   ```
   # gunzip ibm_solaris_host_utilities_6_0_sparc.tar.gz
   ```

4. Untar the file. You can use the `tar xvf` command to do this.

   The Host Utilities scripts are extracted to the default directory.

The following example uses the `tar xvf` command to extract the Solaris installation package for a SPARC system.

```
# tar xvf ibm_solaris_host_utilities_6_0_sparc.tar
```

5. Add the packages that you extracted from tar file to your host. You can use the `pkgadd` command to do this.

   The packages are added to the /opt/ontap/SANToolkit/bin directory.

   The following example uses the `pkgadd` command to install the Solaris installation package.

```
# pkgadd -d ./ontapSANTool.pkg
```

6. Confirm that the toolkit was successfully installed by using the `pkginfo` command or the `ls -al` command.

```
# ls -alR /opt/NTAP/SANToolkit
/opt/NTAP/SANToolkit:
total 598
drwxr-xr-x   3 root     sys          512 May  9 12:26 ./
drwxr-xr-x   3 root     sys          512 May  9 12:26 ../
-r-xr-xr-x   1 root     sys       292220 Jan  6 13:02 NOTICES.PDF*
drwxr-xr-x   2 root     sys          512 May  9 12:26 bin/

/opt/NTAP/SANToolkit/bin:
total 16520
drwxr-xr-x   2 root     sys          512 May  9 12:26 ./
drwxr-xr-x   3 root     sys          512 May  9 12:26 ../
-r-xr-xr-x   1 root     sys      4724280 May  8 23:36 collectinfo*
-r-xr-xr-x   1 root     sys      2086688 May  8 23:37 host_config*
-r-xr-xr-x   1 root     sys          995 May  8 23:36 san_version*
-r-xr-xr-x   1 root     sys      1606568 May  8 23:37 sanlun*
-r-xr-xr-x   1 root     sys          677 May  8 23:36 vidpid.dat*

# (cd /usr/share/man/man1; ls -al collectinfo.1 host_config.1 sanlun.1)
-r-xr-xr-x   1 root     sys         6367 May  8 23:36 collectinfo.1*
-r-xr-xr-x   1 root     sys         9424 May  8 23:36 host_config.1*
-r-xr-xr-x   1 root     sys         9044 May  8 23:36 sanlun.1*
```

After you finish

To complete the installation, you must configure the host parameters for your environment:

- Veritas DMP
- MPxIO

If you are using iSCSI, you must also configure the initiator on the host.

Information on upgrading or removing the Solaris Host Utilities

You can easily upgrade the Solaris Host Utilities to a new version or remove an older version. If you are removing the Host Utilities, the steps you perform vary based on the version of the Host Utilities or Attach Kit that is currently installed. The following sections provide information on upgrading and removing the Host Utilities.

Upgrading the Solaris Host Utilities or reverting to another version

You can upgrade to a newer version of the Host Utilities or revert to a previous version without any effect on system I/O.

Steps

1. Use the Solaris `pkgrm` command to remove the Host Utilities software package you no longer need.

   Note: Removing the software package does not remove or change the system parameter settings for that I/O stack. To remove the settings you added when you configured the Host Utilities, you must perform additional steps. You do not need to remove the settings if you are upgrading the Host Utilities.

2. Use the Solaris `pkgadd` command to add the appropriate Host Utilities software package.

Methods for removing the Solaris Host Utilities

You should never install the Host Utilities on a host that currently has a version of the Solaris Host Utilities or Attach Kit installed.

There are two standard methods for uninstalling the Host Utilities or Attach Kit from your system. The method you use depends on the version of the kit that is installed.

- For Solaris Host Utilities 5.x, 4.x, or 3.x, use the `pkgrm` command to remove the software package.
- For Solaris Attach Kit 2.0, use the uninstall script included with the Attach Kit to uninstall the software package.

Uninstalling Solaris Host Utilities 5.x, 4.x, 3.x

If you have the Solaris Host Utilities 5.x, 4.x, or 3.0 installed, you can use the `pkgrm` command to remove the software. If you want to revert to the saved parameter values, you must perform additional steps.

Steps

1. If you want to remove the parameters that were set when you ran the `host_config` command or that you set manually after installing the Host Utilities and restore the previous values, you can do one of the following:
   - Replace the system files with the backup files you made before changing the values.
     - **(Sun native drivers)** SPARC systems and systems: /kernel/drv/ssd.conf.
     - **(Sun native drivers)** x86/64 systems: /kernel/drv/sd.conf.
     - **(Veritas DMP)** Replace /kernel/drv/sd.conf
   - Use the `host_config -cleanup` command to revert to the saved values.

     Note: You can only do this once.
2. Use the `pkgrm` command to remove the Solaris Host Utilities software from the `/opt/ontap/SANToolkit/bin directory.`

   The following command line removes the Host Utilities software package.

   ```
   # pkgrm ontapSANTool
   ```
3. You can disable MPxIO by using `stmsboot`:
   - **(For FCP):**

     ```
     # /usr/sbin/stmsboot -D fc -d
     ```

     Answer "n" when prompted to reboot your host.
   - **(For iSCSI):**

     ```
     # /usr/sbin/stmsboot -D iscsi -d
     ```

     Answer "n" when prompted to reboot your host.
4. To enable the changes, reboot your system using the following commands:

   ```
   # touch /reconfigure
   # init 6
   ```

Uninstalling the Attach Kit 2.0 software

If you have the Solaris Attach Kit 2.0 installed, complete the following steps to remove the software.

Steps

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

   You can use the following command to uninstall the existing software.

   ```
   # ./uninstall
   ```

   Note: The uninstall script automatically creates a backup copy of the /kernel/drv/lpfc.conf and sd.conf files as part of the uninstall procedure. It is a good practice, though, to create a separate backup copy before you begin the uninstall.

4. At the prompt "Are you sure you want to uninstall lpfc and sanlun packages?" enter **y**.

   The uninstall script creates a backup copy of the /kernel/drv/lpfc.conf and sd.conf files to /usr/tmp and names them:

   - lpfc.conf.save
   - sd.conf.save

   If a backup copy already exists, the install script prompts you to overwrite the backup copy.

5. Reboot your system.

   You can use the following commands to reboot your system.

   ```
   # touch /reconfigure
   # init 6
   ```

(iSCSI) Additional configuration for iSCSI environments

When you are using the iSCSI protocol, you need to perform some additional tasks to complete the installation of the Host Utilities.

You must:

- Record the host's initiator node name. You need this information to set up your storage.
- Configure the initiator with the IP address for each storage system using either static, ISNS, or dynamic discovery.
- (Optionally) configure CHAP.

The following sections explain how to perform these tasks.

iSCSI node names

To perform certain tasks, you need to know the iSCSI node name.

Each iSCSI entity on a network has a unique iSCSI node name. This is a logical name that is not linked to an IP address.

Only initiators (hosts) and targets (storage systems) are iSCSI entities. Switches, routers, and ports are TCP/IP devices only and do not have iSCSI node names.

The Solaris software initiator uses the iqn-type node name format:

`iqn.`*`yyyy-mm.backward_naming_authority:unique_device_name`*

- *`yyyy`* is the year and *`mm`* is the month in which the naming authority acquired the domain name.
- *`backward_naming_authority`* is the reverse domain name of the entity responsible for naming this device. An example reverse domain name is com.ibm.
- *`unique_device_name`* is a free-format unique name for this device assigned by the naming authority.

The following example shows a default iSCSI node name for a Solaris software initiator:

```
iqn.1986-03.com.sun:01:0003ba0da329.43d53e48
```

(iSCSI) Recording the initiator node name

You need to get and record the host's initiator node name. You use this node name when you configure the storage system.

Steps

1. On the Solaris host console, enter the following command:

   ```
   iscsiadm list initiator-node
   ```

   The system displays the iSCSI node name, alias, and session parameters.
2. Record the node name for use when configuring the storage system.

(iSCSI) Storage system IP address and iSCSI static, ISNS, and dynamic discovery

The iSCSI software initiator needs to be configured with one IP address for each storage system. You can use static, ISNS, or dynamic discovery.

When you enable dynamic discovery, the host uses the iSCSI `SendTargets` command to discover all of the available interfaces on a storage system. Be sure to use the IP address of an interface that is enabled for iSCSI traffic.

Note: See the Solaris Host Utilities Release Notes for issues with regard to using dynamic discovery.

Follow the instructions in the *Solaris System Administration Guide: Devices and File Systems* to configure and enable iSCSI `SendTargets` discovery. You can also refer to the `iscsiadm` man page on the Solaris host.

(Veritas DMP/iSCSI) Support for iSCSI in a Veritas DMP environment

The Host Utilities support iSCSI with certain versions of Veritas DMP.

Check the interoperability matrix to determine whether your version of Veritas DMP supports iSCSI.

To use iSCSI with Veritas DMP, make sure that MPxIO is disabled. If you previously ran the Host Utilities on the host, you might need to remove the MPxIO settings in order to allow Veritas DMP to provide multipathing support.

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

(iSCSI) CHAP authentication

If you choose, you can also configure CHAP authentication. The Solaris initiator supports both unidirectional and bidirectional CHAP.

The initiator CHAP secret value that you configure on the Solaris host must be the same as the inpassword value you configured on the storage system. The initiator CHAP name must be the same as the inname value you configured on the storage system.

Note: The Solaris iSCSI initiator allows a single CHAP secret value that is used for all targets. If you try to configure a second CHAP secret, that second value overwrites the first value that you set.

(iSCSI) Configuring bidirectional CHAP

Configuring bidirectional CHAP involves several steps.

About this task

For bidirectional CHAP, the target CHAP secret value you configure on the Solaris host must be the same as the outpassword value you configured on the storage system. The target CHAP username must be set to the target's iSCSI node name on the storage system. You cannot configure the target CHAP username value on the Solaris host.

Note: Make sure you use different passwords for the inpassword value and the outpassword value.

Steps

1. Set the username for the initiator.

   ```
   iscsiadm modify initiator-node --CHAP-name sunhostname
   ```

2. Set the initiator password. This password must be at least 12 characters and cannot exceed 16 characters.

   ```
   iscsiadm modify initiator-node --CHAP-secret
   ```

3. Tell the initiator to use CHAP authentication.

   ```
   iscsiadm modify initiator-node -a chap
   ```

4. Configure bidirectional authentication for the target.

   ```
   iscsiadm modify target-param -B enable targetIQN
   ```

5. Set the target username.

```
iscsiadm modify target-param --CHAP-name filerhostname targetIQN
```

6. Set the target password. Do not use the same password as the one you supplied for the initiator password. This password must be at least 12 characters and cannot exceed 16 characters.

   ```
   iscsiadm modify target-param --CHAP-secret targetIQN
   ```

7. Tell the target to use CHAP authentication.

   ```
   iscsiadm modify target-param -a chap targetIQN
   ```

8. Configure security on the storage system.

   ```
   iscsi security add -i initiatorIQN -s CHAP -p initpassword -n
   sunhostname -o targetpassword -m filerhostname"
   ```

(iSCSI) Data ONTAP upgrades can affect CHAP configuration

In some cases, if you upgrade the Data ONTAP software running on the storage system, the CHAP configuration on the storage system is not saved.

To avoid losing your CHAP settings, run the `iscsi security add` command. You should do this even if you have already configured the CHAP settings.

About the host_config command

The `host_config` command enables you to configure your system and automatically set recommended system values. You can use the same options for the `host_config` command across all the environments supported by the Host Utilities.

The `host_config` command has the following format:

```
host_config <-setup> <-protocol fcp|iscsi|mixed> <-multipath mpxio|dmp|
non> [-noalua]
```

Note: The `host_config` command replaces the `basic_config` command, which was used with the versions of the Host Utilities prior to 6.0.

This command replaces the `basic_config` command and the `basic_config` command options used prior to 6.0.

You must be logged on as root to run the `host_config` command. The `host_config` command does the following:

- Makes setting changes for the Fibre Channel and SCSI drivers for both X86 and SPARC systems
- Provides SCSI timeout settings for both the MPxIO and DMP configurations
- Sets the VID/PID information
- Enables or disables ALUA
- Configures the ALUA settings used by MPxIO and the SCSI drivers for both X86 and SPARC systems.

  Note: iSCSI is not supported with ALUA if you are running Data ONTAP operating in 7-Mode or Data ONTAP operating in Cluster-Mode prior to release 8.1.1.

host_config options

The `host_config` command has several options you can use. These options apply to all environments. This command is executed on the host.

Option	Description
-setup	Automatically sets the recommended parameters.

Option	Description
-protocol fcp|iscsi|mixed	Lets you specify the protocol you will be using. Enter **`fcp`** if you are using the FC protocol. Enter **`iscsi`** if you are using the iSCSI protocol. Enter **`mixed`** if you are using both the FC and iSCSI protocols.
-multipath mpxio|dmp|none	Lets you specify your multipathing environment. If you are not using multipathing, enter the argument none.
-noalua	Disables ALUA.
-cleanup	Deletes parameters that have been previously set and reinitializes parameters back to the OS defaults.
-help|-H|-?	Displays a list of available commands.
-version	Displays the current version of the Host Utilities.

Valid host_config -setup combinations for Data ONTAP operating in Cluster-Mode

The following parameter combinations can be used with the `host_config` command when your storage system is running Data ONTAP operating in Cluster-Mode.

- `host_config -setup -protocol fcp -multipath mpxio`
- `host_config -setup -protocol fcp -multipath dmp`
- `host_config -setup -protocol iscsi -multipath mpxio`
- `host_config -setup -protocol iscsi -multipath dmp`
- `host_config -setup -protocol mixed -multipath mpxio`
- `host_config -setup -protocol mixed -multipath dmp`

Valid host_config -setup combinations for Data ONTAP operating in 7-Mode

The following parameter combinations can be used with the `host_config` command when your storage system is running Data ONTAP operating in 7-Mode.

- `host_config -setup -protocol fcp -multipath mpxio`
- `host_config -setup -protocol fcp -multipath dmp`

- `host_config -setup -protocol fcp -multipath dmp -noalua`
- `host_config -setup -protocol fcp -multipath none -noalua`
- `host_config -setup -protocol iscsi -multipath mpxio -noalua`
- `host_config -setup -protocol iscsi -multipath dmp -noalua`
- `host_config -setup -protocol iscsi -multipath none -noalua`

host_config command examples

The following examples step you through the process of using the host_config command to configure your system.

Note: If you need to remove these changes, run the `host_config <-cleanup>` command.

Example: Oracle/Solaris FCP Driver with MPxIO Usage (SPARC)

```
# host_config -setup -protocol fcp -multipath mpxio

########################################################################
The following lines will be ADDED to the /kernel/drv/ssd.conf file
########################################################################

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


################################################################################
#
The following lines will be REMOVED from the /kernel/drv/scsi_vhci.conf
file
################################################################################
#

device-type-scsi-options-list =
"NETAPP  LUN", "symmetric-option";
symmetric-option = 0x1000000;


Do you want to continue (y/n): y

########################################################################
To complete the configuration, please run the following commands:
########################################################################

/usr/sbin/stmsboot -D fp -e     (Do not reboot if prompted)
/usr/sbin/shutdown -y -g0 -i 6
```

Example: Oracle/Solaris with DMP and ALUA Usage (SPARC)

```
# host_config -setup -protocol fcp -multipath dmp

########################################################################
The following lines will be ADDED to the /kernel/drv/ssd.conf file
```

```
#####################################################################

ssd-config-list="NETAPP  LUN", "netapp-ssd-config";
netapp-ssd-config=1,0x9007,8,300,30,0,0,0,0,0,0,0,0,30,0,0,2,0,0;


Do you want to continue (y/n): y

#####################################################################
To complete the configuration, please run the following commands:
#####################################################################

/usr/sbin/stmsboot -D fp -d     (Do not reboot if prompted)
/usr/sbin/shutdown -y -g0 -i 6
```

iSCSI and Oracle/Solaris with DMP and ALUA Usage (SPARC)

```
# host_config -setup -protocol mixed -multipath dmp

#####################################################################
The following lines will be ADDED to the /kernel/drv/sd.conf file
#####################################################################

sd-config-list="NETAPP  LUN", "netapp-sd-config";
netapp-sd-config=1,0x9025,8,0,300,0,030,0,0,0,0,0,0,30,0,0,2,0,0;


#####################################################################
The following lines will be ADDED to the /kernel/drv/ssd.conf file
#####################################################################

ssd-config-list="NETAPP  LUN", "netapp-ssd-config";
netapp-ssd-config=1,0x9007,8,300,30,0,0,0,0,0,0,0,0,30,0,0,2,0,0;


Do you want to continue (y/n): y

#####################################################################
To complete the configuration, please run the following commands:
#####################################################################

/usr/sbin/stmsboot -D fp -d     (Do not reboot if prompted)
/usr/sbin/stmsboot -D iscsi -d  (Do not reboot if prompted)
/usr/sbin/shutdown -y -g0 -i 6
```

ISCSI and Oracle/Solaris with MPxIO and ALUA Usage (SPARC)

```
# host_config -setup -protocol mixed -multipath mpxio

#####################################################################
The following lines will be ADDED to the /kernel/drv/ssd.conf file
#####################################################################

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

```
###############################################################################
#
The following lines will be REMOVED from the /kernel/drv/scsi_vhci.conf
file
###############################################################################
#

device-type-scsi-options-list =
"NETAPP  LUN", "symmetric-option";
symmetric-option = 0x1000000;


