

IBM FAStT Storage Manager Version 7.10 for
the FAStT500 in UNIX[®] and AIX[™] Environments



Installation and Support Guide

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IBM FAStT Storage Manager Version 7.10 for
the FAStT500 in UNIX[®] and AIX[™] Environments



Installation and Support Guide

Note:

Before using this information and the product it supports, read the information in "Notices" on page 73.

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About this book

This book provides information about setting up, installing, configuring, and working with the IBM FAST Storage Manager Version 7.10 for the FAST500 in UNIX and AIX Environments.

Throughout this book, the terms *storage management software* and *Storage Manager 7.10* refer to the IBM FAST Storage Manager Version 7.10 for the FAST500. Individual components of the storage management software are identified by name.

Use this book to:

- Determine the hardware and software that is required to install the management software into your subsystem network
- Integrate the necessary hardware components
- Install the management software
- Upgrade controller firmware and NVSRAM
- Identify management features that are unique to your specific installation

Who should read this book

This book is intended for system administrators and storage administrators who are responsible for installing software. Readers should have knowledge of RAID, SCSI, and fibre-channel technology, and should also have working knowledge of the applicable operating systems that are used with the management software.

How this book is organized

“Chapter 1. Introduction” on page 1 provides an introduction to the Storage Manager 7.10 product, including information about product resources in addition to this book.

“Chapter 2. Installing storage management station software” on page 11 provides step-by-step instructions for installing the AIX, HP-UX, or Solaris software on a management station.

“Chapter 3. Installing host software” on page 23 provides step-by-step instructions for installing the AIX, HP-UX, or Solaris management software on a host.

“Chapter 4. Specific information for AIX operating systems” on page 31 provides information about installing and using Storage Manager 7.10 with the AIX operating system.

“Chapter 5. Specific information for HP-UX operating systems” on page 45 provides information about installing and using Storage Manager 7.10 with the HP-UX operating system.

“Chapter 6. Specific information for Solaris operating systems” on page 51 provides information about installing and using Storage Manager 7.10 with the Solaris operating system.

“Chapter 7. Completing the software installation” on page 55 provides step-by-step instructions for performing post-installation tasks.

“Chapter 8. Setting up the storage subsystem in a heterogeneous environment” on page 65 provides step-by-step instructions for setting up and running Storage Manager 7.10 in a heterogeneous environment.

“Chapter 9. Storage Manager 7.10 with high-availability cluster services” on page 67 provides information about the high-availability clustering system. Storage Manager 7.10 is certified for use with MC/Service Guard releases A.11.09 and A.11.12 on HP-UX systems, and with Veritas Cluster Server 1.3 and Veritas Volume Manager 3.1 on Solaris systems.

“Appendix A. HP-UX system requirements” on page 69 and “Appendix B. Solaris system requirements” on page 71 list the minimum hardware and software requirements that HP-UX and Solaris systems, respectively, must meet to be used in a storage system with Storage Manager 7.10.

Related publications

This section lists books, online help systems, and Web sites. These resources provide related information that might be of interest to you.

Books

The following publications are available in Adobe Acrobat PDF on the Storage Manager 7.10 installation CD and at the following Web site:

www.ibm.com/pc/support/

- *IBM FAStT Storage Manager Version 7.10 for the FAStT500 in UNIX and AIX Environments, Installation and Support Guide* (this book)
- *IBM FAStT Storage Manager Concepts Guide*
- *IBM Netfinity® FAStT Host Bus Adapter Installation and User's Handbook*
- *IBM Netfinity FAStT500 RAID Controller Enclosure Unit Installation Guide*
- *IBM Netfinity FAStT500 RAID Controller Enclosure Unit User's Reference*
- *Fibre Array Storage Technology, A Fast Introduction (Redbook)*

You can also order publications through the IBM Publications Ordering System at the following Web site:

www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi/

Online help

Storage Manager 7.10 provides online help for the Enterprise Management and Subsystem Management windows. These help systems contain information about working with the management domain and about managing storage subsystems.

You can access the help systems from the Enterprise Management and Subsystem Management windows in Storage Manager 7.10. Click **Help** on the toolbar or press F1.

The help systems contain operating information that is common to all operating environments. See this *Installation and Support Guide* for information that is specific to AIX, HP-UX, and Solaris systems.

Web sites

For the most up-to-date information about the IBM FAStT500, go to the following Web site and click **Downloads**:

www.storage.ibm.com/fast500/supserver.htm

For information about all IBM storage products, go to the following Web site:

www.ibm.com/storage/

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Chapter 1. Introduction

The IBM FAStT Storage Manager Version 7.10 for the FAStT500 in UNIX and AIX Environments provides an interface for storage management based on information that is supplied by the storage subsystem controllers. You can install the storage management software on a *storage management station*, which is the system that is responsible for managing all, or a portion of, a network. The management station communicates with the network management agents that reside in the managed nodes using a network management protocol, such as Simple Network Management Protocol (SNMP). When you manage a storage subsystem that uses the client software installed on a management station, commands are sent to the storage subsystem controllers. The controller firmware contains the necessary information to carry out the storage management commands. The controller firmware validates and runs the storage management commands, and then returns status and configuration information to the client software.

This *Installation and Support Guide* provides system administrators with information on how to install, configure, and work with Storage Manager 7.10 in UNIX and AIX environments. Before installing Storage Manager 7.10, consult the following documentation:

README.txt files

Read these text files first. One is located in each operating system subdirectory on the installation CD, and contains the latest installation and user information about the storage management software and hardware components.

