IBM TotalStorage
SAN Volume Controller

IBM

Host Attachment Guide

Version 1.2.0

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Version 1.2.0

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About this guide

This guide provides information that is required when attaching the SAN Volume Controller to an open-systems host with Fibre Channel adapters.

You can attach the following host systems to a SAN Volume Controller:
- Hewlett-Packard
- IBM @server xSeries (xSeries)
- IBM RS/6000 and pSeries
- Intel with Linux
- Microsoft Windows 2000 or 2003
- Sun

Each chapter describes how to attach a SAN Volume Controller to a specific open-system host with Fibre Channel adapters.

Related topics:
- "Fibre Channel (SCSI-FCP) attached open-systems host support" on page 1

Emphasis

The following typefaces are used to show emphasis:

boldface	Text in **boldface** represents menu items and command names.
italics	Text in *italics* is used to emphasize a word. In command syntax, it is used for variables for which you supply actual values, such as a default directory or the name of a cluster.
`monospace`	Text in `monospace` identifies the data or commands that you type, samples of command output, examples of program code or messages from the system, or names of command flags, parameters, arguments, and name-value pairs.

Related publications

The tables in this section list and describe the following publications:
- The publications that make up the library for the IBM TotalStorage SAN Volume Controller
- Other IBM publications that relate to the SAN Volume Controller

SAN Volume Controller library:

Table 1 on page viii lists and describes the publications that make up the SAN Volume Controller library. Unless otherwise noted, these publications are available in Adobe portable document format (PDF) on a compact disc (CD) that comes with the SAN Volume Controller. If you need additional copies of this CD, the order number is SK2T-8811. These publications are also available as PDF files from the following Web site:

http://www.ibm.com/storage/support/2145/

Table 1. Publications in the SAN Volume Controller library

Title	Description	Order number
IBM TotalStorage SAN Volume Controller: CIM Agent Developer's Reference	This reference guide describes the objects and classes in a Common Information Model (CIM) environment.	SC26-7590
IBM TotalStorage SAN Volume Controller: Command-Line Interface User's Guide	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	SC26-7544
IBM TotalStorage SAN Volume Controller: Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller.	SC26-7543
IBM TotalStorage SAN Volume Controller: Host Attachment Guide	This guide provides guidelines for attaching the SAN Volume Controller to your host system.	SC26-7575
IBM TotalStorage SAN Volume Controller: Installation Guide	This guide includes the instructions the service representative uses to install the SAN Volume Controller.	SC26-7541
IBM TotalStorage SAN Volume Controller: Planning Guide	This guide introduces the SAN Volume Controller and lists the features you can order. It also provides guidelines for planning the installation and configuration of the SAN Volume Controller.	GA22-1052
IBM TotalStorage SAN Volume Controller: Service Guide	This guide includes the instructions the service representative uses to service the SAN Volume Controller.	SC26-7542
IBM TotalStorage SAN Volume Controller: Translated Safety Notices	This guide contains the danger and caution notices for the SAN Volume Controller. The notices are shown in English and in numerous other languages.	SC26-7577

Other IBM publications:

Table 2 on page ix lists and describes other IBM publications that contain additional information related to the SAN Volume Controller.

Table 2. Other IBM publications

Title	Description	Order number
IBM TotalStorage Enterprise Storage Server, IBM TotalStorage SAN Volume Controller, IBM TotalStorage SAN Volume Controller for Cisco MDS 9000, Subsystem Device Driver: User's Guide	This guide describes the IBM Subsystem Device Driver Version 1.5 for TotalStorage Products and how to use it with the SAN Volume Controller. This publication is referred to as the *IBM TotalStorage Subsystem Device Driver: User's Guide*.	SC26-7608

Related topics:
- "How to order IBM publications"
- "How to send your comments" on page x

How to order IBM publications

This topic explains how to order copies of IBM publications and how to set up a profile to receive notifications about new or changed publications.

The IBM publications center:

The publications center is a worldwide central repository for IBM product publications and marketing material.

The IBM publications center offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download free of charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM publications center through the following Web site:

www.ibm.com/shop/publications/order/

Publications notification system:

The IBM publications center Web site offers you a notification system for IBM publications. Register and you can create your own profile of publications that interest you. The publications notification system sends you a daily e-mail that contains information about new or revised publications that are based on your profile.

If you want to subscribe, you can access the publications notification system from the IBM publications center at the following Web site:

www.ibm.com/shop/publications/order/

Related topics:
- "Related publications" on page vii

Related Web sites

Table 3 lists Web sites that have information about SAN Volume Controller or related products or technologies.

Table 3. Web sites

Type of information	Web site
SAN Volume Controller support	http://www.ibm.com/storage/support/2145/
Technical support for IBM storage products	http://www.ibm.com/storage/support/

How to send your comments

Your feedback is important to help us provide the highest quality information. If you have any comments about this book or any other documentation, you can submit them in one of the following ways:

- e-mail

  Submit your comments electronically to the following e-mail address:

  starpubs@us.ibm.com

  Be sure to include the name and order number of the book and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.

- Mail or fax

  Fill out the Readers' Comments form (RCF) at the back of this book. Return it by mail or fax (1-408-256-0488), or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

  International Business Machines Corporation
  RCF Processing Department
  Department 61C
  9032 South Rita Road
  Tucson, Arizona 85775-4401
  U.S.A.

Related topics:

- "Related publications" on page vii

Chapter 1. SAN Volume Controller and host system overview

This information provides an overview of the relationship between the SAN Volume Controller and the host systems.

The SAN Volume Controller provides heterogeneous host attachments so that you can consolidate storage capacity and workloads for open-systems hosts. The SAN Volume Controller supports a maximum of 64 separate hosts and a maximum of 128 host fibre-channel ports, identified by their World-Wide Port Numbers (WWPNs).

Hosts are attached to the SAN Volume Controller using a switched fibre channel fabric.

Related topics:
- "Fibre Channel (SCSI-FCP) attached open-systems host support"

Fibre Channel (SCSI-FCP) attached open-systems host support

This information describes important requirements for attaching the SAN Volume Controller to a Fibre Channel open systems host. For information about host systems, operating system levels, host bus adapters, cables, and fabric that IBM® supports, see:http://www.ibm.com/storage/support/2145/

Each SAN Volume Controller fibre-channel adapter has two ports. You can configure the port to operate with the SCSI-FCP upper layer protocol.

Fibre-channel adapters that are configured for SCSI-FCP (fibre-channel protocol) support:
- A maximum of 128 host logins per fibre-channel port
- A maximum of 512 SCSI-FCP host logins or SCSI-3 initiators per SAN Volume Controller
- A maximum of 4096 LUNs per target (one target per host adapter), depending on host type
- Switched fabric topology

The SAN Volume Controller supports the following host systems for shortwave fibre-channel attachment and longwave fibre-channel attachment:
- IBM RS/6000®, pSeries™, RS/6000 SP™, and pSeries SP server that run an IBM AIX® operating system
- Hewlett-Packard servers that run an HP/UX operating system
- Intel-based servers that run a Microsoft® Windows® 2000 or 2003 operating system
- Sun servers that run a Solaris operating system

Related topics:
- "Targets and LUNs" on page 2

Targets and LUNs

This information provides a description of the LUN support.

For fibre-channel attachment, each fibre-channel host adapter can architecturally attach up to 2^{64} LUNs. The SAN Volume Controller supports a maximum of 1024 LUNs with a maximum of 512 configured to any one host. Not all hosts will support 512 LUNs.

Each virtual disk created on the SAN Volume Controller can be mapped to multiple Host Bus Adapter (HBA) fibre channel ports in a given host. There may also be multiple paths across the Storage Area Network. For these reasons the SAN Volume Controller needs the IBM Subsystem Device Driver (SDD) to be running on each host. The SDD software handles the many paths that are available to the virtual disk and presents a single storage device to the operating system.

FlashCopy and Remote Copy restrictions

IBM This information provides a brief description and the conditions required for using FlashCopy® and Remote Copy.

When you copy a source volume to a target volume with FlashCopy or Remote Copy, the source and target volumes should be on different host systems. That is, if you require concurrent read/write access of both volumes. A copy operation with the target volume and the source on the same host system creates a target volume with the same identification as the source volume. The host system sees two identical volumes.

When the copy operation creates the same identification for the target volume as for the source volume, you cannot distinguish one from the other. Therefore, you might not be able to access the original data.

The target volume and the source volume can be on the same host system for a Remote Copy or FlashCopy operation only under the following conditions:
* For AIX, when the host is using a logical volume manager (LVM) with **recreatevg** command.
* For HP, when the host is using LVM with the **vfchigid -f** command.
* For AIX and Sun, when the host is *not* using an LVM.
* For those host systems that run the Veritas Volume Manager, the SAN Volume Controller sets a bit in the inquiry data that enables the Veritas Volume Manager to distinguish between the source and target VDisks for those mapping states where the source and target VDisks could be identical copies.
* For any host system, when the host system can distinguish between a source and a target volume that has the same identification.

Chapter 2. Requirements for attaching to a Hewlett-Packard 9000 host

This information describes how to attach a Hewlett-Packard host system to a SAN Volume Controller with the following adapter cards:

- A5158A
- A6795A

For up to date information about the servers, operating systems, and fabric connections that IBM supports for the Hewlett-Packard host, check the storage support Web site.

Requirements:

The requirements for attaching the SAN Volume Controller to your host system are:

- Check the LUN limitations for your host system. The maximum configuration for HP-UX is 8 virtual disks per I/O group per host.
- Ensure that you have the documentation for your host system.
- See ssddom02.storage.ibm.com/techsup/webnav.nsf/support/2145 for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller.

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
2. Configure the fibre-channel host system with the worldwide port name identifiers. You will have to locate the list of worldwide port names.
3. Define the fibre-port configuration if it was not done when the SAN Volume Controller or fibre-channel adapters were installed.
4. Configure the host system for the SAN Volume Controller using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for HP-UX to enable the management of multiple paths to SAN Volume Controller virtual disks. SDD does not support HP-UX in a clustering environment. Also note that SDD is not supported in the HP-UX 32-bit mode operating environment.

Note: To have failover protection on an open system, SDD requires a minimum of two fibre-channel adapters. The maximum number of fibre-channel adapters supported is 4 for a total of 4 fibre-channel ports.

Related topics:

- "Locating the WWPN for a Hewlett Packard host" on page 49
- "Installing the adapter drivers for the HP-UX 11.0 and HP-UX 11.i operating systems" on page 4

Installing the adapter drivers for the HP-UX 11.0 and HP-UX 11.i operating systems

This section explains how to download and configure the following adapter drivers:

- A5158A
- A6795A

Note: The steps to install and configure adapter cards are examples. Your configuration might be different.

Steps:

Perform the following steps to install the adapter, download the adapter, and configure the adapter:

1. Go to http://www.ibm.com/storage/support/2145/.
2. From the page for 2145 SAN Volume Controller, click **Fibre channel host bus adapter firmware and driver level matrix**.
3. Find the section for the current version of the driver and firmware and driver you want.
4. Obtain the driver and firmware from Hewlett-Packard and install them according to the documentation provided.

Post-processing requirements:

After installing the fibre-channel adapters and drivers, you can verify their status using the `fcmsutil /dev/td`*x* command, where *x* is the number of the adapter, normally beginning with 0.

After storage has been configured and mapped to the host, you can discover the disks by running `ioscan -f -n`. The disks are discovered as IBM 2145 disks, and the number of devices discovered depends on the number of adapters and zoned paths to the SAN Volume Controller.

After discovering the disks, run `insf -e` to build the device nodes in the `/dev/dsk` and `/dev/rdsk` directories. When this is done, you can build your host disk devices using SDD. For more information, see *IBM TotalStorage Subsystem Device Driver: User's Guide*.