Do you want to continue (y/n): y

#####################################################################
To complete the configuration, please run the following commands:
#####################################################################

/usr/sbin/stmsboot -D fp -e     (Do not reboot if prompted)
/usr/sbin/stmsboot -D iscsi -e  (Do not reboot if prompted)
/usr/sbin/shutdown -y -g0 -i 6
```

(Veritas DMP/FC) Tasks for completing the setup of a Veritas DMP stack

To complete the Host Utilities installation when you're using a Veritas DMP stack, you must configure the system parameters.

The tasks you perform vary slightly depending on your driver.

- Solaris native drivers: You must modify the `/kernel/drv/ssd.conf` file for SPARC and `/kernel/drv/sd.conf` for x86
- iSCSI drivers: You must modify the `/kernel/drv/sd.conf` file for SPARC and x86

There are two ways to modify these files:

- Manually edit the files.
- Use the `host_config` command to modify them. This command is provided as part of the Solaris Host Utilities and automatically sets these files to the correct values.

  Note: The `host_config` command does not modify the `/kernel/drv/sd.conf` file unless you are using an x86/x64 processor with MPxIO. For more information, see the information on configuring an MPxIO environment.

For a complete list of the host parameters that the Host Utilities recommend you change and an explanation of why those changes are recommended, see the *Host Settings Affected by the Host Utilities* document.

(Veritas DMP) Before you configure the Host Utilities for Veritas DMP

Before you configure the system parameters for a Veritas DMP environment, you need to create backup files.

- Create your own backup of the files you are modifying:
  For systems using Solaris native drivers, make a backup of the `/kernel/drv/ssd.conf` file for SPARC and the `/kernel/drv/sd.conf` for x86.

The `host_config` command automatically creates backups for you, but you can revert to those backups only once. By manually creating the backups, you can revert to them as needed.

Related information

Changing the Cluster cfmode Setting in Fibre Channel SAN Configuration: www.ibm.com/storage/support/nseries/

(Veritas DMP) sd.conf and ssd.conf variables for systems using native drivers

If your system uses Solaris native drivers, you need to modify the values in `/kernel/drv/ssd.conf` file for SPARC and in the `/kernel/drv.sd.conf` file for x86.

Note: Versions of the Host Utilities using native drivers always use single-image cfmode. If you are using native drivers and not using single-image mode, change your mode.

The required values are:

- throttle_max=8
- not_ready_retries=300
- busy_retries=30
- reset_retries=30
- throttle_min=2

The Solaris Host Utilities provides a best-fit setting for target and/or LUN queue depths.

Tasks for completing the setup of a MPxIO stack

To complete the configuration when you're using a MPxIO stack, you must modify the parameters in either `/kernel/drv/ssd.conf` or `/kernel/drv/sd.conf` and set them to the recommended values.

To set the recommended values, you can either:

- Manually edit the file for your system.
- Use the `host_config` command to automatically make the changes.

For a complete list of the host parameters that the Host Utilities recommend you change and an explanation of why those changes are recommended, see the *Host Settings Affected by the Host Utilities* document.

Before configuring system parameters on a MPxIO stack

Before you configure the system parameters on a MPxIO stack using FC, you need to perform certain tasks.

- Create your own backup of the file you are modifying:
  - `/kernel/drv/ssd.conf` for systems using SPARC processors
  - `/kernel/drv/sd.conf` for systems using x86/x64 processors

  The `host_config` command automatically creates backups for you, but you can only revert to those backups once. By manually creating the backups, you can revert to them as needed.
- If MPxIO was previously installed using the Host Utilities or a Host Attach Kit prior to 3.0.1 and ALUA was not enabled, you must remove it.

  Note: iSCSI is not supported with ALUA if you are running Data ONTAP operating in 7-Mode or Data ONTAP prior to 8.1.1. operating in Cluster-Mode. ALUA is supported in the iSCSI Solaris Host Utilities 3.0 and the Solaris Host Utilities using the FC protocol. However, it is not supported with the iSCSI protocol for the Host Utilities 5.x, the iSCSI Solaris Host Utilities 3.0.1, or Solaris 10 Update 3.

Parameter values for systems using MPxIO

You can manually set the parameter values for systems using MPxIO with the FC protocol by modifying `/kernel/drv/ssd.conf` (SPARC processor systems) or `/kernel/drv/sd.conf` (x86/x64 processor systems).

Both SPARC processor systems and x86/x64 processor systems using MPxIO use the same valves. The required values are:

- throttle_max=64
- not_ready_retries=300
- busy_retries=30
- reset_retries=30
- throttle_min=8

You must also set the VIP/PID information to “IBM LUN”. You can use the `host_config` command to configure this information.

(Veritas DMP) Configuration requirements for Veritas Storage Foundation environments

There are several tasks you must perform to set up your Veritas DMP environment. Some of them, such as whether you need to install the Array Support Library (ASL) and the Array Policy Module (APM), depend on your version of Veritas Storage Foundation.

To determine whether you need to install the ASL and APM, check your version of Veritas Storage Foundation:

- If you have Veritas Storage Foundation 5.1, you do not need to install the ASL and APM. They are included with the Veritas Storage Foundation product.
- If you have Veritas Storage Foundation 5.0, you must manually install the ASL and APM.

With the ASL and APM installed, you can use either the `sanlun` utility or VxVM to display information about the paths to the LUNs on the storage system.

In addition to confirming that you have the correct ASL and APM installed for your system, you should also set the Veritas restore daemon values for the restore policy and the polling interval to the Host Utilities recommended values. The section *(Veritas DMP) Setting the restore daemon interval* contains information the values you should use.

(Veritas DMP) The Array Support Library and the Array Policy Module

The ASL and APM for N series storage systems are necessary if you want to use Veritas with the Host Utilities. While the ASL and APM are qualified for the Host Utilities, they are provided and supported by Symantec.

To get the ASL and APM, you must go to the Symantec website and download them.

Note: If you encounter a problem with the ASL or APM, contact Symantec customer support.

To determine which versions of the ASL and APM you need for your version of the Host Utilities, check the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8). This information is updated frequently. After you know the version you need, go to the Symantec website and download the ASL and APM.

The ASL is an IBM-qualified library that provides information about storage array attributes configurations to the Device Discovery Layer (DDL) of VxVM.

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

The 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.

(Veritas DMP) Information provided by the ASL

The ASL provides enclosure-based naming information and array information about SAN-attached storage systems.

The ASL lets you obtain the following information about the LUNs:

- Enclosure name.
  With enclosure-based naming, the name of the Veritas disk contains the model 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 Just a Bunch of Disks (JBOD) devices or raw devices. The enclosure-based naming feature used by VxVM creates a disk name based on the name of its enclosure, or disk array, and not a raw device name.
- Multipathing policy. The storage is accessed as either an active/active (A/A-NETAPP) disk array or an active/passive concurrent (A/P-C-NETAPP) disk array. The ASL also provides information about primary and secondary paths to the storage.

For details about system management, see *Veritas Volume Manager Administrator's Guide*. Veritas documents are available at *Veritas Storage Foundation DocCentral*.

(Veritas DMP) Information on installing and upgrading the ASL and APM

If you are using a Veritas environment, you must use the ASL and APM. While the ASL and APM are included with Veritas Storage Foundation 5.1, other versions of Veritas Storage Foundation require that you install them.

If you are using Veritas Storage Foundation 5.0 or later, you must install both the ASL and the APM.

Before you can install the ASL and APM, you must first remove any currently installed versions of the ASL and the APM.

The basic installation of the ASL and the APM involves the following tasks:

- Verify that your configuration meets system requirements. See the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8) for current information about the system requirements.
- If you currently have the ASL installed, determine its version to see if it is the most up-to-date version for your system.
- If you need to install a newer version of the ASL and APM, remove the older versions before you install the new versions.

You can add and remove ASLs from a running VxVM system. You do not need to reboot the host.

You can use the `pkgrm` command to uninstall the ASL and APM.

Note: In a Veritas Storage Foundation RAC cluster, you must stop clustering on a node before you remove the ASL.

- Get the new ASL and the APM from Symantec.
- Follow the instructions in the Symantec TechNote as well as the steps provided in this chapter to install the new version of the ASL and APM.

(Veritas DMP) ASL and APM installation overview

If you are using DMP with Veritas Storage Foundation 5.0 or later, you must install the ASL and the APM.

The basic installation of the ASL and the APM involves the following tasks:

- Verify that your configuration meets system requirements. See the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8) for current information about the system requirements.
- If you currently have the ASL installed, determine its version.
- If you need to install a newer version of the ASL and APM, remove the older versions before you install the new versions.

  You can add and 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.
- Obtain the new ASL and the APM.
- Follow tech note instructions from Symantec (Veritas) to install new versions of ASL and APM. to install the new version of the ASL and APM.

Related information

N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

(Veritas) Determining the ASL version

If you currently have the ASL installed, you should check its version to determine whether you need to update it.

Step

1. Use the Veritas `vxddladm listversion` command to determine the ASL version.

   The `vxddladm listversion` command generates the following output:

```
# vxddladm listversion
LIB_NAME                        ASL_VERSION      Min. VXVM version
=================================================================
libvxCLARiiON.so                vm-5.0-rev-1            5.0
libvxcscovrts.so                vm-5.0-rev-1            5.0
libvxemc.so                     vm-5.0-rev-2            5.0
libvxengenio.so                 vm-5.0-rev-1            5.0
libvxhds9980.so                 vm-5.0-rev-1            5.0
libvxhdsalua.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
libvxibmds4k.so                 vm-5.0-rev-1            5.0
libvxibmds6k.so                 vm-5.0-rev-1            5.0
libvxibmds8k.so                 vm-5.0-rev-1            5.0
libvxsena.so                    vm-5.0-rev-1            5.0
libvxshark.so                   vm-5.0-rev-1            5.0
libvxsunse3k.so                 vm-5.0-rev-1            5.0
libvxsunset4.so                 vm-5.0-rev-1            5.0
libvxvpath.so                   vm-5.0-rev-1            5.0
libvxxp1281024.so               vm-5.0-rev-1            5.0
libvxxp12k.so                   vm-5.0-rev-2            5.0
libvxibmsvc.so                  vm-5.0-rev-1            5.0
libvxnetapp.so                  vm-5.0-rev-0            5.0
```

(Veritas) How to get the ASL and APM

The ASL and APM are available from the Symantec website. They are not included with the Host Utilities.

To determine which versions of the ASL and APM you need for your version of the host operating system, check *www.ibm.com/systems/storage/network/interophome.html*. This information is updated frequently. When you know which version you need, go to the Symantec website and download the ASL and APM.

Note: Because the ASL and APM are Symantec (Veritas) products, Symantec provides technical support if you encounter a problem using them.

Note: From Veritas Storage Foundation 5.1 onwards, the ASL and APM are included in the Veritas Storage Foundation product.

For Veritas Storage Foundation 5.0 or later, the Symantec TechNote download file contains the software packages for both the ASL and the APM. You must extract the software packages and then install each one separately as described in the TechNote.

Information about getting the Symantec TechNote for the ASL and APM is provided on the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8).

(Veritas DMP) Installing the ASL and APM software

To install a fresh version of the ASL and APM that you downloaded from Symantec involves several steps.

Before you begin

- Make sure you obtain the ASL and APM TechNote, which you can view at the Symantec website. The TechNote contains the Symantec instructions for installing the ASL and APM.
- You should have your LUNs set up before you install the ASL and APM.

Steps

1. Log in to the VxVM system as the root user.
2. If you have your N series storage configured as JBOD in your VxVM configuration, remove the JBOD support for the storage by entering:

   ```
   vxddladm rmjbod vid=NETAPP
   ```

3. Verify that you have downloaded the correct version of the ASL and APM by checking the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8). If you do not already have the correct version or the ASL and APM TechNote, you can follow the link in the matrix to the correct location on the Symantec website.
4. Install the ASL and APM according to the installation instructions provided by the ASL/APM TechNote on the Symantec website.
5. If your host is connected to N series storage, verify your installation by entering:

   ```
   vxdmpadm listenclosure all
   ```

   By locating the Enclosure Type in the output of this command, you can verify the installation. The output shows the model name of the storage device if you are using enclosure-based naming with VxVM.
6. If your host is not connected to storage, use the following command:

   ```
   vxddladm listsupport all
   ```

7. Verify that the APM is installed by entering following command:

   `vxdmpadm listapm all`

After you finish

After you install the ASL and APM, you should perform the following procedures:

- If you have Data ONTAP 7.1 or later, it is recommended that you change the cfmode setting of your clustered systems to single-image mode, and then reconfigure your host to discover the new paths to the disk.

- On the storage system, create LUNs and map them to the igroups containing the WWPNs of the host HBAs.
- On the host, discover the new LUNs and configure them to be managed by VxVM.

Related information

N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

(Veritas DMP) Tasks to perform before you uninstall the ASL and APM

Before you uninstall the ASL and APM, you should perform certain tasks.

- Quiesce I/O
- Deport the disk group

(Veritas) Example of uninstalling the ASL and the APM

The following is an example of uninstalling the ASL and the APM when you have Veritas Storage Foundation 5.0.

If you were actually doing this uninstall, your output would vary slightly based on your system setup. Do not expect to get identical output on your system.

```
# swremove VRTSNTAPapm
======= 05/20/08 18:28:17 IST BEGIN swremove SESSION
(non-interactive) (jobid=hpux_19-0149)
* Session started for user "root@hpux_19".
* Beginning Selection
* Target connection succeeded for "hpux_19:/".
* Software selections:
VRTSNTAPapm.APM_FILES,l=/,r=5.0,v=VERITAS,fr=5.0,fa=HPUX_
B.11.23_PA
* Selection succeeded.
* Beginning Analysis
* Session selections have been saved in the file
"/.sw/sessions/swremove.last".
* The analysis phase succeeded for "hpux_19:/".
* Analysis succeeded.
* Beginning Execution
* The execution phase succeeded for "hpux_19:/".
* Execution succeeded.
NOTE: More information may be found in the agent
logfile using the
command "swjob -a log hpux_19-0149 @ hpux_19:/".
======= 05/20/08 18:28:35 IST END swremove SESSION
(non-interactive)
(jobid=hpux_19-0149)
# swremove VRTSNTAPasl
======= 05/20/08 18:29:01 IST BEGIN swremove SESSION
(non-interactive) (jobid=hpux_19-0150)
* Session started for user "root@hpux_19".
* Beginning Selection
```

```
* Target connection succeeded for "hpux_19:/".
* Software selections:
VRTSNTAPasl.ASL_FILES,l=/,r=5.0,a=HPUX_
B.11.23_IA/PA,v=VERITAS,fr=5.0,fa=HP-UX_B.11.23_PA
* Selection succeeded.
```

(Veritas DMP) Example of 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 installation, your output would vary slightly based on your system setup. Do not expect to get identical output on your system.

```
# pkgadd -d. VRTSNTAPasl

Processing package instance "VRTSNTAPasl" from "/tmp"

Veritas NetApp Array Support Library(sparc) 5.0,REV=11.19.2007.14.03
Copyright © 1990-2006 Symantec Corporation. All rights reserved.

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trademarks of
Symantec Corporation or its affiliates in the U.S. and other
countries. Other
names may be trademarks of their respective owners.

The Licensed Software and Documentation are deemed to be "commercial
computer
software" and "commercial computer software documentation" as defined
in FAR
Sections 12.212 and DFARS Section 227.7202.
Using "/etc/vx" as the package base directory.
## Processing package information.
## Processing system information.
   3 package pathnames are already properly installed.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of "VRTSNTAPasl"
[y,n,?] y

Installing Veritas NetApp Array Support Library as "VRTSNTAPasl"

## Installing part 1 of 1.
/etc/vx/aslkey.d/libvxnetapp.key.2
/etc/vx/lib/discovery.d/libvxnetapp.so.2
[ verifying class "none" ]
```

```
## Executing postinstall script.
Adding the entry in supported arrays
Loading The Library

Installation of "VRTSNTAPasl" was successful.
#

# pkgadd -d. VRTSNTAPapm

Processing package instance "VRTSNTAPapm" from "/tmp"
Veritas NetApp Array Policy Module.(sparc) 5.0,REV=09.12.2007.16.16
      Copyright 1996-2005 VERITAS Software Corporation. All rights
reserved.
      VERITAS, VERITAS SOFTWARE, the VERITAS logo and all other
VERITAS
      product names and slogans are trademarks or registered
      trademarks of VERITAS Software Corporation in the USA and/or
other
      countries. Other product names and/or slogans mentioned herein
may
      be trademarks or registered trademarks of their respective
companies.