IBM FAStT Storage Manager Concepts Guide

Use this reference document to become familiar with the terminology and the features of the Storage Manager 7.10 software. This book is available on the installation CD and at the following Web site:

www.ibm.com/pc/support/

For information about installing Storage Manager 7.10 software on AIX, HP-UX, or Solaris systems, refer to this book. When you have completed the entire installation process, refer to the following online help systems, which contain information that is common to all operating system environments. You can access the help systems from the Enterprise Management and Subsystem Management windows in Storage Manager 7.10 by clicking **Help** on the toolbar or pressing F1.

Enterprise Management Help window

Use this online help system to learn more about working with the entire management domain.

Subsystem Management Help window

Use this online help system to learn more about managing individual storage subsystems.

Other references

This section lists references to other general and hardware documentation that provide additional information.

General documentation

See the following document for additional information:

index.pdf

This file contains a list of all documents, with hyperlinks to each PDF file. The **index.pdf** file is available on the installation CD.

Hardware documentation

See the following documents for information about the controller enclosures and the drive enclosures:

Hardware Maintenance Manual

This book helps you determine and resolve the issues most commonly encountered with IBM Fibre Channel devices and configurations.

IBM Netfinity FASt500 RAID Controller Enclosure Unit Installation Guide

This book describes how to set up, install, and connect IBM Netfinity FASt500 RAID Controller Enclosure Units.

IBM Netfinity FASt500 RAID Controller Enclosure Unit User's Reference

This book provides an overview of the IBM Netfinity FASt500 RAID Controller Enclosure Unit and information about routine operations and replacement procedures for all field replaceable units (FRUs).

IBM Netfinity Fibre Channel Cabling Instructions

This reference sheet describes how to install IBM Gigabit Interface Converters (GBICs) and fibre-channel cables.

FASt500 features

The Fibre Array Storage Technology (FASt) storage disk subsystem consists of a FASt500 storage server enclosure and from 1 - 10 EXP500 storage expansion enclosures. The FASt500 storage server is a 4U rack-mountable enclosure, or drawer, that features two RAID controller units, redundant power supplies, and fans for high availability. Each RAID controller unit has a 300 MHz AMD K6 processor and from 256 MB - 512 MB of battery-backed cache to aid in high performance.

On the host side, each RAID controller is connected to two fibre-channel loops through two mini-hubs, which each have two GBICs. The four mini-hubs (with two GBICs per mini-hub) can be used to connect up to eight host ports, or four redundant hosts, on the host side of the RAID controller. Mini-hubs 1 and 3 are connected to RAID controller 1, and mini-hubs 2 and 4 are connected to RAID controller 2.

On the drive side, each RAID controller is attached to four fibre-channel loops, which are normally used as two redundant loops. Each redundant loop can be attached to up to five EXP500 disk expansion enclosures, for a total of up to 10 EXP500 expansion enclosures for both RAID controllers. The EXP500 is a 3U rack-mountable storage expansion enclosure that has 10 bays that are available for slim-line hot-swappable fibre-channel (FC) disk drives. Each EXP500 has two Enclosure Service Monitor (ESM) boards that are both connected to all 10 disk drives for full redundancy, and redundant power supplies and fans.

Storage Manager 7.10 also provides:

- 1 gigabit interface converter (GBIC) and fibre channel (FC) attachment on the host side
- 1 GBIC FC attachment to the FC disk enclosures on the drive side
- Dual controllers with path failover capabilities
- A robust, out-of-band systems-management package

- Multiple levels of RAID (RAID 0, 1, 3, and 5)
- Up to 16 partitions, each with 32 logical unit numbers (LUNs)
- Up to 16 port logins per FC host port
- Storage capacity up to 7.34 TB (using 73.4 GB drives)
- Multi-host support for heterogeneous server environments

FAStT500 supports the following hot-swappable components for high availability:

- Dual RAID controller units
- Power supply modules
- Fans
- Cache backup battery

Storage Manager 7.10 features

This section describes the Storage Manager 7.10 software features.

Event monitoring

Event monitoring allows you to monitor storage subsystems, even when the Enterprise Management window is not open. A toolbar button and an option, **Tools** → **Update monitor**, allow updates to the monitor if changes have occurred to your storage subsystem configuration.

Heterogeneous hosts

Heterogeneous hosts, with the storage partitioning feature, allow you to connect hosts that are running different operating systems to a single storage subsystem.

Configuration replication

Configuration replication allows you to save the logical configuration of a storage subsystem, and then load it on an identical storage subsystem. This feature can be used to replicate a logical configuration from one storage subsystem to another, or to save a storage subsystem configuration for backup purposes.

Auto volume transfer (AVT)/auto disk transfer (ADT)

Auto volume transfer (AVT), also known as auto disk transfer (ADT) and referred to in this manual as AVT/ADT, allows individual volumes on a storage subsystem to be owned by different controllers in the storage subsystem. Previous firmware versions allowed ownership at the array level only. If a problem occurs along a path between a host and a volume, the multipath driver can move that volume to the other active controller.

Support for AVT/ADT varies by operating system:

- AIX does not support AVT/ADT.
- Solaris supports AVT/ADT in a homogeneous environment. However, Solaris does not support AVT/ADT if it is in a heterogeneous environment with AIX.
- HP-UX requires that AVT/ADT be enabled.

Command-line interface

The command-line interface is based on the script-engine commands found in the script editor and allows you to issue commands to the storage subsystems. See the SM7cli.txt file on the installation CD or the Command Line Interface (CLI) online help topic for usage information.