Related topics:

- Chapter 2, "Requirements for attaching to a Hewlett-Packard 9000 host," on page 3
- "Known problems and limitations"

Known problems and limitations

This information lists the known problems and limitations of attaching the SAN Volume Controller to the Hewlett Packard 9000 host.

It is recommended that you manually set the domain IDs prior to building the multiswitch fabric and prior to rezoning for the following reasons:

- When two switches are joined while active, they will determine if the domain ID is already in use as before, but if there is a conflict it cannot be changed in an active switch. A conflict will cause an active switch to fail.
- The domain ID is used to identify switch ports when you implement zoning using the domain and switch port number. If domain IDs are negotiated at every fabric start up, there is no guarantee that switch IDs will persist from one session to the next. If the switch ID changes, any zoning definitions will become invalid.
- If the domain ID is changed after a SAN is set up, some host systems may have difficulty logging back in with the switch, and a host reconfiguration might be required to detect devices on the switch again.

Related topics:
- Chapter 2, "Requirements for attaching to a Hewlett-Packard 9000 host," on page 3
- "Installing the adapter drivers for the HP-UX 11.0 and HP-UX 11.i operating systems" on page 4

Chapter 3. Requirements for attaching to an IBM RS/6000 or IBM @server pSeries host

This information describes the host system requirements to attach a SAN Volume Controller to the following host systems:

- RS/6000 with fibre-channel adapters
- pSeries with fibre-channel adapters
- RS/6000 ScalablePOWER Parallel (SP) Complex with fibre-channel adapters
- pSeries SP Complex with fibre-channel adapters

For up-to-date information about the servers, operating systems, host adapters, and fabric connections that IBM supports, see the following Web site: http://www.ibm.com/storage/support/2145/

Requirements:

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Ensure that you have the installation script files. These files are on the Compact Disc (CD) that you receive with the SAN Volume Controller.
- Ensure that you have the correct updates and APARs for your operating system:
  - For AIX 5.1, ensure that you have obtained and installed maintenance level AIX 5100-05. Type the command: **oslevel -r** to determine the current AIX level.
  - For AIX 5.2, ensure that you have obtained and installed maintenance level AIX 5200-02. Type the command: **oslevel -r** to determine the current AIX level.
- Ensure that you have 1 MB minimum of hard disk space available to install the AIX host attachment package.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
- For details about the release level for your operating system, see the following Web site: http://www.ibm.com/storage/support/2145/

The following tasks must be performed to configure a SAN Volume Controller:

1. The IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
2. Define the fibre-port configuration if you did perform the installation of the SAN Volume Controller or fibre-channel adapters.
3. Configure the host system for the SAN Volume Controller. Use the instructions in your host system publications.
4. Install the IBM Subsystem Device Driver for AIX to enable the management of multiple paths to SAN Volume Controller virtual disks.

Note: The SDD supports RS/6000 and pSeries host systems in a clustering environment. To have failover protection on an open system, the SDD requires a minimum of two fibre-channel adapters. The maximum number of fibre channel ports supported in a single host (or logical partition) is four. This can be four single-port adapters or two dual-port adapters or a

combination as long as the maximum number of ports attached to the SAN Volume Controller does not exceed four.

Related topics:
- "Locating the WWPN for an IBM @server pSeries or an RS/6000 host" on page 50
- "Installing the host attachment package"

Preparing for installation

This information details the steps that must be performed before installing the host attachment package on the IBM RS/6000 or IBM @server pSeries host.

Steps:

Perform the following steps to prepare your IBM RS/6000 or IBM @server pSeries host for the host attachment package:

1. Attach the SAN Volume Controller to your host system.
2. Turn on the host system and all attachments.
3. Ensure that you have root access.
4. Ensure that you have administrator knowledge.
5. Ensure that you have knowledge of the System Management Interface Tool (SMIT).
6. Ensure that you have installed the prerequisite package devices.fcp.disk, which is required by the host attachment package.

Note: You are not required to vary off the volume group before you install the new version.

Result:

You are now ready to install the host attachment package.

Related topics:
- "Installing the host attachment package"
- Chapter 3, "Requirements for attaching to an IBM RS/6000 or IBM @server pSeries host," on page 7

Installing the host attachment package

This information lists the steps required to install the host attachment to an IBM RS/6000 or IBM @server pSeries host.

Prerequisites:

Before installing the host attachment package, be sure that you are aware of the preinstall procedures. You must have superuser authority to complete this procedure.

Steps:

Perform the following steps using SMIT to install the host attachment package, *devices.fcp.disk.ibm2145.rte*, from a CD:

Note: The following procedure is an example. The example uses /dev/cd0 for the address of the CD drive. Your address might be different.

Note: You can see the version of the host attachment package currently installed on your computer, if any, by entering the command: `lslpp -l devices.fcp.disk.ibm2145.rte.`

1. From your desktop window, type `smit install_update` to go directly to the installation panel.
2. Select **Install and Update from the Latest Available Software** and press Enter.
3. Press F4 to open the Input Device/Directory for Software window.
4. Select the CD drive that you are using for the installation, for example, /dev/cd0, or enter the absolute path and package name for the host attachment package.
5. Press Enter.

   The Install and Update from the Latest Available Software window opens.
6. Select **Software to Install** and press F4.
7. Select **Software Packages** and press F7.

   The Install and Update from the Latest Available Software panel displays with the name of the software you selected to install.
8. Check the default option settings to ensure that they are what you need.
9. Press Enter to install the software.

   SMIT prompts you for confirmation.
10. Press Enter to continue.

    The installation process might take several minutes. A message is displayed when the installation process is complete, and you are prompted to restart the host system.
11. Press F10 when the installation process is complete.
12. Exit from SMIT.
13. Remove the CD.
14. Restart the host system.

Related topics:
- "Preparing for installation" on page 8
- "Completing the installation"

Completing the installation

These instructions explain how to upgrade the data on existing SAN Volume Controller disks when you install or upgrade the host attachment package on an IBM RS/6000 or IBM @server pSeries host.

Prerequisites:

Before performing these steps, be sure that you installed the host attachment package.

Context:

This procedure applies if you want to replace a previous version of the host attachment package and have data that exists on all configured SAN Volume Controller disks.

Steps:

Perform the following steps to upgrade the data on the SAN Volume Controller to match the newly installed host attachment:

1. Run the **umount** command to unmount the file system. For example, type umount *x*, where *x* is the file system name. If you are on an SP host, go to step 2, otherwise go to step 4.
2. Type suspendvsd to suspend the virtual shared disks associated with the volume groups.
3. Type stopvsd to stop the virtual shared disks associated with the volume groups.
4. Run the **varyoffvg** command for the 2145 volume group. For example, type varyoffvg VGname.
5. Type rmdev -dl hdisk# on the command line to remove or unconfigure the SAN Volume Controller devices.
6. Install devices.fcp.disk.ibm2145.rte.
7. Run cfgmgr so that the host can accept your changes.
8. After your host restarts, verify that the volume groups are set to autovaryon and that the file systems are set to automount. If the volume groups *are not* set to autovaryon and the file systems *are not* set to automount, you must perform the following tasks:
   a. Type the **varyonvg** command to varyon the volume groups.
   b. Type the **mount** command to mount the file systems.
9. Install the IBM Subsystem Device Driver (SDD) for AIX to enable the management of multiple paths to SAN Volume Controller virtual disks. The SAN Volume Controller does not support MPIO.

Related topics:
- "Installing the host attachment package" on page 8
- "Verifying the configuration"

Verifying the configuration

This information provides the required steps for verifying the configuration of the SAN Volume Controller on the AIX host system.

Steps:

Enter the following command to verify the configuration of the SAN Volume Controller on the AIX host system:

lsdev -Ct 2145

Result:

Figure 1 on page 11 shows an example of the results of the lsdev command if the configuration is successful.

```
hdisk235 Available 31-08-01 SAN Volume Controller Device
hdisk236 Available 31-08-01 SAN Volume Controller Device
hdisk237 Available 31-08-01 SAN Volume Controller Device
...
...
```

Figure 1. Example of a list of devices displayed by the lsdev command for a successful configuration

Figure 2 shows an example of the results of the lsdev command if the configuration was not successful.

```
hdisk3 Available 30-68-01, Other FCSCSI disk device
hdisk4 Available 30-68-01, Other FCSCSI disk device
hdisk5 Available 30-68-01, Other FCSCSI disk device
...
...
```

Figure 2. Example of a list of other devices displayed by the lsdev command for an unsuccessful configuration

Related topics:
- "Completing the installation" on page 9
- "Making SAN changes"

Making SAN changes

This task explains how to make changes to the SAN on the AIX host system.

Prerequisites:

Describe task prerequisites or other information helpful to beginning the task. This section is optional.

Context:

The 6227 and 6228 host adapter cards do not support dynamic SAN configuration changes. Do not change the domain ID of the switch port of the switch connected to the SAN Volume Controller, otherwise, you might lose the connection to the SAN Volume Controller.

Steps:

Perform the following steps to make changes to the SAN:
1. Before you change the switch port connected to the SAN Volume Controller or the switch domain ID, remove the fibre-channel adapter:
   a. Run the **umount** command to unmount the files on the file system.

      For example, type umount *x*, where *x* is the file system name. If you are on an SP host, go to step 1b, otherwise go to step 1d.
   b. Type suspendvsd to suspend the virtual shared disks with the volume groups.
   c. Type stopvsd to stop the virtual shared disks associated with the volume groups.
   d. Run the **varyoffvg** command for the 2145 volume group.

      For example, type varyoffvg VGname

e. Type `rmdev -dl fcsx -R` on the command line to remove the fibre-channel adapter.
2. Type `cfgmgr` to reinstall the adapter and rediscover the 2145 hdisks.
3. Type `importvg VGname` to import the volume groups.
4. Type `varyonvg` to vary on the volume groups.
5. Remount the file system.

Related topics:
- "Configuring SAN Volume Controller devices with multiple paths per LUN"

Configuring SAN Volume Controller devices with multiple paths per LUN

Dynamically increasing the size of a SAN Volume Controller virtual disk:

This information explains how to dynamically change the size of a vdisk.

In AIX 5.2 and later versions, the **chvg** command options provide the ability to grow the size of a physical volume that LVM uses, without interruptions to the use or availability of the system. Refer to the System Management Guide: Operating System and Devices LVM – Maintenance Tasks for more information.

This information explains the SAN Volume Controller support for multiple LUNs on an AIX host.

The SAN Volume Controller supports multiple path configurations for a LUN. This means that you can have multiple hdisks available on the AIX server for each physical LUN. To configure multiple paths for all LUNs, add all of the adapters and fibre channel cables, then use the **cfgmgr** command once for each adapter to discover all of the fibre channel devices. If you add fibre channel devices after running cfgmgr, you must run it again to discover the new devices.

Related topics:
- "Known issues and limitations"

Known issues and limitations

This information provides a reference to known issues and limitations with the SAN Volume Controller and an AIX host.

On heavily loaded systems, you might see lower than expected performance without any errors being logged. One possible cause is that the host is low on DMA resources.

On a heavily loaded system you might see errors indicating that the host bus adapter (HBA) was unable to activate an I/O request on the first attempt. The most likely cause of these errors is that the host is low on DMA resources.

To reduce the incidence of these messages you can increase the resources by modifying the maximum transfer size attribute for the adapter as follows:
1. Type the following command to view the current setting:
   ```
   lsattr -El <HBA> -a max_xfer_size
   ```

where *HBA* is the name of the adapter logging the error. For this example the HBA is fcs0.