Using "/" as the package base directory.
## Processing package information.
## Processing system information.
   9 package pathnames are already properly installed.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of "VRTSNTAPapm"
[y,n,?] y

Installing Veritas NetApp Array Policy Module. as "VRTSNTAPapm"

## Installing part 1 of 1.
/etc/vx/apmkey.d/32/dmpnetapp.key.SunOS_5.10
/etc/vx/apmkey.d/32/dmpnetapp.key.SunOS_5.8
/etc/vx/apmkey.d/32/dmpnetapp.key.SunOS_5.9
/etc/vx/apmkey.d/64/dmpnetapp.key.SunOS_5.10
/etc/vx/apmkey.d/64/dmpnetapp.key.SunOS_5.8
/etc/vx/apmkey.d/64/dmpnetapp.key.SunOS_5.9
/kernel/drv/vxapm/dmpnetapp.SunOS_5.10
/kernel/drv/vxapm/dmpnetapp.SunOS_5.8
/kernel/drv/vxapm/dmpnetapp.SunOS_5.9
/kernel/drv/vxapm/sparcv9/dmpnetapp.SunOS_5.10
/kernel/drv/vxapm/sparcv9/dmpnetapp.SunOS_5.8
/kernel/drv/vxapm/sparcv9/dmpnetapp.SunOS_5.9
[ verifying class "none" ]
## Executing postinstall script.
```

```
Installation of "VRTSNTAPapm" was successful.
```

(Veritas DMP) What an ASL array type is

The ASL reports information about the multipathing configuration to the DD and specifies the configuration as a disk array type.

The configuration is identified as one of the following disk array types:

- Active/active (A/A-NETAPP)—All paths to storage are active and simultaneous I/O is supported on all paths. If a path fails, I/O is distributed across the remaining paths.
- Active/passive concurrent (A/P-C-NETAPP)—The array supports concurrent I/O and load balancing by having multiple primary paths to LUNs. Failover to the secondary (passive) path occurs only if all the active primary paths fail.
- ALUA—The array supports ALUA. The I/O activity is on the primary paths as reported by the RTPG response, and I/O is distributed according to the load balancing policy. The failover to the secondary paths occurs only if all the active primary paths fail.

For additional information about system management, see the *Veritas Volume Manager Administrator's Guide*.

(Veritas DMP) The storage system's FC failover mode or iSCSI configuration and the array types

In clustered storage configurations, the array type corresponds to the storage system cfmode settings or the iSCSI configuration.

If you use the standby cfmode or iSCSI configuration, the array type will be A/A-NETAPP; otherwise, it will be A/P-C-NETAPP.

Note: 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-NETAPP) array types.

(Veritas DMP) Using VxVM to display available paths

If a LUN is being managed by VxVM, then you can use VxVM to display information about available paths to that LUN.

Steps

1. View all the devices by entering:

vxdisk list

The VxVM management interface displays the vxdisk device, type, disk, group, and status. It also shows which disks are managed by VxVM.

2. On the host console, display the path information for the device you want by entering:

   vxdmpadm getsubpaths dmpnodename=*device*

   where *device* is the name listed under the output of the `vxdisk list` command.

3. To obtain path information for a host HBA, enter:

   vxdmpadm getsubpaths ctlr=*controller_name*

   controller_name is the controller displayed under CTLR-NAME in the output of the `vxdmpadm getsubpaths dmpnodename` command you entered in Step 2.

   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.

(Veritas) Displaying multipathing information using sanlun

You can use the Host Utilities `sanlun` utility to display information about the array type and paths to LUNs on the storage system in Veritas DMP environments using ASL and APM.

About this task

When the ASL is installed and the LUN is controlled by VxVM, the output of the `sanlun` command displays the Multipath_Policy as either A/P-C or A/A.

Step

1. On the host, enter the following command:

   # sanlun lun show -p

   The `sanlun` utility displays path information for each LUN; however, it only displays the native multipathing policy. To see the multipathing policy for other vendors, you must use vendor-specific commands.

(Veritas DMP) Veritas environments and the fast recovery feature

Whether you need to enable or disable the Veritas Storage Foundation 5.0 fast recovery feature depends on your environment.

For example, if your host is using DMP for multipathing and running Veritas Storage Foundation 5.0 with the APM installed, you must have fast recovery **enabled**.

However, if your host is using MPxIO with Veritas, then you must have fast recovery **disabled**.

For details on using fast recovery with different Host Utilities Veritas environments, see the *Solaris Host Utilities 6.0 Release Notes*.

(Veritas DMP) The Veritas DMP restore daemon requirements

You must set the Veritas restore daemon values for the restore policy and the polling interval to the Host Utilities recommended values.

These settings determine how frequently the Veritas daemon checks paths between the host and the storage system. By default, the restore daemon checks for disabled paths every 300 seconds.

The Host Utilities recommended settings for these values are a restore policy of "disabled" and a polling interval of "60".

Check the Release Notes to see if these recommendations have changed.

(Veritas DMP) Setting the restore daemon interval for 5.0 MP3 and later

You can change the value of the restore daemon interval to match the recommendation for the Host Utilities. Doing this improves the I/O failover handling.

About this task

At the time this document was prepared, it was recommended that you set the restore daemon interval value to 60 seconds to improve the recovery of previously failed paths and the restore policy to disabled. The following steps take you through the process of setting the values.

Steps

1. Change the restore daemon setting to 60 and set the policy to

   `check_disabled`

   ```
   /usr/sbin/vxdmpadm settune dmp_restore_interval=60
   /usr/sbin/vxdmpadm settune dmp_restore_policy=check_disabled
   ```

   Note: This step reconfigures and restarts the restore daemon without the need for an immediate reboot.

2. Verify the changes.

   ```
   /usr/sbin/vxdmpadm gettune dmp_restore_interval
   /usr/sbin/vxdmpadm gettune dmp_restore_policy
   ```

   The command output shows the status of the vxrestore daemon. Below is a sample of the type of output the command displays.

```
# vxdmpadm gettune dmp_restore_interval
            Tunable                Current Value  Default Value
------------------------------    -------------  -------------
dmp_restore_interval                       60              300

# vxdmpadm gettune dmp_restore_policy
            Tunable                Current Value  Default Value
------------------------------    -------------  -------------
dmp_restore_policy             check_disabled   check_disabled
```

(Veritas DMP) Setting the restore daemon interval for 5.0 MP1 RP4

You can change the value of the restore daemon interval to match the recommendation for the Host Utilities. Doing this improves the I/O failover handling.

About this task

At the time this document was prepared, it was recommended that you set the restore daemon interval value to 60 seconds to improve the recovery of previously failed paths and set the restore policy to disabled. The following steps take you through the process of setting the restore daemon and restore policy values.

Steps

1. Stop the restore daemon.

   ```
   /usr/sbin/vxdmpadm stop restore
   ```

2. Change the restore daemon setting to 60 and set the policy to

   `check_disabled`

   Note: This step reconfigures and restarts the restore daemon without the need for an immediate reboot.

3. Edit the `/lib/svc/method/vxvm-sysboot` file to make the new restore daemon interval persistent across reboots.

   By default, the restore daemon options stored in this file are:

   ```
   restore_daemon_opts="interval=300 policy=check_disabled"
   ```

   Edit the restore daemon options in the `vxvm-sysboot` file so that the interval is 60 seconds.

   ```
   restore_daemon_opts="interval=60 policy=check_disabled"
   ```

4. Save and exit the `/etc/init.d/vxvm-sysboot` file.

5. Verify the changes.

```
/usr/sbin/vxdmpadm stat restored
```

The command output shows the status of the vxrestore daemon. Below is a sample of the type of output the command displays.

```
The number of daemons running: 1
The interval of daemon: 60
The policy of daemon: check_disabled
```

(Veritas DMP) Probe Idle LUN settings

Symantec requires that the probe idle lun setting be disabled in versions 5.0 MP3 and later. I/Os are not issued on LUNs affected by controller failover, and during error analysis they are marked as idle. If the probe idle LUN setting is enabled, DMP proactively checks LUNs that are not carrying I/O by sending SCSI inquiry probes. The SCSI inquiry probes performed on paths that are marked idle as a result of controller failover will fail, causing DMP to mark the path as failed.

Steps

1. Execute the following command to disable the setting.

```
/usr/sbin/vxdmpadm settune dmp_probe_idle_lun=off
```

2. Execute the following command to verify the setting.

```
/usr/sbin/vxdmpadm gettune dmp_probe_idle_lun
```

Below is a sample of the output displayed by the above command.

```
# vxdmpadm gettune dmp_probe_idle_lun
            Tunable               Current Value  Default Value
------------------------------    -------------  -------------
dmp_probe_idle_lun
```

(Veritas DMP) DMP Path Age Settings

If the state of the LUN path changes too quickly, DMP will mark the path as suspect. After the path is marked as suspect, it will be monitored and not be used for I/O for the duration of the `dmp_path_age`. The default monitor time is 300 seconds. Starting in 5.1 SP1, Symantec recommends reducing the default time to 120 seconds to allow for quicker recovery.

About this task

Note: These steps apply to 5.1 SP1 and later.

Steps

1. Execute the following command to disable the setting.

```
/usr/sbin/vxdmpadm settune dmp_path_age=120
```

2. Execute the following command to verify the setting.

```
/usr/sbin/vxdmpadm gettune dmp_path_age
```

This is a sample of the output displayed by the above command:

```
# vxdmpadm gettune dmp_path_age
            Tunable                Current Value  Default Value
------------------------------    -------------  -------------
dmp_path_age                             120              300
```

(Veritas) Information about ASL error messages

Normally, the ASL works silently and seamlessly with the VxVM DDL. If an error, malfunction, or misconfiguration occurs, messages from the library are logged to the console using the host's logging facility. The ASL error messages have different levels of severity and importance.

If you receive one of these messages, call Symantec Technical Support for help. The following table lists the importance and severity of these messages.

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 the 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 fully with Veritas DMP enabled, but the results seen by the user might be other than what is expected. For example, the enclosure name might change.

LUN configuration and the Solaris Host Utilities

Configuring and managing LUNs involves several tasks. Whether you are executing the Host Utilities in a Veritas DMP environment or an MPxIO environment determines which tasks you need to perform. The following sections provide information on working with LUNs in all the Host Utilities environments.

Overview of LUN configuration and management

LUN configuration and management involves a number of tasks.

The following table summarizes the tasks for all the supported Solaris environments. If a task does not apply to all environments, the table specifies the environments to which it does apply. You need to perform only the tasks that apply to your environment.

Task	Discussion
1. Create and map igroups and LUNs	An igroup is a collection of WWPNs on the storage system that map to one or more host HBAs. After you create the igroup, you must create LUNs on the storage system, and map the LUNs to the igroup. For complete information, refer to your version of the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier).
2. **(MPxIO)** Enable ALUA	If your environment supports ALUA, you must have it set up to work with igroups. To see if ALUA is set up for your igroup, use the `igroup show -v` command.
3. **(MPxIO, Solaris native drivers with Veritas DMP)** Display a list of controllers	If you are using an MPxIO stack or Solaris native drivers with Veritas DMP, you need to get information about the controller before you can discover the LUNs. Use the `cfgadm -al` command to display a list of controllers.

Task	Discussion

4. Discover LUNs	**(iSCSI)** When you map new LUNs to the Solaris host, run the following command on the host console to discover the LUNs and create iSCSI device links:
	`devfsadm -i iscsi`
	(MPxIO, Solaris native drivers with Veritas) To discover the LUNs, use the command:
	`/usr/sbin/cfgadm`
	`-c configure cx`
	x is the controller number of the HBA where the LUN is expected to be visible.

5. Label LUNs, if appropriate for your system	Use the Solaris format utility to label the LUNs. For optimal performance, slices or partitions of LUNs must be aligned with the WAFL volume.
6. Configure volume management software	You must configure the LUNs so they are under the control of a volume manager (SVM, ZFS, or VxVM). Use a volume manager that is supported by your Host Utilities environment.

Related information

N series support website: www.ibm.com/storage/support/nseries/

Tasks necessary for creating and mapping LUNs

Before you can work with LUNs, you must set them up.

To set LUNs up, do the following:

- 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.

How the LUN type affects performance

The value you specify for the `ostype` parameter when you create a LUN can affect performance.

For optimal performance, slices or partitions of LUNs must be aligned with the WAFL volume. To achieve optimal performance, you need to provide the correct value for `ostype` for your system. There are two values for `ostype`:

- `solaris`
- `solaris_efi`

Use the `solaris ostype` with UFS and VxFS file systems. When you specify `solaris` as the value for `ostype` parameter, slices or partitions of LUNs are automatically aligned with the WAFL volume.

Solaris uses a newer labeling scheme, known as EFI, for LUNs that will be 2TB or larger, ZFS volumes, and SVM volumes with disk sets. For these situations, you specify `solaris_efi` as the value for the `ostype` parameter when you create the LUN. If the `solaris_efi ostype` is not available, you must perform special steps to align the partitions to the WAFL volume. See the *Solaris Host Utilities Release Notes* for details.

Methods for creating igroups and LUNs

There are several methods for creating igroups and LUNs.

You can create igroups and LUNs on a storage system by entering the following command(s) on the storage system:

- `lun setup`

  This method prompts you through the process of creating a LUN, creating an igroup, and mapping the LUN to the igroup.
- A series of individual commands such as `lun create`, `igroup create`, and `lun map`

  You can use this method to create one or more LUNs and igroups in any order.

Best practices for creating igroups and LUNs

There are several best practices you should consider when you create igroups and LUNs.

The best practices include:

- Disable scheduled snapshots.
- Map the igroup to an application. Make sure the igroup includes all the initiators that the application uses to access its data. (Multiple applications can use the same initiators.)
- Do not put LUNs in the root volume of a storage system. The default root volume is `/vol/vol0`.

(iSCSI) Discovering LUNs

The method you use to discover new LUNs when you are using the iSCSI protocol depends on whether you are using iSCSI with MPxIO or Veritas DMP.

Step

1. To discover new LUNs when you are using the iSCSI protocol, execute the commands that are appropriate for your environment.
   - **(MPxIO)** Enter the command:

     ```
     /usr/sbin/devfsadm -i iscsi
     ```
   - **(Veritas)** Enter the commands:

     ```
     /usr/sbin/devfsadm -i iscsi
     /usr/sbin/vxdctl enable
     ```

   The system probes for new devices. When it finds the new LUNs, it might generate a warning about a corrupt label. This warning means that the host discovered new LUNs that need to be labeled as Solaris disks. You can use the `format` command to label the disk.

   Note: Occasionally the `/usr/sbin/devfsadm` command does not find LUNs. If this occurs, reboot the host with the reconfigure option (`touch /reconfigure; /sbin/init 6`).

Solaris native drivers and LUNs

There are several tasks you need to perform when using Solaris native drivers and working with LUNs. The following sections provide information about those tasks.

(Solaris native drivers) Getting the controller number

Before you discover the LUNs, you need to determine what the controller number of the HBA is.

About this task

You must do this regardless of whether you are using Solaris native drivers with MPxIO or Veritas DMP.

Step

1. Use the `cfgadm -al` command to determine what the controller number of the HBA is. If you use the `/usr/sbin/cfgadm -c configure c` *x* command to discover the LUNs, you need to replace *x* with the HBA controller number.

The following example uses the `cfgadm -al` command to determine the controller number of the HBA. To make the information in the example easier to read, the key lines in the output are shown in **bold**.

```
$ cfgadm -al
Ap_Id                          Type         Receptacle   Occupant
Condition
c0                             fc-fabric    connected    configured
unknown
c0::500a098187f93622           disk         connected    configured
unknown
c0::500a098197f93622           disk         connected    configured
unknown
c1                             scsi-bus     connected    configured
unknown
c1::dsk/c1t0d0                 disk         connected    configured
unknown
c1::dsk/c1t1d0                 disk         connected    configured
unknown
c2                             fc-fabric    connected    configured
unknown
c2::500a098287f93622           disk         connected    configured
unknown
c2::500a098297f93622           disk         connected    configured
unknown
```

(Solaris native drivers) Discovering LUNs

You must both ensure that the host discovers the new LUNs and validate that the LUNs are visible on the host.

About this task

You must do this regardless of whether you are using Solaris native drivers with MPxIO or with Veritas DMP.

Step

1. To discover new LUNs, enter:

   `/usr/sbin/cfgadm -c configure c x`

   where *x* is the controller number of the HBA where the LUN is expected to be visible.

   If you do not see the HBA in the output, check your driver installation to make sure it is correct.

   The system probes for new devices. When it finds the new LUNs, it might generate a warning about a corrupt label. This warning means that the host discovered new LUNs that need to be labeled as Solaris disks.

Labeling the new LUN on a Solaris host

You can use the `format` utility to format and label new LUNs. This utility is a menu-driven script that is provided on the Solaris host. It works with all the environments supported by the Host Utilities.

Steps

1. On the Solaris host, enter:

   `/usr/sbin/format`

2. At the format> prompt, select the disk you want to modify
3. When the utility prompts you to label the disk, enter **y**. The LUN is now labeled and ready for the volume manager to use.
4. When you finish, you can use the `quit` option to exit the utility.

The following examples show the type of output you would see on a system using LPFC drivers and on a system using Solaris native drivers.

Example 1: This example labels disk number 1 on a system using LPFC drivers. (Portions of this example have been removed to make it easier to review.)

```
# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c3t0d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>
          /pci@7c0/pci@0/pci@1/pci@0,2/LSILogic,sas@2/sd@0,0
       1. c4t0d0 <NETAPP-LUN-7310 cyl 1232 alt 2 hd 16 sec 128>
          /pci@7c0/pci@0/pci@1/pci@0,2/lpfc@1/sd@0,0
       2. c4t0d1 <NETAPP-LUN-7310 cyl 1232 alt 2 hd 16 sec 128>
          /pci@7c0/pci@0/pci@1/pci@0,2/lpfc@1/sd@0,1
       3. c4t0d2 <NETAPP-LUN-7310 cyl 1232 alt 2 hd 16 sec 128>
          /pci@7c0/pci@0/pci@1/pci@0,2/lpfc@1/sd@0,2
       4. c4t0d3 <NETAPP-LUN-7310 cyl 1232 alt 2 hd 16 sec 128>
          /pci@7c0/pci@0/pci@1/pci@0,2/lpfc@1/sd@0,3

Specify disk (enter its number):   1
selecting  c4t0d0
[disk formatted]
...
Disk not labeled.  Label it now? y
```

Example 2: This example labels disk number 2 on a system that uses Solaris native drivers with Veritas DMP. (Portions of this example have been removed to make it easier to review.)