Controller diagnostics

You can access the controller diagnostics from the **Controller** menu in the

storage management software. These diagnostics allow you to test the host-side and drive-side fibre-channel loops.

Access volume mapping

Access volume mapping allows you to assign and change the LUN assignment for the access volume. An access volume is required for communicating in a host-agent-managed environment using the fibre-channel I/O path, but is not required for a directly-managed storage subsystem that is connected through the Ethernet cable connection.

Note: AIX does not support access volumes.

High-availability cluster services

A high-availability clustering system allows application services to continue when a hardware or software failure occurs. This system protects you from software failures as well as from the failure of a CPU, disk, or local area network (LAN) component. If a component fails, the redundant component takes over cluster services and coordinates the transfer between components.

Redundant Dual Active Controller (RDAC)

The Redundant Dual Active Controller (RDAC) package, also known as the Redundant Disk Array Controller (RDAC) package, is a multipath device driver that provides controller failover support when a failure occurs anywhere along the fibre-channel I/O path.

Note: RDAC must be installed on all AIX, Solaris, and Windows systems attached to the same FASSt500 controller.

Storage Manager 7.10 software packages

Storage Manager 7.10 contains the following software packages:

- Storage Manager 7 client software (SM7client)
- Storage Manager 7 agent (SM7agent)
- Storage Manager 7 utility package (SM7util)
- RDAC, a multipath device driver

Install the software packages in the sequences shown in Table 1. For installation instructions, see the referenced sections. For an overview of each package, see the subsections that follow the table.

Table 1. Installation sequences of Storage Manager 7.10 software packages by host type

Step	AIX	HP-UX	Solaris
1	SM7client (see "Installing the client software on AIX hosts" on page 11)	SM7client (see "Installing the client software on HP-UX hosts" on page 15)	SM7client (see "Installing the client software on Solaris hosts" on page 19)
2	RDAC (see "Installing host software on AIX hosts" on page 23)	SM7util (see "Installing the utility software on HP-UX hosts" on page 24)	RDAC (see "Installing host software on Solaris hosts" on page 26)
3		SM7agent (see "Installing the agent software on HP-UX hosts" on page 25)	SM7agent (see "Installing host software on Solaris hosts" on page 26)

Table 1. Installation sequences of Storage Manager 7.10 software packages by host type (continued)

Step	AIX	HP-UX	Solaris
4			SM7util (see “Installing host software on Solaris hosts” on page 26)

Storage Manager 7 client software package

The Storage Manager 7.10 client (SM7client) package provides the graphical user interface (GUI) for managing storage subsystems through the Ethernet network or from the host. The SM7client contains two main components:

Enterprise Management

This component allows you to add, remove, and monitor storage subsystems in the management domain.

Subsystem Management

This component allows you to manage the components of an individual storage subsystem.

For more information about this software, see “Chapter 2. Installing storage management station software” on page 11 and the *IBM FAStT Storage Manager Concepts Guide*.

Storage Manager 7 agent software package

The Storage Manager 7.10 agent (SM7agent) package contains the host-agent software, which you can use to manage storage subsystems through the host fibre-channel connection. The host-agent software takes requests from a management station that is connected to the host through a network connection and passes the requests to the storage subsystem controllers through the fibre-channel I/O path. For more information about managing storage subsystems through the host agent, see “Host-agent (in-band) management method” on page 6.

Storage Manager 7 utility software package

Use the Storage Manager 7.0 utility (SM7util) package to register and map new logical drives to the operating system. Install SM7util on all HP-UX and Solaris systems in your storage subsystem. The host computers are attached to the storage subsystem through the fibre channel.

RDAC

AIX and Solaris systems require an RDAC driver for fibre-channel path redundancy. If a FAStT500 storage server has two controllers, and the operating system does not support multipath I/O, then you can use the RDAC. The RDAC monitors I/O paths; if a component failure occurs in one of the fibre-channel paths, the RDAC reroutes all I/O to another path.

Storage subsystem management methods

The storage management software provides two methods for managing storage subsystems:

- The host-agent (in-band) management method. In this method, you manage the storage subsystems through the fibre-channel I/O path to the host.

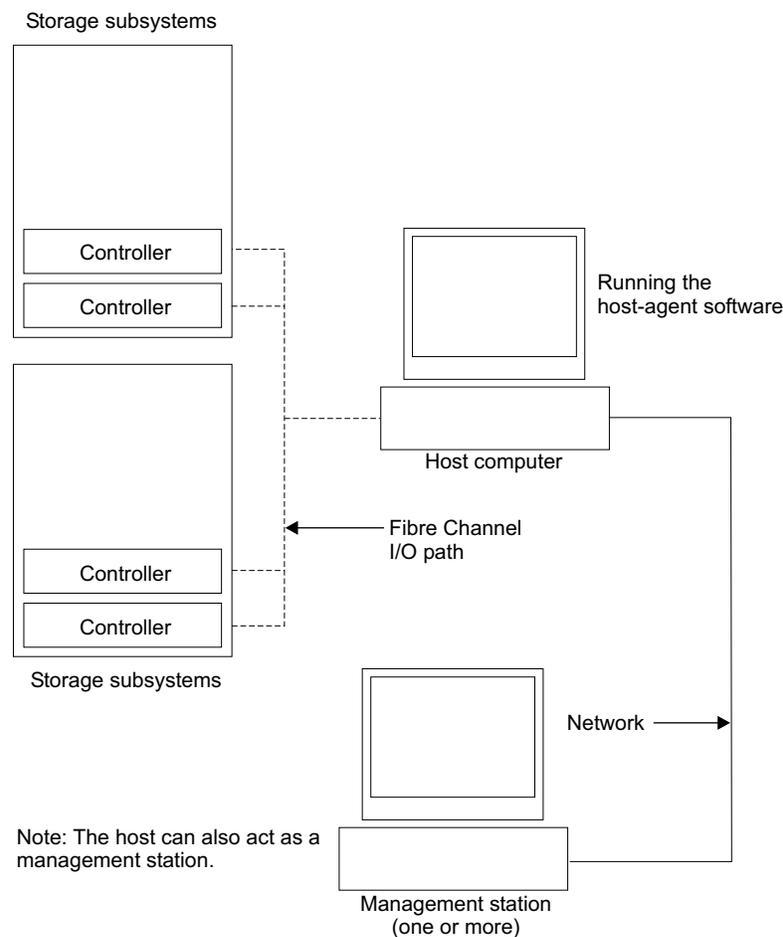
Note: You cannot use this management method on AIX systems.