2. Type the following command to increase the size of the setting:

```
chdev -l fcs0 -P -a max_xfer_size=0x1000000
```

Note: To view the range of allowable values for the attribute, type: `lsattr -Rl fcs0 -a max_xfer_size`

Restart the host to put these changes into effect.

Related topics:
- "Sample AIX error log"

Sample AIX error log

This information provides an example of an AIX error log.

The errors shown in the following sample error log indicate that the HBA was unable to open an I/O request on the first attempt because the DMA resources were too low.

```
LABEL:  FCS_ERR6
IDENTIFIER: D0EAC662

Date/Time:      Wed Dec  4 16:41:48 MST
Sequence Number: 1949119
Machine Id:     0021DF9A4C00
Node Id:        lode1
Class:          H
Type:           TEMP
Resource Name:  fcs0
Resource Class: adapter
Resource Type:  df1000f9
Location:       3V-08
VPD:
        Part Number.................03N2452
        EC Level....................D
        Serial Number...............1809102EC
        Manufacturer................0018
        FRU Number..................09P0102
        Network Address.............10000000C92BB50F
        ROS Level and ID............02C03891
        Device Specific.(Z0)........1002606D
        Device Specific.(Z1)........00000000
        Device Specific.(Z2)........00000000
        Device Specific.(Z3)........02000909
        Device Specific.(Z4)........FF401050
        Device Specific.(Z5)........02C03891
        Device Specific.(Z6)........06433891
        Device Specific.(Z7)........07433891
        Device Specific.(Z8)........20000000C92BB50F
        Device Specific.(Z9)........CS3.82A1
        Device Specific.(ZA)........C1D3.82A1
        Device Specific.(ZB)........C2D3.82A1

Description
MICROCODE PROGRAM ERROR

Probable Causes
ADAPTER MICROCODE

Failure Causes
ADAPTER MICROCODE

 Recommended Actions
```

```
IF PROBLEM PERSISTS THEN DO THE FOLLOWING
CONTACT APPROPRIATE SERVICE REPRESENTATIVE

Detail Data
SENSE DATA
0000 0000 0000 0029 0002 0039 0000 0000 0061 1613 0090 D5FD 0000 C98B 0000 012C
0000 0000 0000 0003 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0608 0000 0000 0010 0000 0000 0000 0000 0000 2710 0000 07D0 0000 076C
0000 0064 0000 000F 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000
```

Related topics:

- "Known issues and limitations" on page 12

Chapter 4. Attaching to an Intel host running Linux

This information describes how to attach an Intel™ server running Linux to a SAN Volume Controller with the following fibre-channel adapters:

- QLogic QLA2310FL adapter card
- QLogic QLA2340FL adapter card
- QLogic QLA2342FL adapter card

See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.

Attachment requirements:

Note: The steps to install and configure adapter cards are examples. Your configuration might be different.

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Check the LUN limitations for your host system.
- Ensure that you have the documentation for your host system and related information *IBM TotalStorage SAN Volume Controller: Installation Guide*.
- Ensure that you are running a supported kernel of Red Hat Linux AS.
- See http://www.ibm.com/storage/support/2145/ for details about the release level for your operating system.
- When attaching the SAN Volume Controller to a Bladecenter HS20 with blade 8678, refer to the Bladecenter documentation for SAN configuration details.

The following tasks must be performed to configure a SAN Volume Controller:

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage SAN Volume Controller: Configuration Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. You will have to locate the worldwide port names.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for Linux to enable the management of multiple paths to SAN Volume Controller virtual disks.

Related topics:

- "Installing the QLogic adapter card"
- "Locating the WWPN for a Linux host" on page 50

Installing the QLogic adapter card

This section tells you how to attach an Intel host system running Linux to a SAN Volume Controller with the QLogic QLA23xx adapter card.

Note: The following steps are an example configuration. The configuration for your adapter might differ.

Prerequisites:

Shutdown your Linux host. This will involve closing applications and then issuing the shutdown command to the operating system. Follow your manufacturer's recommendations for powering down the Linux host and its attached peripherals.

Open the Linux host case. Ensure that, when you are handling the host and adapter hardware that you use the manufacturer's recommended ESD procedures throughout the replacement procedure.

Steps:

Perform the following steps to install the QLogic QLA23xx adapter card:

1. Install the QLogic QLA23xx adapter card in the host system.
2. Connect the cable to the Fibre Channel switch.
3. Restart the server.
4. Press Ctrl+Q to get to the FAST!Util menu panel.
5. From the Select Host Adapter menu, select the adapter type QLA23xx.
6. From the Fast!UTIL Options menu, select **Configuration settings**.
7. From the Configuration Settings menu, click **Host Adapter Settings**.
8. Set the parameters and values from the Host Adapter Settings menu as follows:
   a. Host adapter Basic Input/Output System (BIOS): **Disabled**
   b. Frame size: **2048**
   c. Loop reset delay: **5 (minimum)**
   d. Adapter hard loop ID: **Disabled**
   e. Hard loop ID: **0**
   f. Spinup delay: **Disabled**
   g. Connection options: **1 - point to point only**
   h. Fibre Channel tape support: **Disabled**
   i. Data rate: **2**
9. Press Esc to return to the Configuration Settings menu.
10. From the Configuration Settings menu, select **Advanced Adapter Settings**.
11. From the Advanced Adapter Settings menu, press the Down Arrow to highlight **LUNs per target**. Press Enter. Set the following parameters:
    a. Execution throttle: **100**
    b. LUNs per target: **0**
    c. Enable LIP reset: **No**
    d. Enable LIP full login: **Yes**
    e. Enable target reset: **Yes**
    f. Login retry count: **30**
    g. Port down retry: **30**
    h. Link down timeout: **0**
    i. Extended error logging: **Disabled (might be enabled for debugging)**
    j. RIO operation mode: **0**

      k. Interrupt delay timer: **0**

12. Press Esc to return to the Configuration Settings menu.
13. Press Esc.
14. From the Configuration settings modified window, select **Save changes**.
15. From the Fast!UTIL options menu, select **Select Host Adapter** and repeat steps 5 on page 16 through 14 for any additional QLogic QLA23xx adapters.
16. Restart the server.

Related topics:
- Chapter 4, "Attaching to an Intel host running Linux," on page 15
- "Downloading the current QLogic adapter driver"

Downloading the current QLogic adapter driver

This information explains how to download the current QLogic adapter driver for the adapter installed in your Intel host running Linux.

Steps:

Perform the following steps to download the current adapter driver onto the QLogic adapter card:

1. Go to http://www.ibm.com/storage/support/2145/.
2. Click **Interoperability matrix**.
3. Click **SAN Volume Controller interoperability matrix**.
4. Find the section for the current version of the driver and firmware and driver you want.
5. Go to the QLogic web site.
6. Click **Drivers / Software** from the **Quick Links** list.
7. Select **IBM** from the **OEM-approved Drivers/Firmware** section.
8. Navigate to the adapter you want to download, then click **Download**.

Related topics:
- "Installing the QLogic adapter card" on page 15
- "Installing the QLogic adapter drivers"

Installing the QLogic adapter drivers

This information explains how to install the QLogic adapter drivers on the adapter installed on an Intel host running Linux.

Prerequisites:

Before installing the QLogic adapter drivers, you must install the QLogic adapter card, set the correct BIOS settings, and download the driver.

Steps:

Perform the following steps to install the QLogic adapter drivers:

1. Enter:

   ```
   mkdir /usr/src/qlogic
   ```
2. Enter:

   ```
   mv download location/driver source /usr/src/qlogic
   ```

3. Enter:

```
cd /usr/src/qlogic
```

4. Enter:

```
tar -xzf [driver source]
```

5. Unpack the driver source code provided by QLogic by entering:

```
./drvrsetup
```

6. Read and follow the instructions contained in the driver readme file for compiling and installing the driver. This file is included in the README.ql2x00 distribution.

Related topics:
- "Downloading the current QLogic adapter driver" on page 17
- "Defining the number of disks on Linux"
- "Installing the QLogic adapter card" on page 15

Defining the number of disks on Linux

This information explains how to define the number of disks on Linux.

The maximum number of devices that are supported on a Linux host system is 128. The standard Linux kernel uses a major and minor number address mechanism. A special device file represents each disk device. For each default, there is a maximum of 16 partitions per disk. The major and minor numbers are each 8-bits.

Fibre-channel attached devices are handled as SCSI devices. There are eight major numbers that are reserved for SCSI devices. The major numbers are 8, 65, 66, 67, 68, 79, 70, and 71.

There are 256 minor numbers available for each of the eight major numbers. The following formula provides the maximum number of devices for Linux host systems:

Steps:
1. Number of devices = (number of major numbers) x (number of minor numbers) ÷ (number of partitions)

   For example: Number of devices = 8 x 256 ÷ 16 = 128

You an also use the device file systems **devfs** command. The **devfs** command uses a 32-bit device identifier, which enables the SAN Volume Controller to address many more devices. It lists only the devices that are available on the system, instead of listing device files for devices that are not attached to the system. The **devfs** command is compatible with earlier versions of the processor, mounts over the /dev file, and uses UNIX-like device identification.

Figure 3 show an example of the device file systems command for a Linux host.

```
/dev/scsi/host/bus/target/lun
```

Figure 3. Example of the device file systems command for a Linux host

By default, Linux host systems expect a single LUN for each Fibre-Channel attached device. This leads to the configuration of only one SCSI disk for each

attached SAN Volume Controller. To allow the configuration of additional LUNs on the same SAN Volume Controller, you must modify the Linux kernel so it will search for multiple LUNs on each attached device. Complete these steps to modify the kernel:

1. Add the following line to the /etc/modules.conf file:

   ```
   options scsi_mod max_scsi_luns=255
   ```

2. Run the **mkinitrd** command to rebuild the RAMdisk that is associated with the kernel being used.

Multiple LUNs on the same SAN Volume Controller will now be configured.

Note: Due to limitations of the Linux operating system, LUNs that are not numbered contiguously starting with 0 will not be configured automatically during startup.

Related topics:
- Chapter 4, "Attaching to an Intel host running Linux," on page 15
- "Setting queue depth"

Setting queue depth

This topic lists the steps required to set the queue depth.

Steps:

For Linux hosts, it is necessary to limit the queue depth for each device path to 4. To set the default queue depth when the Qlogic module is loaded, you must modify the Linux kernel. Follow these steps to modify the kernel:

1. Add the following line to the /etc/modules.conf file: options qla2300 ql2xmaxqdepth=4.
2. Run the mkinitrd command to rebuild the RAMdisk associated with the kernel being used.

Related topics:
- "Defining the number of disks on Linux" on page 18
- "SAN Volume Controller storage configuration"

SAN Volume Controller storage configuration

This information describes the SAN Volume Controller storage configuration.

Each of the attached SAN Volume Controller LUNs has a special device file in the Linux directory /dev. There is a maximum of 128 fibre-channel disks that are based on the major numbers that are available. The entries for all 128 devices are added by the operating system automatically.

The range of devices goes from /dev/sda (LUN 0) to /dev/sddx (LUN 127) without an IBM Subsystem Device Driver, or from /dev/vpatha (LUN 0) to /dev/vpathdx (LUN 127) with an IBM Subsystem Device Driver. Figure 4 on page 20 and Figure 5 on page 20 show examples of the range for the devices.

```
# ls –l /dev/sda
brw-rw---- 1 root disk 8, 0 Aug 24 2000 /dev/sda
```

Figure 4. Example of range of devices for a Linux host when not using the IBM Subsystem Device Driver

```
# ls –l /dev/vpatha
brw-rw---- 1 root disk 8, 0 Aug 24 2000 /dev/vpatha
```

Figure 5. Example of range of devices for a Linux host when using the IBM Subsystem Device Driver

Related topics:

- "Defining the number of disks on Linux" on page 18
- "SAN Volume Controller disk partitions"
- "Assigning the system ID to the partition" on page 21
- "File systems on the SAN Volume Controller" on page 22

SAN Volume Controller disk partitions

Refer to this information when setting up SAN Volume Controller disk partitions.