```
$ format
Searching for disks...done
```

```
AVAILABLE DISK SELECTIONS:
       0. c1t0d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w500000e01008eb71,0
       1. c1t1d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>
          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w500000e0100c6631,0
       2. c6t500A098387193622d0 <NETAPP-LUN-0.2 cyl 6398 alt 2 hd 16
sec 2048>
          /pci@8,600000/emlx@1/fp@0,0/ssd@w500a098387193622,0
       3. c6t500A098197193622d0 <NETAPP-LUN-0.2 cyl 6398 alt 2 hd 16
sec 2048>
          /pci@8,600000/emlx@1/fp@0,0/ssd@w500a098197193622,0
       4. c6t500A098187193622d0 <NETAPP-LUN-0.2 cyl 6398 alt 2 hd 16
sec 2048>
          /pci@8,600000/emlx@1/fp@0,0/ssd@w500a098187193622,0
       5. c6t500A098397193622d0 <NETAPP-LUN-0.2 cyl 6398 alt 2 hd 16
sec 2048>
          /pci@8,600000/emlx@1/fp@0,0/ssd@w500a098397193622,0

Specify disk (enter its number): 2
selecting c6t500A098387193622d0: TESTER
[disk formatted]
...
Disk not labeled. Label it now? y
```

Example 3: This example runs the `fdisk` command and then labels disk number 15 on an x86/x64 system. You must run the `fdisk` command before you can label a LUN.

```
$Specify disk (enter its number): 15
selecting  C4t60A98000433468594442D367047492Fd0
[disk formatted]

FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        fdisk      - run the fdisk program
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !>cmd>     - execute >cmd>, then return
        quit
format> label
Please run fdisk first.
format> fdisk
No fdisk table exists. The default partition for the disk is:

  a 100% "SOLARIS System" partition
```

```
Type "y" to accept the default partition,  otherwise type "n" to edit
the
 partition table.
y
format> label
Ready to label disk, continue? y

format>
```

Methods for configuring volume management

When your configuration uses volume management software, you must configure the LUNs so they are under the control of the volume manager.

The tools you use to manage your volumes depend on the environment you are working in: Veritas DMP or MPxIO.

Veritas DMP If you are a Veritas DMP environment, even if you are using Solaris native drivers or the iSCSI protocol, you must use VxVM to manage the LUNs. You can use the following Veritas commands to work with LUNs:

- The Veritas `/usr/sbin/vxdctl enable` command brings new LUNs under Veritas control.
- The Veritas `/usr/sbin/vxdiskadm` utility manages existing disk groups.

MPxIO If you are in a MPxIO environment, you can manage LUNs using SVM, ZFS, or, in some cases, VxVM.

Note: To use VxVM in an MPxIO environment, first check the N series support website (accessed and navigated as described in *Websites* on page 8) to see if your environment supports VxVM.

For additional information, refer to the documentation that shipped with your volume management software.

Related information

IBM N series support website: www.ibm.com/storage/support/nseries/

The sanlun utility

The sanlun utility is a tool provided by the Host Utilities that helps collect and report information about paths to your devices and how they map to LUNs on the storage system. You can also use the `sanlun` command to display information about the host HBAs.

Displaying host LUN information with sanlun

You can use `sanlun` to display information about the LUNs connected to the host.

Steps

1. Ensure that you are logged in as root on the host.
2. Change to the /opt/ontap/SANToolkit/bin directory:

   ```
   cd /opt/ontap/SANToolkit/bin
   ```

3. Enter the `sanlun lun show` command to display LUN information. The command has the following format:

   `sanlun lun show [-v] [-d` *`host device filename`* `|` `all` `|`*`controller/vserver_name`* `|` *`controller/vserver_name:<path_name>`*`]`

   `-v` produces verbose output.

   `-d` is the device option and can be one of the following:

   - *`host device filename`* is the special device file name for the disk on Solaris (which might represent a storage system LUN).
   - `all` lists all storage system LUNs under /dev/rdsk.
   - *`controller/vserver_name`* lists all storage system LUNs under /dev/rdsk on that storage system.
   - *`controller/vserver_name:path_name`* lists all storage system LUNs under `/dev/rdsk` that are connected to the storage system path name LUN on that storage system.

   `-p` provides information about the primary and secondary paths available to the LUN when you are using multipathing. You cannot use the `-d` option if you use `-p`. Use the following format:

   `sanlun lun show -p -v [ all|`*`controller/vserver_name`*`|` *`controller/vserver_name:path_Name`* `]`

   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.

   The requested LUN information is displayed.

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/rdsk/<x>`
  to display the summary listing of the LUN(s) associated with the host device /dev/rdsk<x> where x is a device such as /dev/rdsk/c#t#d#.
- `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:storage_system_pathname> command, the utility displays only the LUNs that have been discovered by the host. LUNs that have not been discovered by the host are not displayed.

The following is an example of the output you see when you use the `sanlun show` command in verbose mode on a system using the Veritas DMP stack.

```
# ./sanlun lun show -v
filer: lun-pathname         device filename    adapter lun
size        lun state
filerX: /vol/vol1/hostA_lun2  /dev/rdsk/c0t500A098487093F9Dd5s2
emlxs0  3g (3221225472)  GOOD
        Serial number: HnTMWZEqHyD5
        Filer FCP nodename:500a098087093f9d Filer FCP portname:
00a098397093f9d
        Filer adapter name: 0a
        Filer IP address:       10.60.181.66
        Filer volume name:vol1   FSID:0x331ee81
        Filer qtree name:/vol/vol1   ID:0x0
        Filer snapshot name:   ID:0x0
        LUN partition table permits multiprotocol access: no
                why: bad starting cylinder or bad size for data
```

```
partition
        LUN has valid label: yes
```

Displaying path information with sanlun

You can use `sanlun` to display information about the paths to the storage system.

Steps

1. Ensure that you are logged in as root on the host.
2. Use the `cd` command to change to the `/opt/ontap/SANToolkit/bin` directory.
3. At the host command line, enter the following command to display LUN information:

   ```
   sanlun lun show -p
   ```

   `-p` provides information about the optimized (primary) and non-optimized (secondary) paths available to the LUN when you are using multipathing.

   Note: (MPxIO stack) MPxIO makes the underlying paths transparent to the user. It only exposes a consolidated device such as /dev/rdsk/c7t60A98000433468656834365496C7931d0s2. This is the name generated using the LUN's serial number in the IEEE registered extended format, type 6. The Solaris host receives this information from the SCSI Inquiry response. As a result, sanlun cannot display the underlying multiple paths. Instead it displays the target port group information. You can use the `mpathadm` or `luxadm` command to display the information if you need it.

   `all` lists all storage system LUNs under `/dev/rdsk`.

Explanation of the sanlun lun show -p output

The `sanlun lun show -p` command provides details for both MPxIO stacks and Veritas DMP stacks.

- **(Veritas DMP stack)** path state—Whether the path is enabled or disabled.
- (Veritas DMP stack) path type:
  - Primary paths communicate directly using the adapter on the local storage system.
  - Secondary paths are proxied to the partner storage system over the cluster interconnect.
  - Standby occurs when the path is being serviced by a partner storage system in takeover mode. Note that this case occurs only when Veritas assumes the array policy is Active/Active. If the array policy is Active/Passive and the path is being served by the partner file in the takeover mode, that path state displays as secondary.
- device filename—The special device file name for the disk on Solaris that represents the LUN.
- host HBA—The name of the initiator HBA on the host.

- local storage system port—The port that provides direct access to a LUN. This port appears as the on N series storage systems, where X is the slot number of the HBA. On N5200 and N5500 storage systems, the port is Xa. This is always a primary (optimized) path.
- partner storage system port—The port that provides passive path failover. This port appears as X_C on N series storage systems, where X is the slot number of the HBA. This is always a secondary (unoptimized or indirect) path.
  After the failover of a storage system cluster, the `sanlun lun show -p` command reports secondary paths as secondary but enabled, because these are now the active paths.

Displaying host HBA information with sanlun

You can use `sanlun` to display information about the host HBA.

Steps

1. Ensure that you are logged in as root on the host.
2. Change to the /opt/ontap/SANToolkit/bin directory.
3. At the host command line, enter the following command to display host HBA information:

   `./sanlun fcp show adapter [-c] [-v] [adapter name | all]`

   -c option produces configuration instructions.

   -v option produces verbose output.

   all lists information for all FC adapters.

   The FC adapter information is displayed.

The following command line displays information about the adapter on a system using the qlc driver.

```
# ./sanlun fcp show adapter -v

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

```
OS device name: /dev/cfg/c1
adapter name: qlc1
WWPN: 210000e08b88b838
WWNN: 200000e08b88b838
driver name: 20060630-2.16
model: QLA2462
model description: Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel
serial number: Not Available
hardware version: Not Available
driver version: 20060630-2.16
firmware version: 4.0.23
Number of ports: 1 of 2
port type: Fabric
port state: Operational
supported speed: 1 GBit/sec, 2 GBit/sec, 4 GBit/sec
negotiated speed: 4 GBit/sec
OS device name: /dev/cfg/c2
adapter name: qlc2
WWPN: 210100e08ba8b838
WWNN: 200100e08ba8b838
driver name: 20060630-2.16
model: QLA2462
model description: Qlogic PCI-X 2.0 to 4Gb FC, Dual Channel
serial number: Not Available
hardware version: Not Available
driver version: 20060630-2.16
firmware version: 4.0.23
Number of ports: 2 of 2
port type: Fabric
port state: Operational
supported speed: 1 GBit/sec, 2 GBit/sec, 4 GBit/sec
negotiated speed: 4 GBit/sec
OS device name: /dev/cfg/c3
```

About the collectinfo command

`collectinfo` is an optional command that collects anonymous support information about system hosts such as HBA types, volume manager configuration and operating system.

When `collectinfo` is executed, this information is pushed to the IBM N series controller. If the IBM N series controller has AutoSupport enabled, this information is part of the payload that is used to ensure that future releases of the Host Utilities meet customer needs. This command must be initiated by the user.

Note: You must be logged as "root" to run `collectinfo`.

The `collectinfo` command has the following format:

- `collectinfo [-controller 7-Mode_Controller_IP_or_Hostname] [-user username] [-password password] [-use_http]`
- `collectinfo [-controller Cluster-Mode_Data_Vserver_IP_or_Hostname] [-user username] [-password password] [-use_http]`
- `collectinfo [-help|-h|-?]`
- `collectinfo [-version]`

collectinfo options

The `collectinfo` command has several options you can use. These options apply to all environments. This command is executed on the host.

Option	Description
`-controller Cluster-Mode_Data_Vserver_IP_or_Hostname | 7-Mode_Controller_IP_or_Hostname> <`	**For Data ONTAP operating in Cluster-Mode:** Specify the IP address or hostname of a LIF on the cluster Vserver. This LIF should have data-protocol set to "none" and cannot be a cluster-mgt LIF. **For Data ONTAP operating in 7-Mode:** Specify the IP address or hostname of one of the controllers. You will be prompted for this information if it is not specified.
`-user <username>`	Username to connect to the controller. You will be prompted for this information if it is not specified.
`-password <password>`	Password to use when connecting. You will be prompted for this information if it is not specified.

Option	Description
`-use_http`	Use the HTTP protocol to connect instead of the default protocol of HTTPS. **Note:** If this option is chosen, information will be sent over the wire to the controller in an unencrypted format.
`-help|-h|-?`	Print the usage statement.
`-version`	Print the program version.

collectinfo command example

The following example steps you through the process of using the `collectinfo` command.

```
# ./collectinfo.pl -controller test01 -user root -password ""

Please enter the password for user ‘root’:

Gathering system information


General Info:
=============
Hostid:                                 162f26f7
OS:                                     Solaris 10U10
Server Platform:                        i86pc
File Systems Mounted:                   UFS ZFS

Multipathing Info:
==================
Native Multipathing:                    In Use
Veritas DMP:                            Not In Use

Native VM and Cluster Info:
===========================
Solaris Volume Manager:                 Not In Use
Sun Cluster:                            Not Installed
ZFS File System:                        In Use

Symantec Product Info:
======================
VCS:                                    Not Installed
Veritas Volume Manager:                 Not Installed
Veritas File System:                    Not Installed
Veritas Cluster File System:            Not Installed
```

```
HBA Info:
=========
Model                Driver               Firmware
==================== ==================== ====================
111-00778            2.50o                2.701.462.1
LPe11002-M4          2.50o                2.70a5

Sending config to the EMS logs on controller 'test01'
```

SAN boot LUNs in a Solaris Veritas DMP environment with FC

You can set up a SAN boot LUN to work in a Veritas DMP environment that is using the FC protocol and running the Solaris Host Utilities.

Note: At the time this document was produced, Veritas DMP environments only supported SAN boot LUNs with the FC protocol. The Veritas DMP environment did not support SAN boot LUNs in an iSCSI environment.

The method you use for creating a SAN boot LUN and installing a new OS image on it in a DMP environment can vary, depending on the drivers you are using.

The sections that follow provide steps for configuring a SAN boot LUN and installing a new OS image on it. You can apply these steps to most configurations.

There are also other methods for creating a SAN boot LUN. This document does not describe other methods for creating bootable LUNs, such as creating configurations that boot multiple volumes or use diskless servers.

If you are using Solaris native drivers, refer to Solaris documentation for details about additional configuration methods. In particular, see the Oracle document, *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide*, which is available in PDF format on the Oracle site at docs.oracle.com.

Note:

Solutions and components are qualified on an ongoing basis. To verify that SAN booting is supported in your configuration, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Related information

Sun StorEdge SAN Foundation Software 4.4 Configuration Guide

(Veritas DMP) Prerequisites for creating a SAN boot LUN

You need to have your system set up and the Host Utilities installed before you create a SAN boot LUN for a Veritas DMP environment.

Note: SAN booting is only supported in Veritas environments that use the FC protocol. It is not supported with the iSCSI protocol.

Before attempting to create a SAN boot LUN, make sure the following prerequisites are in place:

- The Solaris Host Utilities software has been installed and the host and storage system are configured properly and use software and firmware that is supported by the Host Utilities
- The host operating system is installed on a local disk and uses a UFS file system.
- Bootcode/FCode is downloaded and installed on the HBA.
  - For Emulex HBAs, the FCode is available on the Emulex site.
  - For Qlogic-branded HBAs, the FCode is available on the QLogic site.
  - For Oracle-branded QLogic HBAs, the FCode is available as a patch from Oracle.
- If you are using Emulex HBAs, you must have the Emulex FCA utilities with EMLXemlxu and the EMLXdrv installed.
- If you are using Emulex-branded HBAs or Oracle-branded Emulex HBAs, make sure you have the current FCode. The FCode is available on the Emulex site.
- If you are using QLogic-branded HBAs, you must have the SANsurfer SCLI utility installed.

(Veritas DMP) SAN boot configuration overview

To configure a bootable LUN in a Veritas DMP environment, you must perform several tasks.

The following is a high-level overview of the tasks to help you plan the configuration.

1. Make sure the HBA is set to the appropriate Bootcode:
2. Create the boot LUN:
   - Create the LUN that you will use for the bootable LUN.
   - Display the size and layout of the partitions of the current Solaris boot drive.
   - Partition the bootable LUN to match the host boot drive.
3. Select the method for installing to the SAN booted LUN:
   - Directly Install the bootblks onto the bootable LUN.
   - Perform a file system dump and restore to a SAN booted LUN.
     1. Install the bootblks onto the bootable LUN.
     2. Copy the boot data from the source disk onto the bootable LUN.
4. Modify the Bootcode
   - Verify the OpenBoot version.
   - Set the FC topology to the bootable LUN.
   - Bind the adapter target and the bootable LUN.
   - Create an alias for the bootable LUN.
5. Reboot the system.

(Veritas DMP/native) About setting up the Oracle native HBA for SAN booting

Part of configuring a bootable LUN when using Veritas DMP with Solaris native drivers is setting up your HBA. To do this, you might need to shut down the system and switch the HBA mode.

The Veritas DMP environment supports two kinds of Oracle native HBAs. The actions you take to set up your HBA depend on the type of HBA you have. If you have

- An Emulex HBA, you must make sure the HBA is in SFS mode.
- A QLogic HBA, you must change the HBA to enable FCode compatibility.

Note: If you have LPFC HBAs, you must perform different steps.

(Veritas DMP/native) SPARC: Changing the Emulex HBA to SFS mode

To change the mode on an Emulex HBA from an SD compatible mode to an SFS mode, you must bring the system down and then change each HBA.

About this task

Caution: These steps will change the device definition from lpfc@ to emlxs@. Doing this will cause the controller instance to be incremented. Any devices current on the controllers that are being modified will receive new controller numbers. If you are currently mounting these devices by using the `/etc/vfstab` file, those entries will become invalid.