- The direct (out-of-band) management method. In this method, you manage the storage subsystems directly over the network through the Ethernet connection to each controller.

Host-agent (in-band) management method

When you use the host-agent (in-band) management method, you manage the storage subsystems through the fibre-channel I/O path to the host. The management information can be processed by the host or passed to the management station through the network connection. Figure 1 shows the host-agent (in-band) management method.

Note: You cannot use the host-agent (in-band) management method on AIX systems.



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Figure 1. Host-agent (in-band) managed storage subsystems

Managing storage subsystems using the host-agent (in-band) management method has the following advantages:

- You do not need to run Ethernet cables to the controllers.
- You do not need a Dynamic Host Configuration Protocol (DHCP) bootstrap protocol (BOOTP) server to connect the storage subsystems to the network.

- You do not need to configure the controller network (described in “Chapter 2. Installing storage management station software” on page 11).
- When adding devices, you need to specify a host name or IP address for the host only, not for the individual controllers in a storage subsystem. Storage subsystems that are attached to the host are automatically discovered.

Managing storage subsystems using the host-agent (in-band) management method has the following disadvantages:

- You are limited to configuring one less LUN than the maximum number allowed by the operating system and host adapter that you are using.
- The host-agent requires a special logical drive, called an *access volume*, to communicate with the controllers in the storage subsystem.
- If you are upgrading controllers from firmware version 3.x to version 4.x and your host system has already configured its maximum number of LUNs, you must give up a LUN to be used as an access volume.

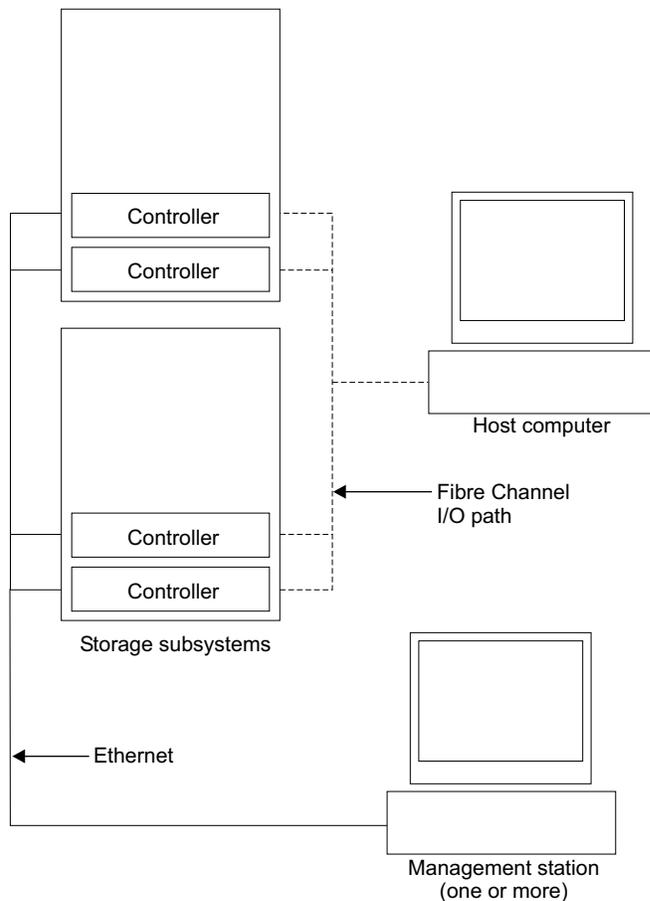
Important: The access volume uses one of the LUNs. If your host already has the maximum number of LUNs configured, either use the direct-management method or give up a LUN for use as the access volume. For information about your specific configuration, see the appropriate “Specific information” chapter in this book for your operating system environment.

Attention: IBM AIX does not support access volumes. Using access volumes on AIX operating systems can yield unknown results.

Direct (out-of-band) management method

When you use the direct (out-of-band) management method, you manage storage subsystems directly over the network through the Ethernet connection to each controller. To manage the storage subsystem through the Ethernet connections, you must define the IP address and host name for each controller and attach a cable to the Ethernet connectors on each of the storage subsystem controllers. Figure 2 on page 8 shows the direct (out-of-band) management method.

Note: You can use the direct (out-of-band) management method for AIX, HP-UX, and Solaris systems.