Before you create a file system, partition the disk by using the fdisk utility. You have to specify the special device file of the disk you want to partition when executing fdisk. Figure 6 shows an example of the different options for the fdisk utility.

Note: If you are using the IBM Subsystem Device Driver, your path in the example would be /dev/vpathb instead of /dev/sdb.

```
# fdisk /dev/sdb

Command  (m for help): m
Command  action
a    toggle a bootable flag
b    edit bsd disklabel
c    toggle the dos compatibility flag
d    delete a partition
l    list known partition types
m    print this menu
n    add a new partition
o    create a new empty DOS partition table
p    print the partition table
q    quit without saving changes
s    create a new empty Sun disklabel
t    change a partitions system id
u    change display/entry units
v    verify the partition table
w    write table to disk and exit
x    extra functionality (experts only)
```

Figure 6. Example of different options for the fdisk utility

Example:

Figure 7 on page 21 shows an example of a primary partition on the disk /dev/sdb.

Note: If you are using the IBM Subsystem Device Driver, your path in the example would be /dev/vpathb instead of /dev/sdb.

```
Command (m for help): n

Command  action
e     extended
p     primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-953, default 1): Enter
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-953, default 953): Enter
Using default value 953

Command (m for help): p

Disk /dev/sdb: 64 heads, 32 sectors, 953 cylinders
Units = cylinders of 2048 * 512 bytes

 Device Boot  Start  End   Blocks  Id  System
 /dev/sdb1     1 953   975856  83  Linux
```

Figure 7. Example of a primary partition on the disk /dev/sdb

Related topics:
- "SAN Volume Controller storage configuration" on page 19
- "Assigning the system ID to the partition"
- "File systems on the SAN Volume Controller" on page 22

Assigning the system ID to the partition

This information provides the steps required to assign the system ID to the SAN Volume Controller partition on the Intel host running Linux.

Steps:

Perform the following steps to assign the Linux system ID to the partition:
1. Assign the system partition ID.
2. Write the information to the partition table on the disk.
3. Exit the fdisk program.

Result:

Figure 8 on page 22 shows the assignment of the Linux system ID to the partition (hex code 83).

```
Command  (m for help): t
Partition number (1-4): 1

Hex code (type L to list codes): 83

Command  (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
SCSI device sdb: hdwr sector= 512 bytes. Sectors= 1953152 [953 MB] [1.0 GB]
 sdb: sdb1
SCSI device sdb: hdwr sector= 512 bytes. Sectors= 1953152 [953 MB] [1.0 GB]
 sdb: sdb1

WARNING: If you have created or modified any DOS 6.x partitions, please see the
fdisk manual page for additional information.
Syncing disks.
[root@yahoo /data]#
```

Figure 8. Example of assigning a Linux system ID to the partition

Related topics:

- "SAN Volume Controller storage configuration" on page 19
- "SAN Volume Controller disk partitions" on page 20
- "File systems on the SAN Volume Controller"

File systems on the SAN Volume Controller

Refer to this information when you are ready to create and use file systems on the SAN Volume Controller.

After you partition the disk, the next step is to create a file system. Figure 9 shows an example of how to use the **mke2fs** command to create an EXT2 Linux file system (which is nonjournaled).

Note: If you are using the IBM Subsystem Device Driver, your path in the example would be /dev/vpathb1 instead of /dev/sdb1.

```
[root@yahoo /data]# mke2fs /dev/sdb1
mke2fs 1.18, 11-Nov-1999 for EXT2 FS 0.5b, 95/08/09
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
122112 inodes, 243964 blocks
12198 blocks (5.00%) reserved for the super user
First data block=0
8 block groups
32768 blocks per group, 32768 fragments per group
15264 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376

Writing inode tables: done
Writing superblocks and filesystem accounting information: done
[root@yahoo /data]#
```

Figure 9. Example of creating a file with the mke2fs command

Figure 10 on page 23 shows an example of the EXT2 Linux file system, which is nonjournaled, by using the **mkfs** command.

Note: If you are using the IBM Subsystem Device Driver, your path in the example would be /dev/vpathb1 instead of /dev/sdb1.

```
[root@yahoo /data]# mkfs -t ext2 /dev/sdb1
mke2fs 1.18, 11-Nov-1999 for EXT2 FS 0.5b, 95/08/09
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
122112 inodes, 243964 blocks
12198 blocks (5.00%) reserved for the super user
First data block=0
8 block groups
32768 blocks per group, 32768 fragments per group
15264 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
[root@yahoo /data]#
```

Figure 10. Example of creating a file with the mkfs command

Related topics:
- "SAN Volume Controller storage configuration" on page 19
- "SAN Volume Controller disk partitions" on page 20
- "Assigning the system ID to the partition" on page 21

Known problems and issues

This information contains known problems and issues when running the SAN Volume Controller with an Intel host running Linux.

In response to errors, the kernel might permanently disable a LUN and log a message stating **device set offline** and the specific device. If this happens, there is no way to bring the LUN online. It might be possible to remove the LUN and add it back through the /proc/scsi/scsi directory or reload the host adapter driver. If those fail, it is necessary to reboot the host.

Related topics:
- Chapter 4, "Attaching to an Intel host running Linux," on page 15
- "SAN Volume Controller storage configuration" on page 19

Chapter 5. Attaching to a Sun host

This information describes how to attach a SAN Volume Controller to a Sun host system with the following fibre-channel adapters:

- JNI FCE-1473 adapter card
- JNI FCE-6460 adapter card

Attachment requirements:

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Ensure that there are enough fibre-channel adapters installed in the server to handle the total LUNs you want to attach.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage SAN Volume Controller: Installation Guide*. This documentation is on the TotalStorage® CD that you receive with the SAN Volume Controller.
- Ensure that you have installed Solaris 9, update 5.
- Review device driver installation documents and configuration utility documents for additional Solaris patches that you might need.

The following tasks must be performed to configure a SAN Volume Controller:

1. The IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. You will have to locate the list of worldwide port names.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver for Solaris to enable the management of multiple paths to SAN Volume Controller virtual disks. SDD does not support the Sun host system in a clustering environment.

Related topics:

- "Locating the WWPN for a Sun host" on page 51
- "Installing the JNI PCI adapter card"
- "Installing the JNI SBUS adapter card" on page 28

Installing the JNI PCI adapter card

This section tells you how to attach a SAN Volume Controller to a Sun host system running Solaris 9, update 5, with the JNI PCI adapter card.

Prerequisites:

Shutdown your Sun host. This will involve closing applications and then issuing the shutdown command to the operating system. Follow your manufacturer's recommendations for powering down the Sun host and its attached peripherals.

Open the case of the Sun host. Ensure that, when you are handling the host and adapter hardware that you use the manufacturer's recommended ESD procedures throughout the replacement procedure.

Steps:

Perform the following steps to install the JNI PCI adapter card:

1. Insert the host adapter board into the empty PCI bus slot. Press firmly until seated.
2. Secure the mounting bracket for the adapter to the case with the panel screw.
3. Replace the computer case by tightening the screws on the case or use the clamp to secure the cover.
4. Connect the adapter card to the fabric with an optical cable.

Related topics:
- "Downloading the current JNI PCI adapter driver"
- "Installing the JNI PCI adapter driver" on page 27

Downloading the current JNI PCI adapter driver

This information provides the steps required to download the JNI PCI fibre-channel adapter driver.

Steps:

Perform the following steps to download the current JNI PCI adapter driver:

1. Restart your host system.
2. Go to the IBM storage support Web site to determine the level of the drivers that you will need for your adapter.
3. Go to the JNI web site.
4. From the navigation menu at the top of the page, click **Drivers**.
5. Click the link: **Click for IBM Drivers**
6. In the IBM Drivers window, download the following:
   a. EZF_2.2.2.tar
   b. JNIC146.pkg file for the recommended JNI driver
   c. Recommended JNI Fcode
7. For each download, in the **File Download** menu, click **Save this file to disk**. Click **OK**.
8. In the Save As window, create a temporary folder. For example, create a folder called Temp.

   Note: If you already have a folder called Temp, change to the Temp directory.
9. Click **Save**. A window opens that shows the progress of the download.
10. When each download completes, click **Close**.
11. If you downloaded the driver file from a Sun host system, install the driver. If you downloaded the driver file from a non-Sun host system, transfer the drive file to a Sun host system.

Post-processing requirements:

You are now ready to install the adapter driver.

Related topics:
- "Installing the JNI PCI adapter card" on page 25
- "Installing the JNI PCI adapter driver"

Installing the JNI PCI adapter driver

This information provides the procedure for installing the JNI PCI adapter driver.

Prerequisites:

Before installing the JNI PCI adapter driver, make sure that you have downloaded the driver.

Steps:

Perform the following steps to install the JNI PCI adapter driver:

Note: You will need access to the host system using either the direct console or an xhost remote console.

1. Install JNI HBA Driver and Fcode per JNI instructions. For the /kernel/drv/jnic146x.conf file, settings should be initially set to:

   automap=1; (dynamic binding)
   FcLoopEnabled=0;
   FcFabricEnabled=1;
   TargetOfflineEnable=0;
   LunDiscoveryMethod=1; (should be default)
   LunRecoveryInterval=10000;

2. Restart the host using the `reboot -- -r` command.
3. Run `format` to determine whether you can see all of the disks, then quit `format`.
4. Install the EZFibre tool following the JNI instructions. Follow the on-screen instructions when running install.sh and select the default settings.
5. Start the EZFibre tool and load it. This does not require restarting the host.

   Note: If a monitor is attached to the host, the user interface will display. If no monitor is attached, you must use an xhost capable client with an attached monitor.

   a. Logon to the attached console of the Sun or Remote Host with xhost capability.
   b. Start the EZFibre tool by entering: **/opt/jni/ezfibre/standalone/ezf**.
   c. The user interface will display a list with both adapters listed, and all of the connected remote ports listed as targets.
   d. Use the SAN Volume Controller command line interface or user interface to register the HBA ports with the SAN Volume Controller.
   e. Create the necessary VDisks and map them to the host.

      Note: You can obtain the HBA WWPN from the /var/adm/messages file, the EZFibre tool, or the SVC/SIS candidate HBA port list.
   f. When the LUNs are created and mapped, restart the host with the reboot -- -r command.

6. When the restart is finished, restart the EZFibre tool. It should show all of the available LUNs under the listing of their corresponding HBA targets.
7. Map the SVC/SIS controlled LUNs to the host with persistent bindings:

a. Select an HBA.

b. Select the third tab on the HBA panel.

c. Click **Select All**.

d. Click **Commit**.

e. Click **Activate Changes**.

f. Select the same HBA.

g. On the first panel, change the Dynamic Binding tab to Disabled.

h. Click **Commit**.

i. Click **Activate Changes**.

j. Repeat steps 7a through 7j until you have performed it on all of the HBAs.

If you add or delete LUNs at a later date, repeat this procedure to acquire the new adapters.

Attention: The EZFibre tool will append any changes to the end of the JNIC146x.conf file. After multiple reconfigurations, this file can become very large. It is recommended that you make a copy of the JNIC146x.conf file after install and restore it before making any configuration changes.

Note: JNI supports this function without restarting the host, but the IBM SDD requires restarts during its process.

8. Restart the host system.

Post-processing requirements:

Update the parameter list and restart the host system. Set the recommended parameters and settings.