Steps

1. At the operating system prompt, issue the `init 0` command.

   ```
   # init 0
   ```

2. When the `ok` prompt appears, enter the `setenv auto-boot? false` command.

   ```
   ok setenv auto-boot? false
   ```

3. Enter the `reset-all` command.

   ```
   ok reset-all
   ```

4. Issue the `show-devs` command to see the current device names.

   The following example uses the `show-devs` command to see if the Emulex device has been set to SFS mode. In this case, executing the command shows that the device has not been set to SFS mode because the devices (shown in **bold**) are displayed as .../lpfc, not .../emlxs. See Step 5 for information setting the devices to SFS mode.

   ```
   ok show-devs
   controller@1,400000
   ```

```
/SUNW,UltraSPARC-III+@1,0
/memory-controller@0,400000
/SUNW,UltraSPARC-III+@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/pci@8,600000/SUNW,qlc@4
/pci@8,600000/SUNW,qlc@4/fp@0,0
/pci@8,600000/SUNW,qlc@4/fp@0,0/disk
/pci@8,700000/lpfc@3
/pci@8,700000/lpfc@1
/pci@8,700000/scsi@6,1
/pci@8,700000/scsi@6
/pci@8,700000/usb@5,3
```

5. Select the first Emulex device and set it to SFS mode using the `set-sfs-boot` command. Doing this changes the devices to emlxs devices.

   In this example the first command, `show-devs`, shows the device name. The next command, `select`, selects the device lpfc@0. Then the `set-sfs-boot` command sets the SFS mode. Some of the output has been truncated to make this example easier to read. To make the SFS information easy to locate, it is in **bold**.

```
ok show-devs
...output truncated...
/pci@0/pci@0/pci@8/pci@0/pci@1/lpfc@0,1
/pci@0/pci@0/pci@8/pci@0/pci@1/lpfc@0
...output truncated...
ok select /pci@0/pci@0/pci@8/pci@0/pci@1/lpfc@0
ok set-sfs-boot
Flash data structure updated.
Signature          4e45504f
Valid_flag               4a
Host_did                  0
Enable_flag               5
SFS_Support               1
Topology_flag             0
Link_Speed_flag           0
Diag_Switch               0
Boot_id                   0
Lnk_timer                 f
Plogi-timer               0
LUN (1 byte)              0
DID                       0
WWPN               0000.0000.0000.0000
LUN (8 bytes)      0000.0000.0000.0000

*** Type reset-all to update. ***
ok
```

6. Repeat Step 5 for each Emulex device.

7. Enter the `reset-all` command to update the devices.

   In this example the reset-all command updates the Emulex devices with the new mode.

```
ok reset-all
Resetting ...
```

8. Issue the `show-devs` command to confirm that you have changed the mode on all the Emulex devices.

   The following example uses the `show-devs` command to confirm that the Emulex devices are showing up as emlx devices. To continue the example shown in from Step 5, the device selected there, `/pci@0/pci@0/pci@8/pci@0/pci@1/lpfc@0`, has been changed to an emlx device. In a production environment, you would want to change all the devices to emlx.

```
ok show-devs
/pci@0/pci@0/pci@8/pci@0/pci@1/lpfc@0,1
/pci@0/pci@0/pci@8/pci@0/pci@1/emlx@0
/memory-controller@1,400000
/SUNW,UltraSPARC-III+@1,0
/memory-controller@0,400000
/SUNW,UltraSPARC-III+@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/pci@8,600000/SUNW,qlc@4
/pci@8,600000/SUNW,qlc@4/fp@0,0
/pci@8,600000/SUNW,qlc@4/fp@0,0/disk
/pci@8,700000/scsi@6,1
/pci@8,700000/scsi@6
/pci@8,700000/usb@5,3
```

9. Set the `auto-boot?` back to true and boot the system with a reconfiguration boot.

   This example uses the boot command to bring the system back up.

```
ok setenv auto-boot? true
ok boot -r
```

(Veritas DMP/native) SPARC: Changing the QLogic HBA to enable FCode compatibility

To enable FCode compatibility on a QLogic HBA, you must bring the system down and then change each HBA.

Steps

1. At the operating system prompt, issue the `init 0` command.

```
# init 0
```

2. When the `ok` prompt appears, enter the `setenv auto-boot? false` command.

```
ok setenv auto-boot? false
```

3. Enter the `reset-all` command.

```
ok reset-all
```

4. Issue the `show-devs` command to see the current device names.

   The following example uses the `show-devs` command to see whether there is FCode compatibility. It has been truncated to make it easier to read.

```
ok show-devs
…
/pci@7c0/pci@0/pci@8/QLGC,qlc@0,1
/pci@7c0/pci@0/pci@8/QLGC,qlc@0
/pci@7c0/pci@0/pci@8/QLGC,qlc@0,1/fp@0,0
/pci@7c0/pci@0/pci@8/QLGC,qlc@0,1/fp@0,0/disk
/pci@7c0/pci@0/pci@8/QLGC,qlc@0/fp@0,0
/pci@7c0/pci@0/pci@8/QLGC,qlc@0/fp@0,0/disk
```

5. Select the first QLogic device.

   This example uses the `select` command to select the first QLogic device.

```
ok select /pci@7c0/pci@0/pci@8/QLGC,qlc@0,1
QLogic QLE2462 Host Adapter Driver(SPARC): 1.16 03/10/06
```

6. If you need to set the compatibility mode to fcode, execute the `set-mode` command.

   The following example uses the `set-mode` command to set the compatibility mode to fcode.

```
ok set-mode
Current Compatibility Mode: fcode
Do you want to change it? (y/n)
Choose Compatibility Mode:
0 - fcode
1 - bios
enter: 0
Current Compatibility Mode: fcode
```

7. Execute the `set-fc-mode` command and, if needed, to set the Fcode Mode to `qlc`.

   The following example uses the `set-mode` command to set the mode to `qlc`.

```
ok set-fc-mode
Current Fcode Mode: qlc
Do you want to change it? (y/n)
Choose Fcode Mode:
0 - qlc
1 - qla
enter: 0
Current Fcode Mode: glc
```

8. Repeat the previous steps to configure each QLogic device.

9. Enter the `reset-all` command to update the devices.

   The following example uses the `reset-all` command to update the QLogic devices with the new mode.

   ```
   ok reset-all
   Resetting ...
   ```

10. Set the `auto-boot?` back to true and boot the system with a reconfiguration boot.

    This example uses the `boot` command to bring the system back up.

    ```
    ok setenv auto-boot? true
    ok boot -r
    ```

(Veritas DMP) Information on creating the bootable LUN

After setting up the HBAs, you must create the LUN you want to use a boot LUN.

Use standard storage system commands and procedures to create the LUN and map it to a host.

In addition, you must partition the bootable LUN so that it matches the partitions on the host boot device. Partitioning the LUN involves:

- Displaying information about the host boot device.
- Modifying the bootable LUN to model the partition layout of the host boot device.

(Veritas DMP) SPARC: Copying data from locally booted server

You can copy data from a locally booted server, if you have a SPARC system that is using DMP.

Steps

1. Use the `mount` command to identify the current boot device.

   Example
   The following example mounts the current boot device.

   ```
   # mount

   / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/
   logging/xattr/onerror=panic/dev=1980000 on Tue Jan 2 12:50:22 2007
   ```

2. Use the `format` command to choose the LUN.
3. Write down the device path from the LUN so you can refer to it later. You need to configure the LUN for:

   - The root file system

- The file systems that will be copied to the bootable LUN. You might want to create slices and place the file systems on the slices.

In addition, you might want to set up the swap slice.

Example

In this example, which uses a QLogic HBA, you have already run the `format` command and based on its output, determined that you want number 33, which has the device path `/pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20.c3t500A09818350B481d32 <DEFAULT cyl 9787 alt 2 hd 255 sec 63> /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20`

Note: Emulex HBAs have "fc" in the device name. QLogic HBAs have "fp" in the device name.

4. Create the SAN file system that you will dump the current file system to.

   Example
   This example uses the following command line to create a new file system.

   ```
   # newfs /dev/dsk/c3t500A09818350B481d32s0
   ```

5. Mount the file system that you will use when you copy the boot data.

   Example
   The following example mounts the file system.

   ```
   # mount /dev/dsk/c3t500A09818350B481d32s0 /mnt/bootlun
   ```

6. Create the required directory structure on the bootable LUN and copy the boot data. Enter:

   `# ufsdump 0f - <source_boot_device> | (cd /<mntpoint of bootable_ lun>; ufsrestore rf -)`

   Note: If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see the Oracle document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide* for instructions.

   Example
   The following example copies the information from c0t0d0s0.

   ```
   # ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /mnt/bootlun; ufsrestore rf -)
   ```

7. Install the bootblk onto the raw bootable LUN.

   The bootblk contains startup information that the Solaris host requires.

   a) Determine the directory in `/usr/platform` where the bootblks are located. Enter:

      `uname -i`

Example

In this example, the output indicates that bootblks should reside in `/usr/platform/sun4u`.

```
# uname -i
SUNW, Sun-Fire-280R
```

b) Write the bootblk. Enter:

`/usr/sbin/installboot /usr/platform/`uname -i`/lib/fs/ufs/bootblk / dev/ rdsk/<device_name>`

Example

The following example installs bootblks in the `/usr/platform/`uname -i`` directory on `/dev/rdsk/c2t500A098786F7CED2d11s0`.

```
#/usr/sbin/installboot /usr/platform/sun4u/lib/fs/ufs/bootblk /dev/
rdsk/c2t500A098786F7CED2d11s0
```

8. Edit the `/etc/vfstab` file to on the SAN file system. Change the swap, root, and file systems in the file to show the boot device instead of the local device.

One way to do this is edit the file using vi.

```
# cd /mnt/bootlun/etc/
# vi vfstab
```

Example

The following example shows the `vfstab` entry for the bootable LUN.

```
#device device mount FS fsck mount
mount

#to mount to fsck point type pass at boot options
#
fd - /dev/fd fd - no -
/proc - /proc proc - no -
/dev/dsk/c3t500A09818350B481d32s1 - - swap -
no -
/dev/dsk/c3t500A09818350B481d320 /dev/rdsk/c3t500A09818350B481d32s0 /
ufs 1 no -
/dev/dsk/c3t500A09818350B481d32s6 /dev/rdsk/c3t500A09818350B481d32s6 /
globaldevices ufs 2 yes
-
/devices - /devices devfs - no -
ctfs - /system/contract ctfs - no -
objfs - /system/object objfs - no -
swap - /tmp tmpfs - yes -
```

(Veritas DMP/native) Methods for installing directly onto a SAN boot LUN

If you are using Solaris native drivers, you can perform a direct installation onto the SAN boot LUN.

You can install the Solaris operating system using:

- A CD/DVD installation
- A jumpstart installation

During the installation, select the bootable LUN you created earlier.

(Veritas DMP) What OpenBoot is

OpenBoot is the firmware that the host uses to start up the system. OpenBoot firmware also includes the hardware level user interface that you use to configure the bootable LUN.

When you're setting up a SAN boot LUN, you need to modify OpenBoot to create an alias for the bootable LUN. The alias substitutes for the device address during subsequent boot operations.

The steps you need to perform to modify OpenBoot differ based on whether you are using Solaris native drivers.

The following sections provide information on working with OpenBoot.

(Veritas DMP/native) Modifying SPARC OpenBoot with Solaris native drivers

You must create an alias for the bootable LUN when you modify OpenBoot using Solaris native drivers.

About this task

The alias you create substitutes for the device address (`/pci@8,700000/emlxs@1/sd@3,0` in the example that follows) during subsequent boot operations.

Steps

1. Perform the following steps to activate the OpenBoot environment.
   a) To halt the Solaris operating system, enter

      ```
      init 0
      ```

      The OpenBoot program displays the OpenBoot prompt.
   b) To stop automatic reboot during OpenBoot configuration, enter

      ```
      setenv auto-boot? false
      ```

c) To reset the host and activate your changes, enter

`reset -all`

2. Run the `show-disks` command to get the correct device path name for your FC card.

   It is important to look for the device path associated with the LUN you used during the earlier format step. Due to the way the OBP sees hardware, the device can show up with either "disk" or "ssd" as the terminating characters and those characters might differ from what was seen in the format output.

   Example

   In this example, the output shown here continues the example used in the section on Partitioning the bootable LUN to match the host device. It uses the information that was written down when you executed the `format` command. The LUN is "w500a098786f7ced2,b" and the device path is `/pci@1d,700000/emlx@2/fp@0,0/ssd 4. c2t500A098786F7CED2d11 >NETAPP-LUN-0.2 cyl 1022 alt 2 hd 16 sec 128> /pci@1d,700000/emlx@2/fp@0,0/ssd@w500a098786f7ced2,b`.

   Example
   The following example shows the type of output you see when you execute the `show-disks` command.

```
{1} ok show-disks
a) /pci@1f,700000/scsi@2,1/disk
b) /pci@1f,700000/scsi@2/disk
c) /pci@1e,600000/ide@d/cdrom
d) /pci@1e,600000/ide@d/disk
e) /pci@1d,700000/emlx@2,1/fp@0,0/disk
f) /pci@1d,700000/emlx@2/fp@0,0/disk
q) NO SELECTION
Enter Selection, q to quit:
```

3. To create an alias for the bootable LUN, enter

   `nvalias <alias_name><boot_LUN_pathname>`

   Example
   This example creates an alias called "sanbootdisk".

```
{0} ok nvalias sanbootdisk /pci@1d,700000/emlx@2/fp@0,0/
ssd@w500a098786f7ced2,b
{0} ok nvstore
{0} ok devalias sanbootdisk /pci@8,700000/emlx@2/fp@0,0/
ssd@w500a098786f7ced2,b
```

4. To add the LUN's alias to your boot device list and allow the system to autoboot to the LUN, enter

   `setenv boot-device <alias_name>`

   Note: Before adding the new alias, use the `printenv boot-device` command to see if there are already boot devices in the list. If aliases are in the list, you'll need to include them on the

`setenv boot-device` command line after the bootable LUN's alias. That alias must always be the first argument. The format for the command would be as follows:

```
setenv boot-device <bootable_lun_alias_name> <existing_alias1>
<existing_alias2> ...
```

Example

This example assumes that you have created the alias sanbootdisk for your bootable LUN. You check the boot device list and discover that there are already two boot devices in the list: disk and net. To add the alias sanbootdisk, you would enter the `setenv boot-device` command followed by sanbootdisk and the other two aliases in the list.

```
{0} ok setenv boot-device sanbootdisk disk net
```

5. To enable auto-boot, enter

   `setenv auto-boot? true`

6. To boot the LUN, enter

   `boot <alias name>`

   Example

   This example boots the alias for `/pci@1d,700000/emlx@2/fp@0,0/disk@w500a098786f7ced2,b`

   ```
   {0} ok boot sanbootdisk
   ```

7. Once the server has booted off of the SAN LUN, it is recommended that encapsulation of the root disk is enabled so that Veritas DMP multipathing is enabled for that device.

   To do this, run `vxdiskadm` and choose menu option 2.

   Your host will reboot on the new encapsulated volume.

   ```
   # /usr/sbin/vxdiskadm
   ```

8. Use the `df -k` command to verify that you booted to the correct LUN.

9. Use the `dumpadm -d` command to configure the system crash dump for the new bootable LUN.

   Example

   ```
   # dumpadm -d /path/to/swap_device
   ```

(Veritas DMP) x86/x64: Copying data from locally booted server

If you have an x86/x64 system using DMP, you can copy data from a locally booted server.

Steps

1. Use the `mount` command to identify the current boot device.

   Example
   The following example mounts the current boot device.

   ```
   # mount

   / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/
   logging/xattr/onerror=panic/dev=1980000 on Tue Jan 2 12:50:22 2007
   ```

2. Use the `format` command to choose the LUN.
3. Write down the device path for the LUN so you can refer to it later. You need to configure the LUN for:

   - The root file system
   - The file systems that will be copied to the bootable LUN. You might want to create slices and place the file systems on the slices.

   In addition, you might want to set up the swap slice.

   Example
   In this example, which uses a QLogic HBA, you have already run the `format` command and, based on its output, determined that you want number 33, which has the device path `/pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20`

   ```
   c3t500A09818350B481d32 <DEFAULT cyl 9787 alt 2 hd 255 sec 63> /pci@0,0/
   pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20
   ```

   Note: Emulex HBAs have "fc" in the device name. QLogic HBAs have "fp" in the device name.

4. Create the SAN file system to which you will dump the current file system.

   Example
   This example uses the following command line to create a new file system.

   ```
   # newfs /dev/dsk/c3t500A09818350B481d32s0
   ```

5. Mount the file system that you will use when you copy the boot data.

   Example
   The following example mounts the file system.

   ```
   # mount /dev/dsk/c3t500A09818350B481d32s0 /mnt/bootlun
   ```

```
# mount /dev/dsk/c3t500A09818350B481d32s0 /mnt/bootlun

# ufsdump 0f - <source_boot_device> | (cd /<mntpoint of bootable_ lun>;
ufsrestore rf -)
```

Note: If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see Oracle's document Sun StorEdge SAN Foundation Software 4.4 Configuration Guide for instructions.

Example
The following example copies the information from c0t0d0s0.

```
# ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /mnt/bootlun; ufsrestore rf -)
```

6. Edit the `/etc/vfstab` file on the SAN file system. Change the swap, root, and file systems in the file to show the boot device instead of the local device.