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Figure 2. Direct (out-of-band) managed storage subsystems

Managing storage subsystems using the direct (out-of-band) management method has the following advantages:

- The Ethernet connections to the controllers enable a management station running SM7client to manage storage subsystems that are connected to a host running one of the following operating systems:
 - AIX
 - HP-UX
 - Linux
 - Microsoft® Windows NT®/2000
 - Solaris
 - Any other operating systems that are supported by Storage Manager 7.10
- You do not need to use an access volume to communicate with the controllers as you do if you are using the host-agent management method. You can configure the maximum number of LUNs that are supported by the operating system and the host adapter that you are using.

Managing storage subsystems using the direct (out-of-band) management method has the following disadvantages:

- It requires two Ethernet cables to connect both storage subsystem controllers to the network.
- When adding devices, you must specify an IP address or host name for each controller.
- A DHCP BOOTP server is required or other network preparation tasks are required. For more information, see the system installation guide for your network server.

Network cabling configuration restrictions

FAStT500 configurations are supported in a fabric (switched) environment only. As shown in Figure 3, if you connect an FC switch to either port of a mini-hub, you cannot connect anything to the second port.

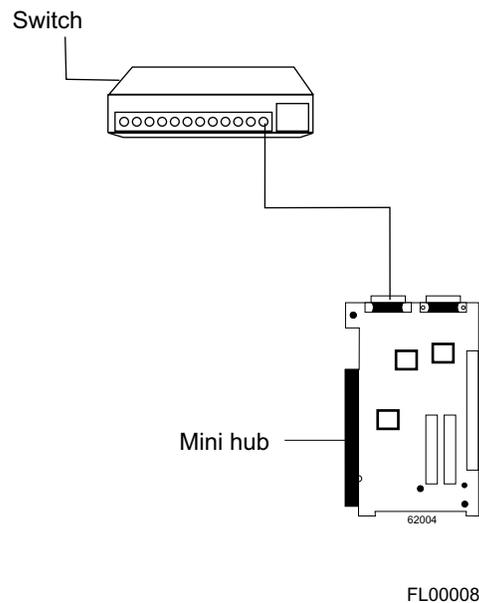


Figure 3. Network cabling configuration restrictions

Operating system requirements

Each management station, host computer, or cluster server requires one of the following operating systems:

- IBM AIX 4.3.3
- HP-UX 11.0 (see “Appendix A. HP-UX system requirements” on page 69)
- Sun Solaris 2.6, 7, or 8 (see “Appendix B. Solaris system requirements” on page 71)

Setting up IP addresses for FAStT500 storage controllers

Contact your network administrator to obtain the IP address and associated host name for each controller in every storage subsystem on the network, and make a note of those values for reference.

To use the out-of-band management method without setting up a DHCP BOOTP server, you must assign IP addresses to the FAStT500 controllers using CLI commands through serial cables connected to a terminal emulator.

Complete the following steps to set up the FAStT500 storage controller IP addresses using serial ports:

1. Stop all I/O to the FAStT500 storage controllers.
2. Connect a serial cable from one of the controllers to a system with a terminal emulator available.

Note: Use HyperTerminal Version 3 (V3) or later.

3. Connect to the FAStT storage server and send a break signal (Ctrl+Break for most emulators).
4. Repeat this step until the following message is displayed:

```
Press the space bar for baud rate within 5 seconds.
```

5. Press the space bar to ensure the correct baud rate setting.
6. Send another break signal; the following message is displayed:

```
Press within 5 seconds: ESC for SHELL, BREAK for baud rate.
```

7. Press Escape to access the shell of the controller.
8. Type the password: `infiniti`
9. Type `netCfgShow` to show the current network configuration.
10. Type `netCfgSet` to change the network configuration information.
11. Assign an IP address to the controller.
12. Disconnect from the first controller and connect to the second controller.
13. Repeat steps 1 - 12 to assign the second IP address to the second controller.
14. Restart the FAStT storage server by turning the controller unit on and off.

Chapter 2. Installing storage management station software

This chapter provides instructions for installing Storage Manager 7.10 client software on storage management stations and for performing the initial configuration of FAST500 storage subsystems for the following supported operating systems:

- AIX
- HP-UX
- Solaris

Typically, a storage management station is a remote system, connected to an Ethernet network, that is used to manage one or more storage subsystems. A storage management station can also be a host that is connected to the storage subsystem with a fibre-channel I/O path; you use this same path to manage the attached storage subsystems. Even though you can install the storage management software on a host, the host still uses the transmission control protocol/internet protocol (TCP/IP) to communicate with the host-agent. The agent communicates with the controllers over the fibre-channel connection through the access volume.

The Storage Manager 7.10 client software, SM7client, is a Java™-based GUI interface that allows you to configure, manage, and troubleshoot the storage subsystem through a host system or through a storage management station. Specifically, SM7client allows you to:

- Configure disk arrays and logical volumes
- Assign names to arrays and volume groups
- Assign logical volumes to storage partitions
- Replace and rebuild failed disk drives
- Expand the size of arrays
- Change RAID-type arrays
- Monitor the status of FAST500 components
- Perform troubleshooting and maintenance tasks, such as downloading firmware to controllers and upgrading NVSRAM

AIX

This section describes how to complete the following tasks for Storage Manager 7.10 software on AIX hosts:

- install the client software
- perform the initial configuration of the storage subsystem

Installing the client software on AIX hosts

Use the following procedure to install the client software on an AIX storage management station or on an AIX host acting as a storage management station.

Prerequisites

Before installing the client software, ensure that the following conditions are met:

- The AIX host on which you will be installing the SM7client software meets the minimum hardware and software requirements described in “Chapter 4. Specific information for AIX operating systems” on page 31.