Related topics:
- "Downloading the current JNI PCI adapter driver" on page 26
- "Installing the JNI PCI adapter card" on page 25

Installing the JNI SBUS adapter card

This information provides the procedure required to attach a SAN Volume Controller to a Sun host system running Solaris 9, update 5 with SAN Foundation Kit Version 1.0 (SUNWsan) with the JNI SBUS adapter card.

Prerequisites:

Shutdown your Sun host. This will involve closing applications and then issuing the shutdown command to the operating system. Follow your manufacturer's recommendations for powering down the Sun host and its attached peripherals.

Open the case of the Sun host. Ensure that, when you are handling the host and adapter hardware that you use the manufacturer's recommended ESD procedures throughout the replacement procedure.

Steps:

Perform the following steps to install the JNI SBUS adapter:

1. Insert the host adapter board into the empty SBUS slot. Press firmly until seated.

2. Secure the mounting bracket for the adapter to the case with the panel screw.
3. Replace the computer case by tightening the screws on the case or use the clamp to secure the cover.
4. Connect the adapter card to the fabric with suitable optical cables.

Related topics:
- "Downloading the current JNI SBUS adapter driver"

Downloading the current JNI SBUS adapter driver

This information lists the steps required to download the JNI SBUS adapter driver.

Steps:

Perform the following steps to download the driver for the JNI SBUS adapter:
1. Restart your host system.
2. Go to the IBM storage support Web site to determine which driver you will need based on the adapter that you are installing.
3. Go to the JNI Web site.
4. From the navigation menu at the top of the page, click **Drivers**.
5. Click the link: **Click for IBM Drivers**.
6. In the IBM drivers window, download the following:
   a. EZF_2.2.2.tar
   b. JNIC146.pkg file recommended JNI driver
   c. Recommended JNI Fcode
7. For each download, in the **File Download** menu, click **Save this file to disk**. Click **OK**.
8. In the Save As window, create a temporary folder. For example, create a folder called Temp.

   Note: If you already have a folder called Temp, change to the Temp directory.
9. Click **Save**. A window opens that shows the progress of the download.
10. When each download completes, click **Close**.

Post-processing requirements:

If you downloaded the driver file from a Sun host system, install the driver. If you downloaded the driver file from a non-Sun host system, transfer the driver file to a Sun host system, and then install the driver.

Related topics:
- "Installing the JNI SBUS adapter card" on page 28
- "Installing the JNI SBUS adapter driver"

Installing the JNI SBUS adapter driver

This information contains the steps required to install the JNI SBUS adapter driver.

Prerequisites:

Before installing the JNI SBUS adapter driver, you will have to download the driver.

Steps:

Perform the following steps to install the JNI SBUS adapter:

Note: You will need access to the host system using either the direct console or an xhost remote console.

Steps:

Perform the following steps to install the JNI PCI adapter driver:

Note: You will need access to the host system using either the direct console or an xhost remote console.

1. Install JNI HBA Driver and Fcode per JNI instructions. For the /kernel/drv/jnic146x.conf *, settings should be initially set to:

   automap=1; (dynamic binding)
   FcLoopEnabled=0;
   FcLoopEnabled=1;
   FcFabricEnabled=0;
   FcLoopEnabled=1;
   TargetOfflineEnable=0;
   LunDiscoveryMethod=1;   (should be default)
   LunRecoveryInterval=10;

2. Restart the host using the `reboot -- -r` command.
3. Run `format` to determine whether you can see all of the disks, then quit `format`.
4. Install the EZFibre tool following the JNI instructions. Follow the on-screen instructions when running install.sh and select the default settings.
5. Start the EZFibre tool and load it. This does not require restarting the host.

   Note: If a monitor is attached to the host, the user interface will display. If no monitor is attached, you must use an xhost capable client with an attached monitor.

   a. Logon to the attached console of the Sun or Remote Host with xhost capability.
   b. Start the EZFibre tool by entering: **/opt/jni/ezfibre/standalone/ezf**.
   c. The user interface will display a list with both adapters listed, and all of the connected remote ports listed as targets.
   d. Use the SAN Volume Controller command line interface or user interface to register the HBA ports with the SAN Volume Controller.
   e. Create the necessary VDisks and map them to the host.

      Note: You can obtain the HBA WWPN from the /var/adm/messages file, the EZFibre tool, or the SVC/SIS candidate HBA port list.

   f. When the LUNs are created and mapped, restart the host with the reboot -- -r command.

6. When the restart is finished, restart the EZFibre tool. It should show all of the available LUNs under the listing of their corresponding HBA targets.
7. Map the SVC/SIS controlled LUNs to the host with persistent bindings:
   a. Select an HBA.
   b. Select the third tab on the HBA panel.
   c. Click **Select All**.

d. Click **Commit**.

e. Click **Activate Changes**.

f. Select the same HBA.

g. On the first panel, change the Dynamic Binding tab to Disabled.

h. Click **Commit**.

i. Click **Activate Changes**.

j. Repeat steps 7a on page 30 through 7j until you have performed it on all of the HBAs.

If you add or delete LUNs at a later date, repeat this procedure to acquire the new adapters.

Attention: The EZFibre tool will append any changes to the end of the JNIC146x.conf file. After multiple reconfigurations, this file can become very large. It is recommended that you make a copy of the JNIC146x.conf file after install and restore it before making any configuration changes.

Note: JNI supports this function without restarting the host, but the IBM SDD requires restarts during its process.

8. Restart the host system.

Post-processing requirements:

Update the parameter list and restart the host system. Set the recommended parameters and settings.

Related topics:
- "Downloading the current JNI SBUS adapter driver" on page 29
- "Installing the JNI SBUS adapter card" on page 28
- "Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters" on page 32

Configuring the host bus adapters

There are two steps required to configure host bus adapters (HBAs) for Solaris:

1. Informing Solaris about the new SCSI target device and LUNs.

2. Configuring the HBA.

Steps:

Perform the following steps to configure the HBA:

1. When you install the JNI driver you will also install the /kernel/drv/jnic146x.conf file. Edit this file to set up the HBA connection to the switch fabric by changing the following lines:

```
FcLoopEnable = 0;
FcFabricEnable = 1;
Automap = 0 (for persistent binding)
```

You must also add a line similar to the following to enable static binding. You must use static binding with the SAN Volume Controller.

```
target0_wwpn = "5005076801300018";
target1_wwpn = "5005076801100018";
target2_wwpn = "5005076801200018";
```

2. Restart and examine the /var/adm/messages file to ensure that the JNI HBA is set up as a switch-fabric connection.

Related topics:
- "Running the LUN configuration method"
- "Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters"

Running the LUN configuration method

The configuration method depends on the level of Solaris that you are using. The following instructions are based on the SunOS 5.8 Generic_108528–16 version. Use a bash shell as root to correctly configure your path.

Steps:

Perform the following steps to run the LUN configuration method:
1. After the cluster has rebooted, delete the following files: `/etc/vpathsave.cfg`, `/etc/vpath.cfg`.
2. Reboot the host using the `reboot -- -r` option to reconfigure for new hardware.
3. When the host restarts, use the `format` command to check for disks.
   - If you see disks, proceed to the next step.
   - If you do not see disks, verify the configuration of your HBAs and clustering configuration and try again.

   Note: You may see a "mode sense error" listed for each disk when running format for the first time. This is normal, and will not occur once the disks have been labeled.
4. Configure the Software Device Driver by issuing the `cfgpath -c` command.
5. Shut down the host using the `shutdown -i6 -g0 -y` command. This will reboot the host and reconfigure it to find disks.
6. When the host comes back up, issue the `devfsadm` command to scan for disks.
7. After the `devfsadm` command completes, enter `vpathmkdev` to create vpaths for the new disks.
8. Enter `format` and browse the returned list for your vpaths.
9. The devices are now accessible from `/dev/dsk/vpath#`.

Related topics:
- "Configuring the host bus adapters" on page 31
- "Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters"

Parameter settings for the JNI FCE-6460 and JNI FCE-1473 adapters

This information provides the recommended configuration settings for the JNI FCE-6460 and JNI FCE-1473 adapters.

Table 4 on page 33 contains the recommended configuration settings. For the most current information about fibre-channel adapter parameter settings, see http://www.ibm.com/storage/support/2145/.

Table 4. Recommended configuration file parameters for a JNI FCE-6460, or a JNI FCE-1473 adapter

Parameters	Recommended settings
FcEngHeartbeatInterval	5: Default. When the JNI adapter or driver detects that the fibre-channel link is up (and there is no I/O activity), it sends a test frame (or heartbeat) to itself to verify link integrity. The test frame is sent at the interval specified by this parameter. If the test frame does not complete, there might be a link problem. In this situation, the driver initiates error recovery to reestablish a good link. A value of 0 disables the heartbeat.
FcLinkUpRecoveryTime	1000: Default. Delay (msec) after the link is up before port discovery begins, allowing the link to stabilize and protecting against a possible I/O surge. This timer is reset every time the link comes up. The default value is adequate for most configurations.
BusyRetryDelay	5000: Default. Delay (msec) before retrying after receipt of an I/O operation with a SCSI Busy status from a target. The number of retries is based on the Solaris retry count associated with the I/O operation.
FailoverDelay	30: Delay (seconds) before failing all I/O operations for an offline target. If the delay timer expires, all I/O operations for the failed target is returned to the application. A zero value disables failover.
TimeoutResetEnable	0: False. Boolean parameter for enabling SCSI target resets for timed-out I/O operations. When the timer expires (usually 60 seconds, as specified by the upper layers), the driver issues a target reset to attempt to clear the device (which might be either too busy to respond or stuck).
QfullRetryCount	5: Default. Number of times an I/O operation is retried due to receipt of a SCSI queue full status from a target. The delay between retries is based on the QfullRetryDelay parameter.
QfullRetryDelay	5000: Default. Delay (msec) before retrying after receipt of an I/O operation with a SCSI queue full status from a target. The number of retries is based on the QfullRetryCount parameter.
LunRecoveryInterval	50: Default. Sets the LUN I/O recovery interval (in msec) after the driver reconnects to a disk. It is a global parameter affecting all targets, and determines how long the driver waits after a port is discovered until sending I/O operations to that port. Some devices might require more time to flush an I/O operation that was in progress prior to a link going down; if this is the case, increase the value of this parameter.
FcLinkSpeed	3: Default. Specifies the desired fibre-channel link speed as follows: • 0: default to SEEPROM setting • 1: force 1 gigabit per second • 2: force 2 gigabit per second • 3: auto negotiate link speed
JniCreationDelay	5: Default. Delay (seconds) after driver creation to allow the network to stabilize, discover ports, and build the driver's database. Increase this value if targets are being discovered too late in the restart process.
FlogiRetryCount	3: Default. Total number of fabric login (FLOGI) attempts before giving up logging in to a switch. Failure prevents participation on a fabric topology.
FcFlogiTimeout	10: Default. Specifies the amount of time (in seconds) that the driver waits for a fabric login (FLOGI) to be accepted. The value should be increased only if the switch to which the host adapter is connected requires more time to respond to a FLOGI. The number of retries is configured with the FlogiRetryCount parameter.
PlogiRetryCount	5: Default. Total number of port login (PLOGI) attempts before failing to log in to a SCSI target.
PlogiControlSeconds	30: Default. Defines the number of seconds that the driver waits for a successful port login (PLOGI) attempt. The maximum number of attempts is defined by the PlogiRetryCount parameter. Some devices might take longer to respond to PLOGIs; if this is the case, increase the value of this parameter.