   One way to do this is to edit the file using vi.

```
# cd /mnt/bootlun/etc/
# vi vfstab
```

   Example
   The following example shows the `vfstab` entry for the bootable LUN.

```
#device device mount FS fsck mount
mount

#to mount to fsck point type pass at boot options
#
fd - /dev/fd fd - no -
/proc - /proc proc - no -
/dev/dsk/c3t500A09818350B481d32s1 - - swap -
no -
/dev/dsk/c3t500A09818350B481d320 /dev/rdsk/c3t500A09818350B481d32s0 /
ufs 1 no -
/dev/dsk/c3t500A09818350B481d32s6 /dev/rdsk/c3t500A09818350B481d32s6 /
globaldevices ufs 2 yes
-
/devices - /devices devfs - no -
ctfs - /system/contract ctfs - no -
objfs - /system/object objfs - no -
swap - /tmp tmpfs - yes -
```

7. Modify the `/mnt/bootlun/boot/solaris/bootenv.rc` file to reflect the new bootpath parameter.

   Use the boot device name noted above to replace the bootpath. To identify the boot slices, use "..:a" at the end if your boot slice is slice 0, use "..:b" for slice1, and so on.

   Note: You can also execute the `list` command to see the device path.

```
# ls -al /dev/rdsk/c3t500A09818350B481d32s2
```

Example

The following example sets the bootpath parameter.

```
...
setprop bootpath /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/
disk@w500a09818350b481,20:a
...
```

8. Install GRUB on the new file systems.

```
# cd /mnt/bootlun/boot/grub; /sbin/installgrub stage1 stage2 /dev/rdsk/
c3t500A09818350B481d32s2
```

Note: The GRUB configuration might indicate the incorrect partition information for the bootable LUN. It might indicate that the boot slice is slice 1. If that is the case, you can change it to slice0 in the `menu.lst` file.

9. Update GRUB bootloader.

```
# bootadm update-archive -R /mnt/bootlun
```

10. Unmount the file system on the bootable LUN.

```
# umount /mnt/bootlun
```

11. Configure your HBA's bios to boot to the bootable LUN. See the documentation for your HBA for more details.

12. Shut down the system.

```
# sync;init 0
```

13. Configure your x86/x64 system to boot to the HBA. See the documentation for you server for more details.

14. Once the server has booted off of the SAN LUN, it is recommended that encapsulation of the root disk is enabled so that Veritas DMP multipathing is enabled for that device.

    To do this, run `vxdiskadm` and choose menu option 2.

    Your host will reboot on the new encapsulated volume.

```
# /usr/sbin/vxdiskadm
```

15. Use the `df - k` command to verify that you booted the correct LUN.

16. Use the `dumpadm -d` command to configure the system crash dump for the new bootable LUN.

    Example

```
# dumpadm -d /path/to/swap_device
```

SAN boot LUNs in an MPxIO environment

You can set up a SAN boot LUN to work in an MPxIO environment that is running the Solaris Host Utilities.

The method you use for creating a SAN boot LUN and installing a new OS image on it in a MPxIO environment can vary, depending on the drivers you are using.

The sections that follow provide steps for configuring a SAN boot LUN and installing a new OS image on it. The examples in these sections uses a Solaris host to configure a SAN boot LUN and install a new OS image onto it.

The sections that follow provide examples of copying data from an existing, locally booted server using:

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

You can use these procedures to set up SAN boot LUNs for most MPxIO configurations.

There are also other methods for creating a SAN boot LUN. This document does not describe other methods for creating bootable LUNs, such as creating configurations that boot multiple volumes or use diskless servers.

Refer to Solaris documentation for details about additional configuration methods. For complete details on the procedures that follow, see the Oracle document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide*, which is available in PDF format on the Oracle site at http://docs.oracle.com. Make sure that you use the FCode specified N series support website (accessed and navigated as described in *Websites* on page 8).

Note:

Solutions and components are qualified on an ongoing basis. To verify that SAN booting is supported in your configuration, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Related information

Sun StorEdge SAN Foundation Software 4.4 Configuration Guide

(MpxIO) Prerequisites for creating a SAN boot LUN

You need to have your system set up and the Host Utilities installed before you create a SAN boot LUN in an MPxIO environment.

Note: SAN booting is only supported in MPxIO environments that use the FC protocol. It is not supported with the iSCSI protocol.

Before attempting to create a SAN boot LUN, make sure the following prerequisites are in place:

- The Solaris Host Utilities software has been installed and the host and storage system are configured properly and use software and firmware that is supported by the Host Utilities.
- The FC Solaris Host Utilities software has been installed and the host and storage system are configured properly and use software and firmware that is supported by the Host Utilities.

(MPxIO) Options for setting up SAN booting

There are two ways to set up SAN booting in an MPxIO environment.

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

(MPxIO) Performing a direct install to create a SAN boot LUN

You can install the operating system directly onto the SAN device.

About this task

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

Steps

1. Run the Solaris Installer.
2. Choose `SAN device` as your install device.
3. Now configure the SAN boot LUN on the storage system and map it to the host.

SPARC systems without MPxIO: Copying data from locally booted server

If you have a SPARC system that has MPxIO disabled, you can create a SAN boot LUN by copying data from a locally booted server using a file system dump and restore.

Steps

1. If MPxIO is enabled, disable it:
   - For Solaris 10 update 5 and later, use this `stmsboot` command line:
     ```
     # stmsboot -D fp -d
     ```
   - For Solaris 10 releases prior to update 5, use this `stmsboot` command line:
     ```
     # stmsboot -d
     ```
2. Use the `mount` command to identify the current boot device.

   This example mounts the current boot device.

   ```
   # mount
   / on /dev/dsk/c0t0d0s0 read/write/setuid/devices/intr/largefiles/
   logging/xattr/onerror=panic/dev=800010 on Tue Jan  2 07:44:48 2007
   ```
3. Use the `format` command to choose the LUN. Write down the device path for the LUN so you can refer to it later. You need to configure the LUN for
   - The root file system
   - The file systems that will be copied to the bootable LUN. You might want to create slices and place the file systems on the slices.

   In addition, you might want to set up the swap slice and slices for the metadatabase replicas.

   In this example, you have already run the `format` command and, based on its output, determined that you want `device 4`, which has device path `/pci@1d,700000/emlx@2,1/fp@0,0/ssd@w500a09838350b481,f4`.

   ```
   c1t500a09838350b481d244 <NETAPP-LUN-0.2 cyl 6142 alt 2 hd 16 sec 256>
   ```
4. Install the bootblock on the new bootable LUN by using the `installboot` command:

   `installboot /usr/platform/`uname -i`/lib/fs/ufs/bootblk /dev/rdsk/ <`*`bootlun`*`>`

   In this example, the following command line installs the bootlock on the boot LUN `c1t500A09838350B481d32s0`.

   ```
   installboot /usr/platform/'uname -i'/lib/fs/ufs/bootblk /dev/rdsk/
   c1t500A09838350B481d32s0
   ```

5. Create the SAN file system that you will dump the current file system to.

   In this example, the following command line creates a new file system.

   ```
   newfs /dev/dsk/c1t500A09838350B481d32s0
   ```

6. Mount the file system that you will use when you copy the boot data.

   In this example, the following example mounts the SAN file system.

   ```
   mount /dev/dsk/c1t500A09838350B481d32s0 /mnt/bootlun
   ```

7. Create the required directory structure on the bootable LUN and copy the boot data. Enter:

   ufsdump 0f - <source_boot_device> | cd /<mntpoint of bootable_ lun>; ufsrestore rf -)

   Note: If your configuration boots off more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see the Oracle document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide* which is available in PDF format on the Oracle site at docs.oracle.com.

   The following example copies the information from c0t0d0s0.

   ```
   # ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /mnt/bootlun; ufsrestore rf -)
   ```

8. Edit the `/etc/vfstab` file to on the SAN file system. Change the swap, root, and file systems in the file to show the boot device instead of the local device. One way to do this is to edit the file using vi:

   cd /mnt/bootlun/etc/

   vi vfstab

   The following example shows the vfstab entry for the bootable LUN.

   ```
   #device         device          mount           FS      fsck    mount
   mount
   #to mount       to fsck         point           type    pass    at boot
   options
   #
   fd      -       /dev/fd fd      -       no      -
   /proc   -       /proc   proc    -       no      -
   /dev/dsk/c1t500A09838350B481d32s1       -       -       swap    -
   no      -
   /dev/dsk/c1t500A09838350B481d32s0       /dev/rdsk/
   c1t500A09838350B481d32s0      /       ufs     1       no      -
   /dev/dsk/c1t500A09838350B481d32s6       /dev/rdsk/
   c1t500A09838350B481d32s6      /globaldevices  ufs     2       yes     -
   /devices        -       /devices        devfs   -       no      -
   ctfs    -       /system/contract        ctfs    -       no      -
   objfs   -       /system/object  objfs   -       no      -
   swap    -       /tmp    tmpfs   -       yes     -
   ```

9. Umount the file system on the bootable LUN.

```
umount /mnt/bootlun
```

10. Run the `show-disks` command to get the correct device path name for your FC card. It is important to look for the device path associated with the LUN you used during the earlier format step. Due to the way the OBP sees hardware, the device can show up with either “disk” or “ssd” as the terminating characters and those characters can differ from what was seen in the format output.

    In this example, the output shows that the device uses "disk" to represent the disk device:

    ```
    ok show-disks
    a) /pci@1f,700000/scsi@2,1/disk
    b) /pci@1f,700000/scsi@2/disk
    c) /pci@1e,600000/ide@d/cdrom
    d) /pci@1e,600000/ide@d/disk
    e) /pci@1d,700000/emlx@2,1/fp@0,0/disk
    f) /pci@1d,700000/emlx@2/fp@0,0/disk
    q) NO SELECTION
    Enter Selection, q to quit:
    ```

    Using the device name you wrote down in Step 3, boot to the bootable LUN. You can specify the slice of the bootable LUN by using ":a" for slice zero, ":b" for slice 1, and so on.

    The following examples show command lines for QLogic HBAs and Emulex HBAs.

    QLogic:

    ```
    # boot /pci@1f,2000/QLGC,qlc@1/fp@0,0/disk@w500a09838350b481,20:a
    ```

    Emulex:

    ```
    # boot /pci@1d,700000/SUNW,emlxs@2/fp@0,0/disk@w500a09818350b481,20:a
    ```

11. Using the device name you wrote down in Step 3, set the boot-device environment variable and boot the system.

    Note: You can specify the slice of the bootable LUN by using ":a" for slice zero, ":b" for slice 1, and so on.

    This example sets the boot device and reboots the system.

    ```
    ok setenv boot-device /pci@1d,700000/emlx@2,1/fp@0,0/
    disk@w500a09838350b481,f4:a
    ok boot -r
    ```

12. Re-enable MPxIO to provide path redundancy.

    - For Solaris 10 update 5 and later, use this `stmsboot` command line:

      ```
      # stmsboot -D fp -e
      ```

13. Verify that you booted to the correct LUN by using the `df -k` command.

    In addition, configure the system crash dump for the new bootable LUN boot device using the `dumpadm -d` command:

```
dumpadm -d /dev/rdsk/c1t500A09838350B481d32s1
```

Related information

Sun StorEdge SAN Foundation Software 4.4 Configuration Guide

x86/x64 with MPxIO systems: Copying data from a locally booted disk

If you have an x86/x64 system that is using MPxIO, you can copy data from a locally booted server.

Steps

1. Use the `mount` command to identify the current boot device.

   The following example mounts the current boot device.

   ```
   # mount / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/
   logging/xattr/onerror=panic/dev=1980000 on Tue Jan 2 12:50:22 2007
   ```

2. Use the `format` command to choose the LUN. Write down the device path for the LUN so you can refer to it later. You need to configure the LUN for

   - The root file system
   - The file systems that will be copied to the bootable LUN. You might want to create slices and place the file systems on the slices.

   In addition, you might want to set up the swap slice and slices for the metadatabase replicas.

   In this example, you have already run the `format` command and, based on its output, determined that you want number 33, which has the device path `/scsi_vhci/disk@g60a98000567164366 36f393164695969`.

   ```
   33. c4t60A9800056716436636F393164695969d0 <DEFAULT cyl 9787 alt 2 hd
   255 sec 63>
   /scsi_vhci/disk@g60a98000567164366 36f393164695969
   ```

3. Create the SAN file system that you will dump the current file system to.

   This example uses the following command line to create a new file system.

   ```
   newfs /dev/dsk/c4t60A9800056716436636F393164695969d0s0
   ```

4. Mount the file system that you will use when you copy the boot data.

   The following example mounts the file system.

   ```
   # mount /dev/dsk/c4t60A9800056716436636F393164695969d0s0 /mnt/bootlun
   ```

5. Create the required directory structure on the bootable LUN and copy the boot data. Enter:

ufsdump 0f - <source_boot_device> | cd /<mntpoint of bootable_ lun>; ufsrestore rf -)

Note: If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot partitions, see Oracle's document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide* which is available in PDF format on the Oracle site at docs.oracle.com.

The following example copies the information from c1d0s0.

```
# ufsdump 0f - /dev/rdsk/c1d0s0 | (cd /mnt/bootlun/boot; ufsrestore rf
-)
```

6. Edit the `/etc/vfstab` file to on the SAN file system. Change the swap, root, and file systems in the file to show the boot device instead of the local device. One way to do this is to edit the file using vi:

   cd /mnt/bootlun/boot/etc/

   vi vfstab

   The following example shows the vfstab entry for the bootable LUN.

```
#device         device          mount           FS      fsck    mount
mount
#to mount       to fsck         point           type    pass    at boot
options
#
fd      -       /dev/fd fd      -       no      -
/proc   -       /proc   proc    -       no      -
/dev/dsk/c4t60A9800056716436636F393164695969d0s1 -       -
swap    -       no      -
/dev/dsk/c4t60A9800056716436636F393164695969d0s0/dev/rdsk/
c4t60A9800056716436636F393164695969d0s0        /       ufs     1
no      -
/dev/dsk/c4t60A9800056716436636F393164695969d0s6/dev/rdsk/
c4t60A9800056716436636F393164695969d0s6        /globaldevices  ufs
2       yes     -
/devices        -       /devices        devfs   -       no      -
ctfs    -       /system/contract        ctfs    -       no      -
objfs   -       /system/object  objfs   -       no      -
swap    -       /tmp    tmpfs   -       yes     -
```

7. Modify the `/mnt/boot/solaris/bootenv.rc` file to reflect the new bootpath parameter. Use the boot device name noted above to replace the bootpath. To identify the boot slices, use "..:a" at the end if your boot slice is slice 0, use "..:b" for slice1, and so on.

   Note: You can also see the device path by executing the `list` command:

```
ls -al /dev/rdsk/c4t60A9800056716436636F393164695969d0s2
```

   The following example displays a modified file.

```
...
#
# Copyright 2005 Sun Microsystems, Inc.  All rights reserved.
```

```
# Use is subject to license terms.
#

#ident  "@(#)bootenv.rc 1.32    05/09/01 SMI"
#
#       bootenv.rc -- boot "environment variables"
#
setprop kbd-type US-English
setprop ata-dma-enabled 1
setprop atapi-cd-dma-enabled 0
setprop ttyb-rts-dtr-off false
setprop ttyb-ignore-cd true
setprop ttya-rts-dtr-off false
setprop ttya-ignore-cd true
setprop ttyb-mode 9600,8,n,1,-
setprop ttya-mode 9600,8,n,1,-
setprop lba-access-ok 1
setprop prealloc-chunk-size 0x2000
setprop bootpath /scsi_vhci/disk@g60a98000567164366 36f393164695969:a
setprop console 'ttya'
```

8. Install GRUB on the new file systems.

   `cd /boot/grub; /sbin/installgrub stage1 stage2 /dev/rdsk/c3t500A09818350B481d32s0`

   Note: The GRUB configuration might indicate the wrong partition information for the bootable LUN. It can indicate that the boot slice is slice 1. If that is the case, you can change it to slice 0 in the `menu.lst` file.

9. Update the GRUB bootloader:

   `bootadm update-archive -R /mnt/bootlun/boot/grub`

10. Umount the file system on the bootable LUN.

    `umount /mnt/bootlun/boot/grub`

11. Configure your HBA's bios to boot to the bootable LUN. See the documentation for your HBA for more details.

12. Shut down the system.

    `sync;halt`

13. Configure your x86/x64 system to boot the HBA. See the documentation for your server for more details.

Related information

Sun StorEdge SAN Foundation Software 4.4 Configuration Guide

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

If you have an x86/x64 system that is using MPxIO, you can copy data from a locally booted server.

Steps

1. Use the `mount` command to identify the current boot device.

   The following example mounts the current boot device.

   ```
   # mount / on /dev/dsk/c1d0s0 read/write/setuid/devices/intr/largefiles/
   logging/xattr/onerror=panic/dev=1980000 on Tue Jan 2 12:50:22 2007
   ```

2. Use the `format` command to choose the LUN. Write down the device path for the LUN so you can refer to it later. You need to configure the LUN for

   - The root file system
   - The file systems that will be copied to the bootable LUN. You might want to create slices and place the file systems on the slices.

   In addition, you might want to set up the swap slice and slices for the metadatabase replicas.

   In this example, which uses a QLogic HBA, you have already run the `format` command and, based on its output, determined that you want number 33, which has the device path `/pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20`.