- The following filesets (located on the AIX CD) are present on the system.

Fileset	Version
X11.adt.lib	4.3.3.10
bos.adt.include	4.3.3.75

Procedure

In the following procedure, the installation CD is mounted at /dev/cdrom. Adjust these instructions as required for your specific installation. No restart is required during the client installation process.

1. Create the /cdrom mount point:

```
# mkdir /cdrom
```

2. Insert the installation CD into the CD-ROM drive and mount the CD at /cdrom:

```
# mount -v cdrfs -o ro /dev/cd0 /cdrom
```

3. Install the SM7client software package:

```
# installp -a -d /cdrom/AIX/SM7client-aix-0710G510.bff SM7client.aix.rte
```

The installation process begins. The process displays information as it runs, including an installation summary when the process is finished.

4. Verify that the installation was successful:

```
# ls1pp -ah SM7client.aix.rte
```

The verification process returns a table that describes the software installation, including the install package file name, version number, action, and action status. If the verification process returns an error, contact your customer support representative.

5. You are finished with the client software installation for this AIX storage management station. Unmount the CD using the following command, and then remove it from the CD-ROM drive:

```
# umount /cdrom
```

Performing the initial configuration of storage subsystems on AIX hosts

All FAStT systems ship with NVSRAM configured for Windows NT hosts and have an access volume set to LUN 31. However, because AIX does not support access volumes, you must perform the following tasks, which are described in detail (along with the other configuration tasks) starting with step 1 on page 13.

- Disable AVT/ADT using the script supplied on the Storage Manager 7.10 installation CD and following the instructions in step 8 on page 14. AVT/ADT must be disabled for path redundancy to be effective.
- Delete access volumes (also known as UTM LUNs), following the instructions in step 9 on page 14. Access volumes are not supported in this release; failure to delete them can cause system errors.

- If the controllers are shipped with a firmware release prior to version 04.01.02.21 and an NVSRAM release prior to NV477HET856008, they must be upgraded. Anytime that the NVSRAM is upgraded, AVT/ADT is automatically enabled and must be disabled again. Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast500/supserver.htm

Note: The versions of firmware and NVSRAM that ship with this product can be later releases than those described in this document.

Complete the following procedure to configure Storage Manager 7.10 for an AIX system.

1. To set up the storage subsystem for AIX, the subsystem must be physically configured for direct management through the Ethernet connections on each controller. Install SM7client before configuring the subsystem.

Note: See “Setting up IP addresses for FAST500 storage controllers” on page 9 for information about assigning IP addresses to the controllers.

2. After the disk subsystem is configured on the network, start the SM7client software on the host server:

```
# /usr/SM7client/SM7client
```

3. Complete the following steps to specify the IP addresses of the controllers.
 - a. In the Enterprise Management window, click **Edit** → **Add Device**.
 - b. In the Add Device window, type the IP address of the first controller in the storage subsystem and click **Add**.
 - c. Type the IP address of the second controller and click **Add** → **Close**.

The storage subsystem is shown as a direct network attachment. Double-click **Storage Subsystem** to open the Subsystem Management window.

4. In the Subsystem Management window, click **Storage Subsystem** → **Profile** and review the summary portion of the output. Verify that the controller firmware and NVSRAM are at the correct versions. If they are, go to step 10 on page 14; if not, continue with step 5.

Note: Upgrade the controller firmware, and then ensure that the controllers are in a quiescent state, before you upgrade the NVSRAM. Concurrent upgrades of NVSRAM are not supported.

5. Complete the following steps to upgrade the controller firmware.
 - a. Mount and locate the firmware file on the installation CD (`/cdrom/Firmware/3552`), or download the correct version from the Web site. Place the file in a designated directory on the host system.
 - b. In the Subsystem Management window, click **Storage Subsystem** → **Download** → **Firmware**.
 - c. Type or select the full pathname of the firmware file.
 - d. Click **OK** to update both controllers.
 - e. Click **Yes** to start the download. A new window is displayed.
 - f. Close the Subsystem Management window and then reopen it to complete the firmware update.
 - g. Verify that the firmware was successfully installed.

6. After you ensure that all I/O to the controllers is stopped, complete the following steps to upgrade the NVSRAM.
 - a. Mount and locate the NVSRAM file on the installation CD (/cdrom/NVSRAM/3552), or download the correct version from the Web site. Place the file in a designated directory on the host system.
 - b. In the Subsystem Management window, click **Storage Subsystem** → **Download** → **NVSRAM**.
 - c. Type or select the full pathname of the NVSRAM directory.
 - d. Double-click the NVSRAM filename or click **OK** to select the correct file.
 - e. Click **Yes** to start the download.
 - f. Verify that the NVSRAM was successfully installed.
7. After you upgrade the firmware and the NVSRAM, turn the power to the controller enclosure off and on in the following sequence, and then restart the AIX host.
 - a. Turn off both controllers.
 - b. Wait at least 30 seconds.
 - c. Turn on both controllers.
8. Complete the following steps to disable AVT/ADT. For more information about AVT/ADT, see “Chapter 7. Completing the software installation” on page 55.
 - a. Insert the installation CD into the CD-ROM drive of the storage management station.
 - b. Start the storage management software.
 - c. In the Enterprise Management window, highlight the storage subsystem on which you want to disable AVT/ADT.
 - d. Click **Tools** → **Execute Script**.
The Script Editor window opens.
 - e. Click **File** → **Load Script**.
The Load Script window opens.
 - f. Select the avtdisable.scr file from the /cdrom/Scripts directory of the installation CD.
 - g. Click **OK** to load the script.
 - h. Click **Tools** → **Execute Only**.
The script runs. It displays a Script Execution Complete message when it is finished.
 - i. Turn off the controller enclosure, and then turn it back on.
9. Complete the following steps to delete access volumes.
 - a. In the Subsystem Management window, click **Configure** → **View Logical Drive-To-LUN Mappings**.
 - b. Right-click **Access Logical Drive**.
 - c. Click **Delete**.
 - d. Type Yes.
10. You must install the RDAC driver on the AIX system before you can use it to recognize and configure FASt500 devices. See “Installing host software on AIX hosts” on page 23 to verify that the driver is installed. If the RDAC driver is not installed, install it now and then use the following command to probe for devices:

```
# cfmgr -v
```