Parameters	Recommended settings
FcEmldEngTcbCount	1789: Default. Total number of concurrent exchanges (also called transfer control blocks) that the adapter allows. To optimize performance, set this parameter to match the memory capacity of the hardware.
LunDiscoveryMethod	1: Default. Specifies the LUN discovery as follows: • 0 = use Inquiry • 1 = use ReportLuns

Related topics:

Setting the Sun host system parameters for JNI adapters

The following information contains the procedures required to set the Sun host system parameters for optimum performance on the SAN Volume Controller with the supported JNI adapters.

Steps:

Perform the following steps to set the Sun host system parameters for optimum performance on the SAN Volume Controller with the JNI adapter:

1. Type `cd /etc` to change to the /etc subdirectory.
2. Back up the system file in the subdirectory.
3. Edit the system file, and set the following parameters for servers with configurations that use JNI adapters:

sd_max_throttle

> This sd_max_throttle parameter specifies the maximum number of commands that the sd driver can queue to the host adapter driver. The default value is 256, but you must set the parameter to a value less than or equal to a maximum queue depth for each LUN connected. Determine the value by using the following formula:
>
> `256 ÷ (LUNs per adapter)`
>
> where *LUNs per adapter* is the largest number of LUNs assigned to a single adapter.
>
> To set the sd_max_throttle parameter for the SAN Volume Controller LUNs in this example, you would add the following line to the /etc/system file:
>
> `set sd:sd_max_throttle=5`

sd_io_time   This parameter specifies the time-out value for disk operations. Add the following line to the /etc/system file to set the sd_io_time parameter for the SAN Volume Controller LUNs:

> `set sd:sd_io_time=0x78`

sd_retry_count

> This parameter specifies the retry count for disk operations.

Add the following line to the /etc/system file to set the sd_retry_count parameter for the SAN Volume Controller LUNs:

```
set sd:sd_retry_count=5
```

maxphys
This parameter specifies the maximum number of bytes that you can transfer for each SCSI transaction. The default value is 126976 (124 KB). If the I/O block size that you requested exceeds the default value, the request is broken into more than one request. The value should be tuned for the application requirements. For maximum bandwidth, set the maxphys parameter by adding the following line to the /etc/system file:

```
set maxphys=1048576 (1 MB)
```

Note: Do not set the value for maxphys greater than 1048576 (1 MB). Doing so can cause the system to hang.

If you are use the Veritas volume manager on the SAN Volume Controller LUNs, you must set the VxVM maximum I/O size parameter (vol_maxio) to match the maxphys parameter. When you set the maxphys parameter to 1048576 and you use the Veritas Volume Manager on your SAN Volume Controller LUNs, set the maxphys parameter like in the following sentence:

```
set vxio:vol_maxio=2048
```

Chapter 6. Attaching to a Microsoft Windows 2000 or 2003 host

This information provides an overview of how to attach a SAN Volume Controller to a Windows 2000 or 2003 host system running Windows 2000 or 2003 Server, Service Pack 3 or Windows 2000 or 2003 Advanced Server, Service Pack 3 with the following fibre-channel adapters:

- Netfinity® FAStT adapter card
- QLogic QLA2310FL adapter card
- QLogic QLA2340FL adapter card
- QLogic QLA2342FL adapter card
- Emulex LP9002 adapter card
- Emulex LP9002DC adapter card
- Emulex LP9402 adapter card

In addition, this information lists the requirements for installing, downloading, and configuring the adapter cards.

For up to date information about the switch and fabric connections that IBM supports, see the support Web site.

Attachment requirements:

This section lists the requirements for attaching the SAN Volume Controller to your host system:

- Check the LUN limitations for your host system.
- Ensure that you have the documentation for your host system and the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
- See support Web site for details about the release level for your operating system.

The following tasks must be performed to configure a SAN Volume Controller:

1. An IBM Systems Services Representative (SSR) installs the SAN Volume Controller by using the procedures in the *IBM TotalStorage SAN Volume Controller: Installation Guide*.
2. Define the fibre-channel host system with the worldwide port name identifiers. You will have to locate the list of worldwide port names.
3. Define the fibre-port configuration if you did not do it during the installation of the SAN Volume Controller or fibre-channel adapters.
4. Configure the host system for the SAN Volume Controller by using the instructions in your host system publications.
5. Install the IBM Subsystem Device Driver (SDD) for Windows to enable the management of multiple paths to SAN Volume Controller virtual disks.

Related topics:

- "Locating the WWPN for a Windows 2000 or 2003 host" on page 51
- "Installing and configuring the Netfinity FAStT adapter card" on page 38
- "Installing the QLogic QLA23*xx* adapter card" on page 40

- "Installing the Emulex adapter card" on page 43

Installing and configuring the Netfinity FAStT adapter card

This information lists the steps required to install an configure the Netfinity FAStT adapter on a Microsoft Windows 2000 or 2003 host.

Steps:

Perform the following steps to install an configure the Netfinity FAStT adapter on a Microsoft Windows 2000 or 2003 host:

1. Obtain an optical multimode cable with a standard-connector style of duplex connector.
2. Write down the serial number of the adapter card.

   In the unlikely event that the nonvolatile random access memory is damaged, the system will prompt you for the Netfinity FAStT adapter serial number.
3. Check the system board and make any configuration changes necessary to accommodate the Netfinity FAStT adapter.
4. Power off the peripheral devices and then the host.
5. Disconnect the power cord.
6. Remove the cover to the host.
7. Choose any PCI bus slot that supports 32- or 64-bit adapters.

   You can install the adapter in a 64-bit PCI slot if one is available. If a 64-bit slot is not available, use a 32-bit PCI slot.
8. Align the adapter with the expansion slot, and carefully press the adapter into the slot until you hear the adapter snap into place.
9. Secure the adapter.
10. Connect one end of the fiber cable from the devices to the J1 connector on the adapter.
11. Carefully reinstall and secure the cover.
12. Connect the power cables.
13. Turn on all external fibre-channel devices.
14. Observe the monitor.

    Note: You will not see the BIOS menu because the adapter BIOS is set to disabled by default. Instead, you should see the information in Figure 11.

```
QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1998 All rights reserved.
www.qlc.com

Press <Alt+Q> for FAST!Util

BIOS for Adapter X is disabled.

ROM BIOS not installed
```

Figure 11. Example of what is displayed when starting the Windows 2000 host

15. To see the devices, press Alt+Q, and then use the utility program.

Related topics:

- "Checking the level of the device driver in the Netfinity FAStT adapter card"

Checking the level of the device driver in the Netfinity FAStT adapter card

This information provides the steps required to determine the level of the device driver on the Netfinity FAStT adapter card.

Steps:

Perform the following steps to determine the level of the device driver on the Netfinity FAStT adapter card:

1. For the latest versions of the device drivers, utilities, and documentation, see the Web site for the device drivers.
2. Create backup copies of the following driver diskettes that are included with the FAStT adapter:
   - Netfinity FAStT host adapter for Windows 2000
   - Netfinity FAStT host adapter for Windows 2003
3. Read the software installation chapters to determine which device driver you want to install.
4. Place the device driver diskette in the diskette drive.
5. Copy the QLVER.EXE file from the diskette into the directory that contains the QLogic device drivers.

   For example, type: `COPY A:\QLVER.EXE C:\QLC\QLVER.EXE`
6. Change directories to the subdirectory that contains the QLogic drivers.

   For example, type: `CD \QLC`
7. At the command prompt, type: `QLVER *.*`

   This action invokes the QLogic banner, followed by a list of drivers and version numbers.

Related topics:

- "Documentation included with the Netfinity FAStT adapter card"

Documentation included with the Netfinity FAStT adapter card

This information lists the documentation included with the Netfinity FAStT adapter card.

The following files are on the diskette that is shipped with your adapter card:

TXTSETUP.OEM	The driver installation script for the initial Windows NT® text setup
QLOGIC	The identification file for the Windows NT setup program
\W2K\OEMSETUP.INF	The driver installation script for the Windows NT setup program
\W2K\QL2200.SYS	The Windows 2000 device driver
\W2K\README.TXT	Helpful hints about the Windows 2000 device driver
\W2K\RELEASE.TXT	The history of release fixes

Related topics:
- "Installing and configuring the Netfinity FAStT adapter card" on page 38
- "Installing the device driver for a Netfinity FAStT adapter card"

Installing the device driver for a Netfinity FAStT adapter card

This information lists the steps required to install the device driver on the Netfinity FAStT adapter card.

Steps:

Perform the following steps to install the device driver on the Netfinity FAStT adapter card:

1. Install the Netfinity adapter.
2. Restart Windows 2000 or 2003 depending on your host system.
3. Insert the Netfinity FAStT host adapter device driver for Windows 2000 or 2003 diskette and follow the instructions that are displayed.

Related topics:
- "Documentation included with the Netfinity FAStT adapter card" on page 39
- "Checking the level of the device driver in the Netfinity FAStT adapter card" on page 39

Updating the Microsoft Windows 2000 or 2003 device driver

This information lists the required steps to update the Windows 2000 or 2003 device driver.

Steps:

Perform the following steps to update the Windows 2000 or 2003 device driver:

1. Right click **My Computer → Manage → Device Manager**.
2. Click the plus (+) sign to expand the menu for **SCSI and RAID Controllers**.
3. Click the QLogic adapter you want to update.
4. Click on the adapter that you want and select **Properties**.
5. Select the tab for **Driver**.
6. Click **Update Driver** and follow the instructions that appear on the screen.

Related topics:
- "Documentation included with the Netfinity FAStT adapter card" on page 39

Installing the QLogic QLA23*xx* adapter card

This information provides the steps required to install the QLogic QLA23*xx* adapter card on a Microsoft Windows 2000 or 2003 host.

Prerequisites:

Shutdown your Windows 2000 or 2003 host. This will involve closing applications and then issuing the shutdown command to the operating system. Follow your manufacturer's recommendations for powering down the Windows 2000 or 2003 host and its attached peripherals.

Ensure that, when you are handling the host and adapter hardware that you use the manufacturer's recommended ESD procedures throughout the replacement procedure.

Steps:

Perform the following steps to install the QLogic QLA23*xx* adapter card:

1. Install the QLogic QLA23xx adapter card in the host system.
2. Connect the cable to the Fibre Channel switch.
3. Restart the server.
4. Press Ctrl+Q to get to the FAST!UTIL menu panel.
5. From the Select Host Adapter menu select the Adapter Type QLA23xx.
6. From the Fast!UTIL Options menu select **Configuration Settings**.
7. From the Configuration Settings menu, click **Host Adapter Settings**.
8. Set the parameters and values from the Host Adapter Settings menu as follows:
   - Host Adapter BIOS: **Disabled**
   - Frame size: **2048**
   - Loop Reset Delay: **5 (minimum)**
   - Adapter Hard Loop ID: **Disabled**
   - Hard Loop ID: **0**
   - Spinup Delay: **Disabled**
   - Connection Options: **1 - point to point only**
   - Fibre Channel Tape Support: **Disabled**
   - Data Rate: **2**
9. Press Esc to return to the Configuration Settings menu.
10. From the Configuration Settings menu select **Advanced Adapter Settings**.
11. From the Advanced Adapter Settings menu set the following parameters:
    - Execution throttle: **100**
    - Luns per Target: **0**
    - Enable LIP Reset: **No**
    - Enable LIP Full Login: **Yes**
    - Enable Target Reset: **Yes**
    - Login Retry Count: **30**
    - Port Down Retry Count: **30**
    - Link Down Timeout: **0**
    - Extended error logging: **Disabled (might be enabled for debugging)**
    - RIO Operation Mode: **0**
    - Interrupt Delay Timer: **0**
12. Press Esc to return to the Configuration Settings menu.
13. Press Esc.
14. From the Configuration settings modified window select **Save changes**.
15. From the Fast!UTIL Options menu select **Select Host Adapter**, and repeat steps 5 to 14, if more than one QLogic QLA23xx adapter card has been installed.
16. Restart the server.