   ```
   c3t500A09818350B481d32 <DEFAULT cyl 9787 alt 2 hd 255 sec 63>
   /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/disk@w500a09818350b481,20
   ```

   Note: Emulex HBAs have "fc" in the device name. QLogic HBAs have "fp" in the device name.

3. Create the SAN file system that you will dump the current file system to.

   This example uses the following command line to create a new file system.

   ```
   newfs /dev/dsk/c3t500A09818350B481d32s0
   ```

4. Mount the file system that you will use when you copy the boot data.

   The following example mounts the file system.

   ```
   mount /dev/dsk/c3t500A09818350B481d32s0 /mnt/bootlun
   ```

5. Create the required directory structure on the bootable LUN and copy the boot data. Enter:

   `ufsdump 0f - <source_boot_device> | (cd /<mntpoint_of_bootable_lun>; ufsrestore rf -)`

   Note: If your configuration boots off of more than one device, you must create and configure a bootable LUN that matches each boot device on the host. If you are copying non-root boot

partitions, see the Oracle document *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide* which is available in PDF format on the Oracle site at docs.oracle.com.

The following example copies the information from c0t0d0s0.

```
ufsdump 0f - /dev/rdsk/c0t0d0s0 | (cd /mnt/bootlun; ufsrestore rf -)
```

6. Edit the `/etc/vfstab` file to on the SAN file system. Change the swap, root, and file systems in the file to show the boot device instead of the local device. One way to do this is to edit the file using vi:

   ```
   cd /mnt/bootlun/etc/
   ```

   ```
   vi vfstab
   ```

   The following example shows the vfstab entry for the bootable LUN.

   ```
   #device         device          mount           FS      fsck    mount
   mount
   #to mount       to fsck         point           type    pass    at boot
   options
   #
   fd      -       /dev/fd fd      -       no      -
   /proc   -       /proc   proc    -       no      -
   /dev/dsk/c3t500A09818350B481d32s1 -       -       swap    -
   no      -
   /dev/dsk/c3t500A09818350B481d320 /dev/rdsk/
   c3t500A09818350B481d32s0        /       ufs     1       no      -
   /dev/dsk/c3t500A09818350B481d32s6 /dev/rdsk/
   c3t500A09818350B481d32s6        /globaldevices  ufs     2       yes
   -
   /devices        -       /devices        devfs   -       no      -
   ctfs    -       /system/contract        ctfs    -       no      -
   objfs   -       /system/object  objfs   -       no      -
   swap    -       /tmp    tmpfs   -       yes     -
   ```

7. Modify the `/mnt/bootlun/boot/solaris/bootenv.rc` file to reflect the new bootpath parameter. Use the boot device name noted above to replace the bootpath. To identify the boot slices, use "..:a" at the end if your boot slice is slice 0, use "..:b" for slice1, and so on.

   Note: You can also see the device path by executing the `list` command:

   ```
   ls -al /dev/rdsk/c3t500A09818350B481d32s2
   ```

   The following example sets the bootpath parameter.

   ```
   ...
   setprop bootpath /pci@0,0/pci10de,5d@e/pci1077,138@0,1/fp@0,0/
   disk@w500a09818350b481,20:a
   ...
   ```

8. Install GRUB on the new file systems.

   ```
   cd /mnt/bootlun/boot/grub; /sbin/installgrub stage1 stage2 /dev/rdsk/
   c3t500A09818350B481d32s2
   ```

Note: The GRUB configuration might indicate the wrong partition information for the bootable LUN. It might indicate that the boot slice is slice 1. If that is the case, you can change it to slice0 in the `menu.lst` file.

9. Update the GRUB bootloader:

   ```
   bootadm update-archive -R /mnt/bootlun
   ```

10. Umount the file system on the bootable LUN.

    ```
    umount /mnt/bootlun
    ```

11. Configure your HBA's bios to boot to the bootable LUN. See the documentation for your HBA for more details.

12. Shut down the system.

    ```
    sync;halt
    ```

13. Configure your x86/x64 system to boot the HBA. See the documentation for your server for more details.

Related information

Sun StorEdge SAN Foundation Software 4.4 Configuration Guide

Supported Solaris and Data ONTAP features

The Host Utilities work with both Solaris and Data ONTAP features.

Features supported by the Host Utilities

The Host Utilities support a number of features and configurations available with Solaris hosts and storage systems running Data ONTAP. Your specific environment affects what the Host Utilities support.

Some of the supported features include:

- Multiple paths to the storage system when a multipathing solution is installed
- Veritas VxVM, Solaris Volume Manager (SVM), and ZFS file system
- **(MPxIO)** ALUA
- Oracle Microsystems Logical Domains
- SAN booting

For information on which features are supported with which configurations, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

HBAs and the Solaris Host Utilities

The Host Utilities support a number of HBAs.

Ensure the supported HBAs are installed before you install the Host Utilities. Normally, the HBAs should have the correct firmware and FCode set. To determine the firmware and FCode setting on your system, run the appropriate administration tool for your HBA.

Note: For details on the specific HBAs that are supported and the required firmware and FCode values, see the N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8).

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

Multipathing and the Solaris Host Utilities

The Solaris Host Utilities support different multipathing solutions based on your configuration.

Having multipathing enabled allows you to configure multiple network paths between the host and storage system. If one path fails, traffic continues on the remaining paths.

The Veritas environment of the Host Utilities uses Veritas DMP to provide multipathing.

The MPxIO environment of the Host Utilities uses Oracle's native multipathing solution (MPxIO).

Note: The Host Utilities also support IP Multipathing (IPMP). You do not need to perform any specific N series configuration to enable IPMP.

You can use the Host Utilities `sanlun` command to display the path policy to which the host has access.

iSCSI and multipathing

You can use iSCSI with either Veritas DMP or MPxIO.

You should have at least two Ethernet interfaces on the storage system enabled for iSCSI traffic. Having two interfaces enables you to take advantage of multipathing. Each iSCSI interface must be in a different iSCSI target portal group.

In Veritas DMP environments, you must also disable MPxIO before you can use iSCSI. You must use DMP for multipathing when you are using Veritas.

For more information about using multipathing with iSCSI, see *Using iSCSI Multipathing in the Solaris 10 Operating System*.

Volume managers and the Solaris Host Utilities

The Solaris Host Utilities support different volume management solutions based on your environment.

The Veritas DMP environment uses Veritas Volume Manager (VxVM).

The MPxIO stack works with Solaris Volume Manager (SVM), ZFS, and VxVM to enable you to have different volume management solutions.

Note: To determine which versions of VxVM are supported with MPxIO, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Related information

IBM N series support website: www.ibm.com/storage/support/nseries/

(FC) ALUA support with certain versions of Data ONTAP

The MPxIO environment of the Solaris Host Utilities requires that you have ALUA enabled for high availability storage controllers (clustered storage systems) using FC and a version of Data ONTAP that supports ALUA. Veritas Storage Foundation also supports ALUA starting with version 5.1 P1.

Stand-alone storage controllers provide symmetric access to LUNs and do not use ALUA.

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

ALUA defines a standard set of SCSI commands for discovering path priorities to LUNs on FC and iSCSI SANs. When you have the host and storage controller configured to use ALUA, it automatically determines which target ports provide optimized (direct) and unoptimized (indirect) access to LUNs.

Note: iSCSI is not supported with ALUA if you are running Data ONTAP operating in 7-Mode or Data ONTAP prior to 8.1.1. operating in Cluster-Mode.

Check your version of Data ONTAP to see if it supports ALUA and check the N series support website (accessed and navigated as described in *Websites* on page 8) to see if the Host Utilities support that version of Data ONTAP. ALUA support was first available with Data ONTAP 7.2 and single-image cfmode.

You can also check the N series support website (accessed and navigated as described in *Websites* on page 8) to determine if your version of the Host Utilities supports Veritas Storage Foundation 5.1 P1 or later.

(FC) Solaris Host Utilities configurations that support ALUA

The Solaris Host Utilities support ALUA in both MPxIO environments and certain Veritas Storage Foundation environments as long as the environments are running the FC protocol. ALUA is not supported in environments running the iSCSI protocol.

If you are using MPxIO with FC and high availability storage controllers with any of the following configurations, you must have ALUA enabled:

Host Utilities version	Host requirements	Data ONTAP version
Host Utilities 6.0	Solaris 10 update 5 and later	7.3 and later
Host Utilities 4.1 through 5.1	Solaris 10 update 3 and later	7.2.1.1 and later
Host Utilities 4.0	Solaris 10 update 2 only with QLogic drivers and SPARC processors	7.2.1 and later

If you are running the Host Utilities with Veritas Storage Foundation 5.1 P1 and the FC protocol, you can use ALUA.

Note: Earlier versions of Veritas Storage Foundation do not support ALUA.

Oracle Microsystems Logical Domains and the Host Utilities

Certain configurations of the Host Utilities MPxIO stack support Oracle Microsystems Logical Domains (LDom).

The supported configurations include guests that are I/O Domains or guests that have iSCSI configured. You must install the Host Utilities if a guest is using N series storage.

If you are using LDom, you must configure your system with the Host Utilities settings. You can use Host Utilities `host_config` command do this or you can configure the settings manually.

A Solaris host running LDom accesses and uses N series storage exactly the same way any other Solaris host does.

For information on which configurations support LDom, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Related information

N series support website: www.ibm.com/storage/support/nseries//

SAN booting and the Host Utilities

The Host Utilities support SAN booting with both the Veritas DMP and MPxIO environments. SAN booting is the process of setting up a SAN-attached disk (a LUN) as a boot device for a Solaris host.

Configuring SAN booting on a storage system LUN allows you to:

- Remove the hard drives from your servers and use the SAN for booting needs, eliminating the costs associated with maintaining and servicing hard drives.
- Consolidate and centralize storage.
- Use the reliability and backup features of the storage system.

The downside of SAN booting is that loss of connectivity between the host and storage system can prevent the host from booting. Be sure to use a reliable connection to the storage system.

Support for non-English versions of Solaris operating systems

Solaris Host Utilities are supported on all language versions of Solaris. All product interfaces and messages are displayed in English; however, all options accept Unicode characters as input.

High-level look at Host Utilities Veritas DMP stack

The Host Utilities Veritas DMP stack works with Solaris hosts running Veritas Storage Foundation.

The following is a high-level summary of the supported Veritas DMP stack.

Note: Check the N series support website (accessed and navigated as described in *Websites* on page 8) for details and current information about the supported stack.

- Operating system:
  - Solaris 10 update 5 and later. See the N series support website (accessed and navigated as described in *Websites* on page 8) for more information.
- Processor:
  - SPARC processor systems
  - x86/64 processor systems
- FC HBA
  - Emulex LPFC HBAs and their Oracle-branded equivalents
  - Certain Oracle OEM QLogic® HBAs and their Oracle-branded equivalents
  - Certain Oracle OEM Emulex® HBAs and their Oracle Branded equivalents
- iSCSI software initiators
- Drivers
  - Oracle-branded Emulex drivers (emlxs)
  - Oracle-branded QLogic drivers (qlc)
- Multipathing
  - Veritas DMP

The Host Utilities Veritas DMP stack also supports the following:

- Volume manager
  - VxVM
- Clustering
  - Veritas Cluster Server (VCS)

Related information

N series support website: www.ibm.com/storage/support/nseries/

High-level look at Host Utilities MPxIO stack

The Host Utilities MPxIO stack works with Solaris hosts running Oracle StorEdge SAN Foundation Software and components that make up the native stack.

The following is a high-level summary of the supported MPxIO stack at the time this document was produced.

Note: Check the N series support website (accessed and navigated as described in *Websites* on page 8) for details and current information about the supported stack.

- Operating system:
  - Solaris 10 update 5 and later
- Processor:
  - SPARC processor systems
  - x86/64 processor systems
- HBA
  - Certain QLogic HBAs and their Oracle-branded equivalents
  - Certain Emulex HBAs and their Oracle-branded equivalents
- Drivers
  - Bundled Oracle StorEdge SAN Foundation Software Emulex drivers (emlxs)
  - Bundled Oracle StorEdge San Foundation Software QLogic drivers (qlc)
- Multipathing
  - Oracle StorageTek Traffic Manager (MPxIO)

The Host Utilities MPxIO stack also supports the following:

- Volume manager
  - SVM
  - VxVM
  - ZFS

  Note: To determine which versions of VxVM are supported with MPxIO, see the interoperability matrix.
- Clustering
  - Sun Clusters. This kit has been certified using the Sun Cluster Automated Test Environment (SCATE)
  - Veritas Cluster Server (VCS)

Related information

N series support website: www.ibm.com/storage/support/nseries/

Protocols and configurations supported by the Solaris Host Utilities

The Solaris Host Utilities provide support for FC and iSCSI connections to the storage system using direct-attached, fabric-attached, and network configurations.

Notes about the supported protocols

The FC and iSCSI protocols enable the host to access data on storage systems.

The storage systems are targets that have storage target devices called LUNs. The FC and iSCSI protocols enable the host to access the LUNs to store and retrieve data.

For more information about using the protocols with your storage system, see the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP.

The FC protocol

The FC protocol requires one or more supported HBAs in the host. Each HBA port is an initiator that uses FC to access the LUNs on the storage system. The port is identified by a worldwide port name (WWPN). The storage system uses the WWPNs to identify hosts that are allowed to access LUNs.

You must record the port's WWPN so that you can supply it when you create an initiator group (igroup). You can use the `sanlun fcp show adapter` command to get the WWPN.

When you create the LUN, you must map it to that igroup. The igroup then enables the host to access the LUNs on the storage system using the FC protocol based on the WWPN.

For more information about using FC with your storage system, see the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP.

The iSCSI protocol

The iSCSI protocol is implemented on both the host and the storage system.

On the host, the iSCSI protocol is implemented over either the host’s standard Ethernet interfaces or on an HBA.

On the storage system, the iSCSI protocol can be implemented over the storage system’s standard Ethernet interface using one of the following:

- A software driver that is integrated into Data ONTAP

- (Data ONTAP 7.1 and later) An iSCSI target HBA or an iSCSI TCP/IP offload engine (TOE) adapter. You do not have to have a hardware HBA.

The connection between the host and storage system uses a standard TCP/IP network. The storage system listens for iSCSI connections on TCP port 3260.

For more information on using iSCSI with your storage system, see the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP.

Supported configurations

The Host Utilities support fabric-attached, direct-attached, and network-attached configurations.

The Host Utilities support the following basic configurations:

- Fabric-attached storage area network (SAN)/Fibre Channel over Ethernet network. The Host Utilities support two variations of fabric-attached SANs:
  - A single-host FC connection from the HBA to the storage system through a single switch. A host is cabled to a single FC switch that is connected by cable to redundant FC ports on a high availability storage system configuration. A fabric-attached, single-path host has one HBA.
  - Two or more FC connections from the HBA to the storage system through dual switches or a zoned switch. In this configuration, the host has at least one dual-port HBA or two single-port HBAs. The redundant configuration avoids the single point of failure of a single-switch configuration. This configuration requires that multipathing be enabled.

    Note: Use redundant configurations with two FC switches for high availability in production environments. However, direct FC connections and switched configurations using a single, zoned switch might be appropriate for less critical business applications.
- FC direct-attached. A single host with a direct FC connection from the HBA to stand-alone or active/active storage system configurations.
- iSCSI direct-attached. One or more hosts with a direct iSCSI connection to stand-alone or active/active storage systems. The number of hosts that can be directly connected to a storage system or a pair of storage systems depends on the number of available Ethernet ports.
- iSCSI network-attached. In an iSCSI environment, all methods of connecting Ethernet switches to a network that have been approved by the switch vendor are supported. Ethernet switch counts are not a limitation in Ethernet iSCSI topologies. Refer to the Ethernet switch vendor documentation for specific recommendations and best practices.

The *SAN Configuration Guide* (called *Fibre Channel and iSCSI Configuration Guide* in Data ONTAP 8.1 and earlier) provides detailed information, including diagrams, about the supported topologies. There is also configuration information in the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP. Refer to those documents for complete information about configurations and topologies.

Troubleshooting

If you encounter a problem while running the Host Utilities, here are some tips and troubleshooting suggestions that might help you resolve the issue.

This chapter contains the following information:

- Best practices, such as checking the *Release Notes* to see if any information has changed.
- Suggestions for checking your system.
- Information about possible problems and how to handle them.
- Diagnostic tools that you can use to gather information about your system.

About the troubleshooting sections that follow

The troubleshooting sections that follow help you verify your system setup.

If you have any problems with the Host Utilities, make sure your system setup is correct. As you go through the following sections, keep in mind:

- For more information about Solaris commands, see the man pages and operating system documentation.
- For more information about the Data ONTAP commands, see the Data ONTAP documentation, in particular, the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP.
- 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 can perform the check. For example, the SAN Toolkit contains the `sanlun` command, which is useful when checking your system.
- To make sure you have the current version of the system components, see the interoperability matrix. Support for new components is added on an ongoing basis. This online document contains a complete list of supported HBAs, platforms, applications, and drivers.

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

Check the version of your host operating system

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

You can use the `cat /etc/release` command to display information about your operating system.