Note: For information about creating logical drives and partitions, see the *IBM FASiT Storage Manager Concepts Guide*, available on the installation CD or at the following Web site:

www.ibm.com/pc/support/

11. In the Subsystem Management window, click **Configure** → **View Logical Drive-To-LUN Mappings**.
12. In the Mappings window, click **Configure** → **Topology** → **Define New Host Group** to create a new host group.
13. Type the name of the new host group. Click **Add**, and then click **Close**.
14. Highlight the new host group and click **Configure** → **Topology** → **Define New Host**.
15. Define the new host. Type the name of the AIX host to which the storage subsystem is attached.

Note: You must select an AIX host type. This automatically sets some NVSRAM parameters that are critical for AIX to operate properly.

- a. Click **Add**, and then click **Close**.
- b. Highlight the host that you just added and right-click **Define New Host Port**.
- c. Select the desired host port for the first HBA, and then change the host type to **AIX** and click **Add**.
- d. Choose the host port for the second HBA and click **Add** → **Close**.
- e. click **File** → **Exit Subsystem Management** → **Exit**.
- f. Probe for devices:

```
# cfmgr -v
```

The host is now able to detect the storage subsystem.

HP-UX

This section describes how to complete the following tasks for Storage Manager 7.10 software on HP-UX hosts:

- install the client software
- perform the initial configuration of the storage subsystem

Installing the client software on HP-UX hosts

Use the following procedure to install the client software on an HP-UX storage management station or on an HP-UX host acting as a storage management station.

Prerequisites

Before installing the client software, ensure that the following conditions are met:

- This is the HP 9000-series server that you identified as the storage management station.
- This machine meets the minimum hardware and software requirements described in “Appendix A. HP-UX system requirements” on page 69.
- The SM7client is not installed and you are ready to install it on this machine.

Procedure

In the following procedure, the installation CD is mounted at /cdrom. Adjust these instructions as required for your specific installation. No restart is required during the client installation process.

1. Insert the HP-UX installation CD in the CD-ROM drive.
2. Start the installation process:

```
# swinstall -s /cdrom/HP-UX/SM7client-HP-0710G506
```

The Software Selection window opens and displays this message:

```
SM7client  
JRE
```

3. Select **SM7client**. The Java runtime environment (JRE) is automatically installed during the client software installation.
4. From the toolbar, click **Actions** → **Install (Analysis)**.
If you did not select the JRE, a message displays indicating that it will be automatically installed.
5. Click **OK** when the analysis is finished.
6. In the Confirmation window, click **Yes** to start the installation.
7. When the installation is finished, click **Done** in the Install window and close the application.

Note: You must exit the **swinstall** command before running the **swverify** command.

8. Verify that the installation was successful:

```
# swverify -v SM7client
```

If no failure is reported, proceed to step 9. If a failure is reported, follow the instructions in the /var/adm/sw/swagent.log file.

9. You are finished with the SM7client software installation on this HP-UX storage management station. Remove the installation CD from the CD-ROM drive.
10. Choose one of the following options:

Storage management software is required on additional storage management stations

Repeat step 1 through step 9 for each storage management station.

Storage management software installation is completed on all storage management stations

You are now ready to install the host software. Go to “Chapter 3. Installing host software” on page 23.

Note: To ensure redundancy in a cluster environment, you must install the client software on at least one additional storage management station or cluster server.

Performing the initial configuration of storage subsystems on HP-UX hosts

Read the following before continuing:

- All FAStT systems ship with NVSRAM configured for Windows NT hosts and have an access volume set to LUN 31.
- If the controllers are shipped with a firmware release prior to version 04.01.02.21 and an NVSRAM release prior to NV3542R710NT008, they do not work under HP-UX and must be upgraded. Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast500/supserver.htm

Note: The versions of firmware and NVSRAM that ship with this product can be later releases than those described in this document.

Complete the following procedure to configure Storage Manager 7.10 for an HP-UX system.

1. To set up the storage subsystem for HP-UX, the subsystem must be physically configured, at least initially, for direct management through the Ethernet connections on each controller as well as through the fibre-channel connection. Install the Storage Manager 7.10 software (SM7client, SM7util, and SM7agent) before configuring the subsystem.
2. After the disk subsystem is configured on the network, type the following command to run the SM7client software on either the host server, if it is on the same network as the storage subsystem, or on another machine in the network that has the Storage Manager 7.10 software installed:

```
# SM7client
```

3. Complete the following steps to specify the IP addresses of the controllers.
 - a. In the Enterprise Management window, click **Edit** → **Add Device**.
 - b. In the Add Device window, type the IP address of the first controller in the storage subsystem and click **Add**.
 - c. Type the IP address of the second controller and click **Add**, and then click **Close**.