Related topics:
- "Downloading the QLogic adapter driver"

Downloading the QLogic adapter driver

This information provides the steps required to download the QLogic adapter driver for the Microsoft Windows 2000 or 2003 host.

Steps:

Perform the following steps to download the QLogic adapter driver for the Microsoft Windows 2000 or 2003 host:

1. Visit the support Web site.
2. Click **Interoperability matrix**.
3. Click **SAN Volume Controller interoperability matrix**.
4. Find the section for the current version of the driver and firmware and driver you want.
5. Go to the QLogic web site.
6. Click **Drivers / Software** from the **Quick Links** list.
7. Select **IBM** from the **OEM-approved Drivers/Firmware** section.
8. Navigate to the adapter that you want to download, then click **Download**.

Post-processing requirements:

You will now have to install the adapter driver.

Related topics:
- "Installing the QLogic adapter driver"

Installing the QLogic adapter driver

This information lists the steps required to install the QLogic adapter driver on the Microsoft Windows 2000 host.

Prerequisites:

Before installing the QLogic adapter drivers, you must install the QLogic adapter card, set the correct BIOS settings, and download the driver.

Steps:

Note: If you are installing the fibre-channel adapter for the first time, you must specify the correct topology. You must also select the appropriate device mapping driver.

Perform the following steps to install the QLogic adapter driver on the Microsoft Windows 2000 host:

1. Go to the QLogic Web site.
2. From the navigation pane, click **Drivers / Software**.
3. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Series** menu.
4. Highlight and click **Fibre-Channel HBAs**.
5. In the Download Drivers / Software and HBAs window, click the Down Arrow to open the **Select a Product** menu.

6. Highlight and click the fibre-channel adapter that you want.
7. In the **Drivers and Management Software** menu, click **Windows 2000**.
8. In the Windows 2000 Drivers table, click **Read Me**.

   See the following list for an example of information that you might find in a readme file:
   - Operating system support
   - Supported features
   - Creating the driver diskette
   - Installing the driver
   - Initial operating system installation with the QLogic controller as the boot
   - Adding the QLogic controller to the existing operating system
   - Updating the existing QLogic driver
   - Removing the driver
   - Driver parameters
   - System registry parameters
   - NVRAM parameters
   - Limitations
   - Additional notes
   - Using Fast!UTIL menu to change the connection options
   - Diskette content
   - Contacting QLogic

Related topics:
- "Installing the QLogic QLA23*xx* adapter card" on page 40
- "Downloading the QLogic adapter driver" on page 42

Installing the Emulex adapter card

This information tells you how to attach a SAN Volume Controller to a Windows 2000 host system with an Emulex adapter card.

Steps:

Perform the following steps to install an Emulex adapter card:
1. Record the IEEE number that is printed on the card. You can use the IEEE number to determine the WWPN.
2. Insert the host adapter board into the empty PCI bus slot. Press firmly until seated.
3. Secure the mounting bracket for the adapter to the case with the panel screw.
4. Replace the computer case by tightening the screws on the case or use the clamp to secure the cover.

Related topics:
- "Locating the WWPN for a Windows 2000 or 2003 host" on page 51
- "Downloading the Emulex adapter driver" on page 44

Downloading the Emulex adapter driver

This information explains how to download the Emulex adapter drivers.

Steps:

Perform the following steps to download the Emulex adapter driver:
1. Restart your host system.
2. Go to the IBM storage support Web site.
3. Click **Interoperability matrix**.
4. Click **SAN Volume Controller interoperability matrix**.
5. Find the section for the current version of the driver and firmware you want.
6. Go to www.emulex.com.
7. Click **Drivers, software, and manuals** from the left navigation pane
8. Click **IBM**.
9. Click the link for the adapter that you want to get the firmware, driver, and documentation to install and download the adapter driver.

Post-processing requirements:

After downloading the driver, you will have to install it.

Related topics:
- "Installing the Emulex adapter card" on page 43
- "Installing the Emulex adapter drivers"

Installing the Emulex adapter drivers

This task explains how to install the Emulex adapter drivers:

Prerequisites:

You must download the driver before installing it.

Steps:

Perform the following steps to install the Emulex adapter drivers:
1. Restart your host system.
2. Go to www.emulex.com.
3. Click **drivers, software, and manuals** from the left navigation pane.
4. In the **Drivers, software, and manuals by operating system** section, click **Windows**.
5. Click **Windows 2000** for the Port Driver.
6. Click **Installation** to get the documentation that tells you how to install the adapter driver.

Post-processing requirements:

You will now have to configure the adapter drivers.

Related topics:
- "Downloading the Emulex adapter driver"

- "Configuration settings for the Emulex adapter drivers"

Configuration settings for the Emulex adapter drivers

This information provides the recommended settings for configuring the Emulex adapter drivers.

Note: See the IBM storage support Web site for the most current information about fibre-channel adapter parameter settings.

Table 5. Recommended configuration file parameters for the Emulex LP8000, LP9002, and LP9402 adapters

Parameters	Recommended settings
Automatically map SCSI devices	Checked (enabled)
Query name server for all N-ports	Checked (enabled)
Allow multiple paths to SCSI targets	Checked (enabled)
Point-to-point	• Checked for fabric attach • Arbitrated loop for direct attach
Register for state change	Checked (enabled)
Use report LUNs	Checked (enabled)
Use name server after RSCN	Checked (enabled)
LUN mapping	Checked (enabled)
Automatic LUN mapping	Checked (enabled)
Scan in device ID order	Not checked (disabled)
Enable class 2 for SCSI devices	Not checked (disabled)
Report unknown SCSI devices	Not checked (disabled)
Look for disappearing devices	Not checked (disabled)
Translate queue full to busy	Checked (enabled)
Use bus reset status for retries	Not checked (disabled)
Retry unit attention	Not checked (disabled)
Retry PLOGI open failures	Not checked (disabled)
Maximum number of LUNs	Equal to or greater than the number of the SAN Volume Controller LUNs available to the host bus adapter
Maximum queue depth	8
Link Timer	30 seconds
Retries	64
E_D_TOV	2000 milliseconds
AL_TOV	15 milliseconds
Wait ready timer	45 seconds
Retry timer	2000 milliseconds
R_A_TOV	2 seconds
ARB_TOV	1000 milliseconds
Link Control	
Topology	Point-to-point (fabric)
Link speed	Auto

Related topics:
- "Installing the Emulex adapter card" on page 43
- "Installing the Emulex adapter drivers" on page 44

Configuration for availability and recovery

The host adapter uses the time-out parameter to bind its recovery actions and responses to the disk subsystem.

The value exists in different places in the system configuration. You can retrieve and use it in different ways depending on the type of host adapter that is installed.

Related topics:
- "Setting the TimeOutValue registry"

Setting the TimeOutValue registry

This information lists the steps required to set the TimeOutValue registry.

Steps:

Perform the following steps to set the TimeOutValue registry:
1. From the **Run** menu or command prompt, type:
   Regedit32.exe
2. Navigate to the following registry key:
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk
3. Look for the value called TimeOutValue. If the value called TimeOutValue does not exist, go to step 3a. If the TimeOutValue exists, go to step 4.
   a. Click **Edit → Add Value...**
   b. For ValueName, type: TimeOutValue.
   c. For data type, type: REG-DWORD.
   d. Click **OK**.
   e. For Value data, type: 3c.
   f. For Base, click **Hex**.
   g. Click **OK**.
4. If the value exists and is less than 0x0000003c (60 decimal), perform the following steps to increase it to 0x3c.
   a. Click **TimeOutValue**.
   b. Click **Edit → DWORD...**.
   c. For Value data, type: 3c.
   d. For Base, click **Hex**.
   e. Click **OK**.
5. Exit the Regedit32 program.
6. Restart your Windows 2000 or 2003 server for the changes to take effect.

Related topics:
- "Configuration for availability and recovery"

Windows 2000 known problems and issues

This information provides information about known problems and issues when attaching to a Windows 2000 host.

It is strongly recommended that you create VDisks using the command line interface, and specify the -scsi parameter. Otherwise, the VDisks may be assigned to the wrong SCSI LUN, and cause the Microsoft Clustering Services to fail.

Example:

After creating two VDisks using the command line interface, you enter these commands to assign your VDisks to a host:

1. `svctask mkdiskhostmap -host host1 VDISK1`
2. `svctask mkdiskhostmap -host host1 VDISK2`
3. `svctask mkdiskhostmap -host host2 VDISK2`
4. `svctask mkdiskhostmap -host host2 VDISK1`

In this example, host2 will assign VDISK2 to SCSI LUN 0 by default because it will be the first assigned disk. There will be a conflict because host1 has VDISK2 assigned to SCSI LUN 1.

To avoid this problem, issue the commands as follows:

1. `svctask mkdiskhostmap -host host1 -scsi 0 VDISK1`
2. `svctask mkdiskhostmap -host host1 -scsi 1 VDISK2`
3. `svctask mkdiskhostmap -host host2 -scsi 0 VDISK1`
4. `svctask mkdiskhostmap -host host2 -scsi 1 VDISK2`

Related topics:

Chapter 7. Fibre Channel port name identification

This information provides an overview of the Fibre Channel port name identification for the following host systems:

- Hewlett-Packard 9000
- IBM @server pSeries or RS/6000
- Linux
- Sun
- Windows 2000
- Windows 2003

The WWPN consists of exactly 16 hexadecimal characters (0 - 9 and A - F). The SAN Volume Controller uses it to uniquely identify the fibre-channel adapter card that is installed in your host system. The SAN Volume Controller automatically finds the WWPN for your host fibre-channel adapter when you attach your host system to the SAN Volume Controller.

Note: If your host uses more than one fibre-channel adapter to connect to your SAN Volume Controller, you must add multiple entries to the host list for this host. You must add one for each fibre-channel adapter. Each adapter will have its own unique WWPN.

The format and content of the fibre-channel port identifier are determined by the manufacturer of the link control facility for the applicable fibre-channel port. The identifier is an eight-byte field, which the fibre-channel protocols use to uniquely identify the fibre-channel port.

Related topics:

- "Locating the WWPN for a Hewlett Packard host"
- "Locating the WWPN for an IBM @server pSeries or an RS/6000 host" on page 50
- "Locating the WWPN for a Linux host" on page 50
- "Locating the WWPN for a Sun host" on page 51
- "Locating the WWPN for a Windows 2000 or 2003 host" on page 51

Locating the WWPN for a Hewlett Packard host

This information lists the steps required to locate the WWPN for a Hewlett Packard host.

Steps:

Perform the following steps to locate the WWPN for a Hewlett Packard host:

1. Go to the root directory.
2. Type: `ioscan -fn | more`
3. Look under the description for the Fibre Channel Mass Storage adapter.
   For example, look for the device path name /dev/td1 or /dev/fcms1.
4. Type: `fcmsutil` */dev/td1* where */dev/td1* is the path.

Related topics:
- Chapter 7, "Fibre Channel port name identification," on page 49

Locating the WWPN for an IBM *@server* pSeries or an RS/6000 host

This information lists the steps required to locate the WWPN for an IBM *@server* pSeries or an RS/6000 host.

Steps:

Perform the following steps to locate the WWPN for an IBM *@server* pSeries or an RS/6000 host:

1. Log in as root.
2. Type `lscfg -vl fcsx`, where *x* is the adapter number.

   The network address is the fibre-channel adapter port WWPN value.

Note: The lscfg -vl fcsx ROS level identifies the fibre-channel adapter firmware level.