The following example checks the operating system version on a SPARC system.

```
# cat /etc/release
                        Solaris 10 5/08 s10s_u5wos_10 SPARC
       Copyright 2008 Sun Microsystems, Inc.  All Rights Reserved.
                         Use is subject to license terms.
                              Assembled 24 March 2008
```

The following example checks the operating system version on an x86 system.

```
# cat /etc/release
                         Solaris 10 5/08 s10x_u5wos_10 X86
       Copyright 2008 Sun Microsystems, Inc.  All Rights Reserved.
                         Use is subject to license terms.
                              Assembled 24 March 2008
```

Confirm the HBA is supported

You can use the `sanlun` command to display information on the HBA and the interoperability matrix to determine if the HBA is supported. Supported HBAs should be installed before you install the Host Utilities.

The `sanlun` command is part of the Host Utilities SAN Toolkit.

If you are using MPxIO, you can also use the `fcinfo hba-port` command to get information about the HBA.

1. The following example uses the `sanlun` command to check a QLogic HBA in an environment using a Solaris native qlc driver.

```
 sanlun fcp show adapter -v

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

adapter name:      qlc2
WWPN:              210100e08ba8b838
```

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

Related information

IBM N series interoperability matrix website: www.ibm.com/systems/storage/network/interophome.html

(MPxIO, native drivers) Ensure that MPxIO is configured correctly for ALUA on FC systems

Configurations using native drivers with MPxIO and FC in a clustered environment require that ALUA be enabled.

In some cases, ALUA might have been disabled on your system and you will need to reenable it. For example, if your system was used for iSCSI or was part of a single storage controller configuration, the `symmetric-option` might have been set. This option disables ALUA on the host.

To enable ALUA, you must remove the `symmetric-option` by doing one of the following:

- Running the `host_config` command. This command automatically comments out the `symmetric-option` section.
- Editing the appropriate section in the `/kernel/drv/scsi_vhci.conf` file to manually comment it out. The example below displays the section you must comment out.

Once you comment out the option, you must reboot your system for the change to take effect.

The following example is the section of the `/kernel/drv/scsi_vhci.conf` file that you must comment out if you want to enable MPxIO to work with ALUA. This section has been commented out.

```
#device-type-iscsi-options-list =
#"NETAPP  LUN", "symmetric-option";
#symmetric-option = 0x1000000;
```

Ensure that MPxIO is enabled on SPARC systems

When you use a MPxIO stack on a SPARC system, you must manually enable MPxIO. If you encounter a problem, make sure that MPxIO is enabled.

Note: On x86/64 systems, MPxIO is enabled by default.

To enable MPxIO on a SPARC system, use the `stmsboot` command. This command modifies the `fp.conf` file to set the `mpxio_disable=` option to no and updates `/etc/vfstab`.

After you use this command, you must reboot your system.

The options you use with this command vary depending on your version of Solaris. For systems running Solaris 10 update 5, execute: `stmsboot -D fp -e`

For example, if MPxIO is not enabled on a system running Solaris 10 update 5, you would enter the following commands. The first command enables MPxIO by changing the `fp.conf` file to read `mpxio_disable=no`. It also updates `/etc/vfstab`. You must reboot the system for the change to take effect. Input the following commands to reboot the system.

For FC:

```
# stmsboot -D fp -e
# touch /reconfigure
# init 6
```

For iSCSI

```
# stmsboot -D fp -e
# touch /reconfigure
# init 6
```

(MPxIO) Ensure that MPxIO is enabled on iSCSI systems

While MPxIO should be enabled by default on iSCSI systems, you can confirm this by viewing the iSCSI configuration file `/kernel/drv/iscsi.conf` file.

When MPxIO is enabled, this file has the `mpxio-disable` set to "no".

```
mpxio-disable="no"
```

If this line is set to "yes", you must change it by doing one of the following:

- Running the `host_config` command. This command sets the symmetric-option.

- Editing the appropriate section in the `/kernel/drv/iscsi.conf` file to manually set the command to "no". The example below displays the section you must comment out.

You **must** reboot your system for the change to take effect.

Here is an example of a `/kernel/drv/iscsi.conf` file that has MPxIO enabled. The line that enables MPxIO, `mpxio-disable="no"` is in bold to make it easy to locate.

```
# Copyright 2006 Sun Microsystems, Inc. All rights reserved.
# Use is subject to license terms.
#
#ident "@(#)iscsi.conf 1.2 06/06/12 SMI"
name="iscsi" parent="/" instance=0;
ddi-forceattach=1;
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#
# I/O multipathing feature (MPxIO) can be enabled or disabled using
# mpxio-disable property. Setting mpxio-disable="no" will activate
# I/O multipathing; setting mpxio-disable="yes" disables the
feature.
#
# Global mpxio-disable property:
#
# To globally enable MPxIO on all iscsi ports set:
# mpxio-disable="no";
#
# To globally disable MPxIO on all iscsi ports set:
# mpxio-disable="yes";
#
mpxio-disable="no";
tcp-nodelay=1;
...
```

(MPxIO) Verify that MPxIO multipathing is working

You can confirm that multipathing is working in an MPxIO environment by using either a Host Utilities tool such as the `sanlun lun show` command or a Solaris tool such as the `mpathadm` command.

The `sanlun lun show` command displays the disk name. If MPxIO is working, you should see a long name similar to the following:

```
/dev/rdsk/c5t60A98000433468656834771474A4D42d0s2
```

The long, consolidated Solaris device name is generated using the LUN's serial number in the IEEE registered extended format, type 6. The Solaris host receives this information in the SCSI Inquiry response.

Another way to confirm that MPxIO is working is to check for multiple paths. To view the path information, you need to use the `mpathadm` command. The `sanlun` cannot display the underlying

multiple paths because MPxIO makes these paths transparent to the user when it displays the consolidated device name shown above.

In this example, the `mpathadm list lu` command displays a list of all the LUNs.

```
# mpathadm list lu
        /dev/rdsk/c3t60A980004334612F466F4C6B72483362d0s2
                Total Path Count: 8
                Operational Path Count: 8
        /dev/rdsk/c3t60A980004334612F466F4C6B72483230d0s2
                Total Path Count: 8
                Operational Path Count: 8
        /dev/rdsk/c3t60A980004334612F466F4C6B7248304Dd0s2
                Total Path Count: 8
                Operational Path Count: 8
        /dev/rdsk/c3t60A980004334612F466F4C6B7247796Cd0s2
                Total Path Count: 8
                Operational Path Count: 8
        /dev/rdsk/c3t60A980004334612F466F4C6B72477838d0s2
                Total Path Count: 8
                Operational Path Count: 8
        /dev/rdsk/c3t60A980004334612F466F4C6B72477657d0s2
                Total Path Count: 8
                Operational Path Count: 8
```

(Veritas DMP) Check that the ASL and APM have been installed

You must have the ASL and APM installed in order for the Veritas DMP to identify whether the path is primary or secondary

Without the ASL and APM, the DSM treats all paths as equal, even if they are secondary paths. As a result, you might see I/O errors on the host. On the storage system, you might see the Data ONTAP error:

```
FCP Partner Path Misconfigured
```

If you encounter the I/O errors on the host or the Data ONTAP error, make sure you have the ASL and APM installed.

(Veritas) Check VxVM

The Host Utilities supports the VxVM for the Veritas DMP stack and certain configurations of the MPxIO stack. You can use the `vxdisk list` command to quickly check the VxVM disks and the `vxprint` command to view volume information.

Note: (MPxIO) To determine which versions of VxVM are supported with MPxIO, see the N series support website (accessed and navigated as described in *Websites* on page 8).

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

Related information

N series support website: www.ibm.com/storage/support/nseries/

(MPxIO) Check the Solaris Volume Manager

If you are using the MPxIO version of the Host Utilities with the Solaris Volume Manager (SVM), it is a good practice to check the condition of the volumes.

The `metastat -a` command lets you quickly check the condition of SVM volumes.

Note: In a Solaris Cluster environment, metasets and their volumes are only displayed on the node that is controlling the storage.

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

The following sample command line checks the condition of SVM volumes:

```
# metastat -a
```

(MPxIO) Check settings in ssd.conf or sd.conf

Verify that you have the correct settings in the configuration file for your system.

The file you need to modify depends on the processor your system uses:

- SPARC systems with MPxIO enabled use the `ssd.conf` file. You can use the `host_config` command to update the `/kernel/drv/ssd.conf` file.
- x86/64 systems with MPxIO enabled use the `sd.conf` file. You can use the `host_config` command to update the `sd.conf` file.

Example of ssd.conf file (MPxIO on a SPARC system): You can confirm the `ssd.conf` file was correctly set up by checking it to ensure that it contains the following:

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

Example of sd.conf file (MPxIO on an x86/64 system): You can confirm the sd.conf file was correctly set up by checking it to ensure that it contains the following:

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

Check the storage system setup

Make sure your storage system is set up correctly.

(MPxIO/FC) Check the ALUA settings on the storage system

In MPxIO environments using FC, you must have ALUA set on the storage system to work with igroups.

You can verify that you have ALUA set for the igroup by executing the `igroup show -v`

Note: For more information on ALUA, see the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP. In particular, see the section "Enabling ALUA."

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

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

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 instructions that shipped with your hardware.

You should have completed the following tasks:

- Installed the switch in a system cabinet or rack.
- Confirmed that the Host Utilities support this switch.
- Turned on power to the switch.
- Configured the network parameters for the switch, including its serial parameters and IP address.

Related information

N series support website: www.ibm.com/storage/support/nseries/

Determining whether to use switch zoning

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

Zoning requires more configuration on the switch, but it provides the following advantages:

- It simplifies configuring the host.
- It makes information more manageable. The output from the host tool iostat is easier to read because fewer paths are displayed.

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

It is recommended that your configuration have no more than eight paths per LUN. For more information about zoning, see the N series support website (accessed and navigated as described in *Websites* on page 8).

Power up equipment in the correct order

The different pieces of hardware communicate with each other in a prescribed order, which means that problems occur if you turn on power to the equipment in the wrong order.

Use the following order when powering on the equipment:

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

Verify that the host and storage system can communicate

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

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

- The storage system's console
- A remote login that you established from the host

Possible iSCSI issues

The following sections describe possible issues that might occur when you are working with iSCSI.

(iSCSI) Verify the type of discovery being used

The iSCSI version of the Host Utilities supports iSNS, dynamic (SendTarget) and static discovery.

You can use the `iscsiadm` command to determine which type of discovery you have enabled.

This example uses the `iscsiadm` command to determine that dynamic discovery is being used.

```
$ iscsiadm list discovery
Discovery:
       Static: disabled
       Send Targets: enabled
       iSNS: disabled
```

(iSCSI) Bidirectional CHAP does not work

When you configure bidirectional CHAP, make sure you supply different passwords for the `inpassword` value and the `outpassword` value.

If you use the same value for both of these passwords, CHAP appears to be set up correctly, but it does not work.

(iSCSI) LUNs are not visible on the host

Storage system LUNs are not listed by the `iscsiadm list target -S` command or by the `sanlun lun show all` command.

If you encounter this problem, verify the following configuration settings:

- Network connectivity—Verify that there is TCP/IP connectivity between the host and the storage system by performing the following tasks:
  - From the storage system command line, ping the host.
  - From the host command line, ping the storage system.
- Cabling—Verify the cables between the host and the storage system are properly connected.
- System requirements—Verify that you have the correct Solaris operating system (OS) version, version of Data ONTAP, and other system requirements. See the appropriate interoperability matrix for your N series product, available on the IBM support website.
- Jumbo frames—If you are using jumbo frames in your configuration, ensure that jumbo frames are enabled on all devices in the network path: the host Ethernet NIC, the storage system, and any switches.
- iSCSI service status—Verify that the iSCSI service is licensed and started on the storage system. For more information about licensing iSCSI on the storage system, see the *SAN Administration Guide* (called *Block Access Management Guide for iSCSI and FC* in Data ONTAP 8.1 and earlier) for your version of Data ONTAP.
- Initiator login—Verify that the initiator is logged in to the storage system by entering the `iscsi initiator show` command on the storage system console.

If the initiator is configured and logged in to the storage system, the storage system console displays the initiator node name and the target portal group to which it is connected.

If the command output shows that no initiators are logged in, verify that the initiator is configured according to the procedure described in the section on "Configuring the initiator."

- iSCSI node names—Verify that you are using the correct initiator node names in the igroup configuration.

  On the storage system, use the `igroup show -v` command to display the node name of the initiator. This node name must match the initiator node name listed by the `iscsiadm list initiator-node` command on the host.
- LUN mappings—Verify that the LUNs are mapped to an igroup that also contains the host. On the storage system, use one of the following commands:

Data ONTAP	Command	Description
Data ONTAP operating in 7-Mode	`lun show -m`	Displays all LUNs and the igroups they are mapped to
Data ONTAP operating in 7-Mode	`lun show -g`	Displays the LUNs mapped to the specified igroup
Data ONTAP operating in Cluster-Mode	`lun show -m -vserver <vserver>`	Displays the LUNs and igroups they are mapped to for a given Vserver

- If you are using CHAP, verify that the CHAP settings on the storage system and host match. The incoming user names and password on the host are the outgoing values on the storage system. The outgoing user names and password on the storage system are the incoming values on the host. For bidirectional CHAP, the storage system CHAP username must be set to the storage system's iSCSI target node name.

Related information

N series support website: www.ibm.com/storage/support/nseries

Possible MPxIO issues

The following sections describe issues that can occur when you are using the Host Utilities in an MPxIO environment.

(MPxIO) sanlun does not show all adapters

In some cases, the `sanlun lun show all` command does not display all the adapters. You can display them using either the `luxadm display` command or the `mpathadm` command.

When you use MPxIO, there are multiple paths. MPxIO controls the path over which the sanlun SCSI commands are sent and it uses the first one it finds. This means that the adapter name can vary each time you issue the `sanlun lun show` command.

If you want to display information on all the adapters, use either the `luxadm display` command or the `mpathadm` command. For the `luxadm display` command, you would enter

`luxadm display -v` *`device_name`*

Where *`device_name`* is the name of the device you are checking.

(MPxIO) Solaris log message says data not standards compliant

When running the Host Utilities, you might see a message in the Solaris log saying that data is not standards compliant. This message is the result of a Solaris bug.

```
WARNING: Page 83 data not standards compliant
```

This erroneous Solaris log message has been reported to Oracle. The Solaris initiator implements an older version of the SCSI Spec.

The SCSI target is standards compliant, so ignore this message.

Installing the nSANity data collection program

Obtain and install the `nSANity Diagnostic and Configuration Data Collector` program when instructed to do so by your technical support representative.

Before you begin

The nSANity program replaces the diagnostic programs included in previous versions of the Host Utilities. The nSANity program runs on a Windows or Linux system with network connectivity to the component from which you want to collect data.

About this task

Contact your technical support representative to obtain the `nSANity Diagnostic and Configuration Data Collector` program.

Steps

1. Obtain the Windows zip or Linux tgz version of the nSANity program from your technical support representative and copy it to the workstation or server that you want to run it on.
2. Change to the directory to which you downloaded the zip or tgz file.
3. Extract all of the files and follow the instructions in the README.txt file. Also be sure to review the RELEASE_NOTES.txt file for any warnings and notices.

After you finish

Run the specific nSANity commands specified by your technical support representative.

Related information

IBM N series support website: www.ibm.com/storage/support/nseries

Where to find more information

For additional information about host and storage system requirements, supported configurations, best practices, your operating system, and troubleshooting, see the documents listed in the following table.

If you need more information about...	**Go to...**
Known issues, troubleshooting, operational considerations, and post-release developments	The latest Host Utilities *Release Notes* **Note:** The *Release Notes* are updated more frequently than the rest of the documentation. You should always check the *Release Notes* before installing the Host Utilities to see if there have been any changes to the installation or setup process since this document was prepared. You should check them periodically to see if there is new information on using the Host Utilities. The *Release Notes* provide a summary of what has been updated and when.
The latest supported configurations	• The Interoperability Matrix • *IBM System Storage N series Introduction and Planning Guide*
A summary of some of the commands you might use with the Host Utilities	The *Host Utilities Quick Command Reference* for your protocol
Changes to the host settings that are recommended by the Host Utilities	*Host Settings Affected by the Host Utilities*
Configuring the storage system and managing SAN storage on it	• Data ONTAP documentation Index • *Best Practices for Reliability: New System Installation* • *Data ONTAP Software Setup Guide for 7-Mode* • *Data ONTAP SAN Administration Guide for 7-Mode* • *Data ONTAP Release Notes* • *Command Reference*
Verifying compatibility of a storage system with environmental requirements	*N series Introduction and Planning Guide*

If you need more information about...	Go to...
Upgrading Data ONTAP	*Data ONTAP Upgrade and Revert/Downgrade Guide for 7-Mode*
Migrating the cfmode, if necessary	*Changing the Cluster cfmode Setting in Fibre Channel SAN Configurations*
Installing and configuring the HBA in your host	Your HBA vendor documentation
Your host operating system and using its features, such as SVM, ZFS, or MPxIO	Refer to your operating system documentation. You can download Oracle manuals in PDF format from the Oracle website.
Veritas Storage Foundation and its features	Refer to the Veritas documentation.
Working with Emulex	Refer to the Emulex documentation.
Working with QLogic	Refer to the QLogic documentation.
General product information, including support information	The IBM N series interoperability matrix website (accessed and navigated as described in *Websites* on page 8)

Related information

Emulex partner site
QLogic partner site
Oracle documentation
Veritas Storage Foundation DocCentral

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