Related topics:
- Chapter 7, "Fibre Channel port name identification," on page 49

Locating the WWPN for a Linux host

This information lists the steps required to locate the WWPN for an Intel server running the Linux operating system with a QLogic adapter.

Steps:

Perform the following steps to locate the WWPN for a Linux host:

1. Restart the server.
2. Press Alt+Q to get the **FAST!Util** menu.

   If you have more than one fibre-channel adapter installed, all the fibre-channel adapters are displayed. Scroll down to the adapter you want. Press Enter.
3. From the **FAST!Util** menu, scroll down and select **Select Host Adapter**.
4. Scroll up and highlight **Configuration Settings**. Press Enter.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Write down the 16-digit alphanumeric string that is displayed.

When you configure storage on the SAN Volume Controller for fibre-channel attachment, you must specify the worldwide port name (WWPN) of the fibre-channel adapter.

On Linux systems, the required WWPN can be obtained from a file in the /proc filesystem as follows:

1. Type `cd /proc/scsi/qla2300`. This directory will contain consecutively numbered files according to how many fibre-channel adapter ports are contained on the host.
2. Type `cat 1`.

Figure 12 shows an example of what is displayed when you type cd
/proc/scsi/qla2300.

```
QLogic PCI to Fibre Channel Host Adapter for ISP23xx:
Firmware version: 3.01.18, Driver version 6.05.00b9
.
.
Some lines missed
.
.
SCSI Device Information:
scsi-qla0-adapter-node=200000e08b051f7e; <-- WW Node name
scsi-qla0-adapter-port=210000e08b051f7e; <-- WW Port name
```

Figure 12. Example of what is displayed in the /proc/scsi/qla2300 directory

Related topics:
- Chapter 7, "Fibre Channel port name identification," on page 49

Locating the WWPN for a Sun host

This information lists the steps required to locate the WWPN for a Sun host.

Note: If you have multiple host adapters installed, you will see more than one
WWPN.

Steps:

Perform the following steps to locate the WWPN for the JNI PCI adapter and the
JNI SBUS adapter:
1. After you install the adapter and you restart the host system, view the
   /var/adm/messages file.
2. Search for the line that contains the applicable phrase for your adapter:
   a. For the JNI SBUS adapter, search for fcaw*x*: Fibre Channel WWNN, where *x* is
      the adapter number (0, 1, and so on). You can find the WWPN on the same
      line immediately after the WWNN.
   b. For the JNI PCI adapter, search for fca-pci*x*: Fibre Channel WWNN, where *x*
      is the adapter number (0, 1, and so on). You can find the WWPN on the
      same line following the WWNN.
   c. For the QLogic QLA2200F adapter, search for qla2200-hba*x*-adapter-port-
      name where *x* is the adapter number (0, 1, and so on).

Related topics:
- Chapter 7, "Fibre Channel port name identification," on page 49

Locating the WWPN for a Windows 2000 or 2003 host

This information lists the steps required to locate the WWPN for a Windows 2000
or 2003 host with a QLogic adapter.

Steps:

Perform the following steps to locate the WWPN for the Windows 2000 or 2003
host:
1. Restart the server.
2. Press Alt+Q to get the **FAST!Util** menu.

If you have more than one fibre-channel adapter installed, all the fibre-channel adapters are displayed. Scroll down to the adapter you want. Press Enter.

3. From the **FAST!Util** menu, scroll down and select **Select Host Adapter**.
4. Scroll up and highlight **Configuration Settings**. Press Enter.
5. From the **Configuration Settings** menu, click **Host Adapter Settings**.
6. Write down the 16-digit alphanumeric string that is displayed on your screen.

This information lists the steps required to locate the WWPN for a Windows 2000 or 2003 host with an Emulex adapter.

Steps:

Perform the following steps to locate the WWPN for the Windows 2000 or 2003 host:

1. Click **Start > Programs > Emulex Configuration Tool.**
2. From the Emulex Configuration Tool menu in the Available Adapters window, double-click the adapter entry for which you want to display the WWPN information.

   If you have more than one fibre-channel adapter installed, all the fibre-channel adapters are displayed. Scroll down to the adapter you want. Press Enter.

Related topics:
- Chapter 7, "Fibre Channel port name identification," on page 49

Appendix. Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

Features:

These are the major accessibility features in the SAN Volume Controller master console:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The following screen readers have been tested: JAWS v4.5 and IBM Home Page Reader v3.0.
- You can operate all features using the keyboard instead of the mouse.

Navigating by keyboard:

You can use keys or key combinations to perform operations and initiate many menu actions that can also be done through mouse actions. You can navigate the SAN Volume Controller Console and help system from the keyboard by using the following key combinations:

- To traverse to the next link, button, or topic, press Tab inside a frame (page).
- To expand or collapse a tree node, press →or ←, respectively.
- To move to the next topic node, press V or Tab.
- To move to the previous topic node, press ^ or Shift+Tab.
- To scroll all the way up or down, press Home or End, respectively.
- To go back, press Alt+←.
- To go forward, press Alt+→.
- To go to the next frame, press Ctrl+Tab.
- To move to the previous frame, press Shift+Ctrl+Tab.
- To print the current page or active frame, press Ctrl+P.
- To select, press Enter.

Accessing the publications:

You can view the publications for the SAN Volume Controller in Adobe Portable Document Format (PDF) using the Adobe Acrobat Reader. The PDFs are provided on a CD that is packaged with the product or you can access them at the following Web site:

http://www.ibm.com/storage/support/2145/

Related topics:
- "Related publications" on page vii

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- "Trademarks"

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Glossary

This glossary includes terms for the IBM TotalStorage SAN Volume Controller.

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The following cross-references are used in this glossary:

See Refers the reader to one of two kinds of related information:

- A term that is the expanded form of an abbreviation or acronym. This expanded form of the term contains the full definition.
- A synonym or more preferred term.

See also
Refers the reader to one or more related terms.

Contrast with
Refers the reader to a term that has an opposite or substantively different meaning.

A

asymmetric virtualization. A virtualization technique in which the virtualization engine is outside the data path and performs a metadata-style service. The metadata server contains all the mapping and locking tables while the storage devices contain only data. See also *symmetric virtualization*

C

cache. A high-speed memory or storage device used to reduce the effective time required to read data from or write data to lower-speed memory or a device. Read cache holds data in anticipation that it will be requested by a client. Write cache holds data written by a client until it can be safely stored on more permanent storage media such as disk or tape.

cluster. In SAN Volume Controller, a pair of nodes that provides a single configuration and service interface.

CIM. See *Common Information Model*.

Common Information Model (CIM). A set of standards developed by the Distributed Management Task Force (DMTF). CIM provides a conceptual framework for storage management and an open approach to the design and implementation of storage systems, applications, databases, networks, and devices.

D

degraded. Pertaining to a valid configuration that has suffered a failure but continues to be supported and legal. Typically, a repair action can be performed on a degraded configuration to restore it to a valid configuration.

directed maintenance procedures. The set of maintenance procedures that can be run for a cluster. These procedures are documented in the service guide.

disk zone. A zone defined in the storage area network (SAN) fabric in which the SAN Volume Controller can detect and address the logical units that the disk controllers present.

E

error code. A value that identifies an error condition.

excluded. In SAN Volume Controller, the status of a managed disk that the cluster has removed from use after repeated access errors.

extent. A unit of data that manages the mapping of data between managed disks and virtual disks.

F

failover. In SAN Volume Controller, the function that occurs when one redundant part of the system takes over the workload of another part of the system that has failed.

fibre channel. A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to shared storage devices and for interconnecting storage controllers and drives.

FC. See *fibre channel*.

G

GBIC. See *gigabit interface converter*.

gigabit interface converter (GBIC). An interface module that converts the light stream from a fibre-channel cable into electronic signals for use by the network interface card.

H

HBA. See *host bus adapter*.

host bus adapter (HBA). In SAN Volume Controller, an interface card that connects a host bus, such as a peripheral component interconnect (PCI) bus, to the storage area network.

host ID. In SAN Volume Controller, a numeric identifier assigned to a group of host fibre-channel ports for the purpose of logical unit number (LUN) mapping. For each host ID, there is a separate mapping of Small Computer System Interface (SCSI) IDs to virtual disks (VDisks).

host zone. A zone defined in the storage area network (SAN) fabric in which the hosts can address the SAN Volume Controllers.

I

inconsistent. In a Remote Copy relationship, pertaining to a secondary virtual disk (VDisk) that is being synchronized with the primary VDisk.

input/output (I/O). Pertaining to a functional unit or communication path involved in an input process, an output process, or both, concurrently or not, and to the data involved in such a process.

Internet Protocol (IP). In the Internet suite of protocols, a connectionless protocol that routes data through a network or interconnected networks and acts as an intermediary between the higher protocol layers and the physical network.

IP. See *Internet Protocol*.

I/O. See *input/output.*

I/O group. A collection of virtual disks (VDisks) and node relationships that present a common interface to host systems.

L

local fabric. In SAN Volume Controller, those storage area network (SAN) components (such as switches and cables) that connect the components (nodes, hosts, switches) of the local cluster together.

logical unit (LU). An entity to which Small Computer System Interface (SCSI) commands are addressed, such as a virtual disk (VDisk) or managed disk (MDisk).

logical unit number (LUN). The SCSI identifier of a logical unit within a target. (S)

LU. See *logical unit*.

LUN. See *logical unit number*.

M

managed disk (MDisk). A Small Computer System Interface (SCSI) logical unit that a redundant array of independent disks (RAID) controller provides and a cluster manages. The MDisk is not visible to host systems on the storage area network (SAN).

managed disk group. A collection of managed disks (MDisks) that, as a unit, contain all the data for a specified set of virtual disks (VDisks).

mapping. See *FlashCopy mapping*.

MDisk. See *managed disk*.

N

node. One SAN Volume Controller. Each node provides virtualization, cache, and Copy Services to the storage area network (SAN).

O

object. In object-oriented design or programming, a concrete realization of a class that consists of data and the operations associated with that data.

offline. Pertaining to the operation of a functional unit or device that is not under the continual control of the system or of a host.

online. Pertaining to the operation of a functional unit or device that is under the continual control of the system or of a host.

R

RAID. See *redundant array of independent disks*.

reliability. The ability of a system to continue to return data even if a component fails.

S

SAN. See *storage area network*.

SCSI. See *Small Computer Systems Interface*.

Small Computer System Interface (SCSI). A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SNMP. See *Simple Network Management Protocol*.

storage area network (SAN). A network whose primary purpose is the transfer of data between computer systems and storage elements and among storage elements. A SAN consists of a communication infrastructure, which provides physical connections, and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust. (S)

IBM Subsystem Device Driver (SDD). An IBM pseudo device driver designed to support the multipath configuration environments in IBM products.

U

uninterruptible power supply. A device connected between a computer and its power source that protects the computer against blackouts, brownouts, and power surges. The uninterruptible power supply contains a power sensor to monitor the supply and a battery to provide power until an orderly shutdown of the system can be performed.

V

valid configuration. A configuration that is supported.

VDisk. See *virtual disk*.

virtual disk (VDisk). In SAN Volume Controller, a device that host systems attached to the storage area network (SAN) recognize as a Small Computer System Interface (SCSI) disk.

virtualization. In the storage industry, a concept in which a pool of storage is created that contains several disk subsystems. The subsystems can be from various vendors. The pool can be split into virtual disks that are visible to the host systems that use them.

virtualized storage. Physical storage that has virtualization techniques applied to it by a virtualization engine.

W

worldwide node name (WWNN). An identifier for an object that is globally unique. WWNNs are used by Fibre Channel and other standards.

worldwide port name (WWPN). A unique 64-bit identifier associated with a fibre-channel adapter port. The WWPN is assigned in an implementation- and protocol-independent manner.

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