The storage subsystem is shown as a direct network attachment.

4. In the Subsystem Management window, click **Storage Subsystem** → **Profile** and review the summary portion of the output.

Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast500/supserver.htm

If the version numbers that are installed on the storage subsystem are current, then go to step 8 on page 18.

5. Complete the following steps to upgrade the firmware.
 - a. Click **Storage Subsystem** → **Download** → **Firmware**.
 - b. Go to the directory where the firmware resides.
 - c. Type or select the full pathname of the firmware file, and then click **Update** → **OK**.

The firmware is downloaded to the controllers. When the download is finished, the storage subsystem becomes unresponsive and you are returned to the Enterprise Management window.

6. Complete the following steps to upgrade the NVSRAM.

- a. Rescan the storage subsystem, and then click **Manage the Device** to return to the Subsystem Management window.
- b. Click **Storage Subsystem** → **Download** → **NVSRAM**.
- c. In the NVSRAM window, go to the directory where the latest NVSRAM file resides.
- d. Type or select the full pathname of the NVSRAM file, and then click **Update** → **OK**.
- e. When the NVSRAM download is finished, turn the power to the storage subsystem off and on in the following sequence.
 - 1) Turn off both controllers.
 - 2) Turn off any attached drive enclosures.
 - 3) Wait at least 30 seconds.
 - 4) Turn on any attached drive enclosures.
 - 5) Turn on both controllers.

If required, the host restart process starts after the storage subsystem has been turned off.

7. Type the following command to restart the host:

```
# reboot
```

8. Click **Configure** → **View Logical Drive-To-LUN Mappings** from the Subsystem Management window.
9. In the Mappings window, create a new host group by clicking **Configure** → **Topology** → **Define New Host Group**.
10. Type the name of the new host group (for example, HP-UX). Click **Add**, and then click **Close**.
11. Highlight the new host group and click **Configure** → **Topology** → **Define New Host**.
12. Define the new host. Type the name of the HP-UX host to which the storage subsystem is attached.
 - a. Click **Add**, and then click **Close**.
 - b. Highlight the host that you just added and right-click **Configure** → **Topology** → **Define New Host Port**.
 - c. Select the desired host port for the first HBA, and then change the host type to **HP-UX** and click **Add**.
 - d. Choose the host port for the second HBA and click **Add**, and then click **Close**.
 - e. Click **File** → **Exit Subsystem Management** → **Exit**.
 - f. Obtain the device name for each HBA:

```
# ioscan -fn
```

- g. Obtain the N_port port worldwide name (WWN):

```
# tdu1 <device name>
```

where <device name> is the name of the device, for example, /dev/td1.
The port WWN is equal to the host port identifiers that are displayed in the New Host Port window.

13. Type the following command to run the hot_add utility. The resulting display shows the two UTM LUNs, which are set to 31 by default.

```
# /etc/raid/bin/hot_add
```

14. Run the SM7client at a shell prompt. If the client is unable to recognize the storage subsystem, close the client and type the following command at a shell prompt:

```
# /sbin/init.d/SM7agent start
```

The SM7client is now able to connect to the storage subsystem.

Solaris

This section describes how to complete the following tasks for Storage Manager 7.10 software on Solaris systems:

- install the client software
- perform the initial configuration of the storage subsystem

Installing the client software on Solaris hosts

Use the following procedure to install and integrate the client software on a Solaris storage management station.

Prerequisites

Before installing the client software, ensure that the following conditions are met:

- This is the Sun SPARCstation workstation that you have identified as the storage management station.
- This machine meets the minimum hardware and software requirements described in “Appendix B. Solaris system requirements” on page 71.
- The SM7client is not installed and you are ready to install it on this machine.

Procedure

In the following procedure, the installation CD is mounted at /cdrom/sm710. Adjust these instructions as required for your specific installation location. No restart is required during the client installation process.

1. Insert the Solaris installation CD in the CD-ROM drive.
2. Start the installation process:

```
# pkgadd -d /cdrom/sm710/SUN_Sparc/SM7client-Sparc-0710G506.pkg
```

Information about packages that can be installed in the specified directory is displayed on the command line. The following is an example of what you might see displayed.

```
The following packages are available:
```

```
1 SM7client                IBM FASt500 Storage Manager 7 Client
                           (sparc) <version number>
```

```
Select package(s) you wish to process (or 'all' to process all
packages). (default:all) [?,??,q]:
```

3. Type the value of the package that you are installing and press Enter.
The installation process begins. The following prompt is displayed:

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

Do you want to continue with the installation of <SM7client>

[y, n, ?]
```

4. Type y and press Enter.
The installation process continues. When the SM7client software has been successfully installed, the following message is displayed:

```
Installation of <SM7client> was successful.
```

5. Verify that the installation was successful:

```
# pkgchk SM7client
```

6. You are finished with the client software installation on this Solaris storage management station. Remove the installation CD from the CD-ROM drive.
7. Choose one of the following options:

Storage management software is required on additional storage management stations

Repeat step 1 on page 19 through step 6, using the corresponding installation profile for each storage management station as a guide.

Storage management software installation is completed on all storage management stations

You are now ready to install the host software. Go to “Chapter 3. Installing host software” on page 23.

Note: To ensure redundancy in a cluster environment, you must install the client software on at least one additional storage management station or cluster server.

Performing the initial configuration of storage subsystems on Solaris hosts

Read the following before continuing:

- All FAStT systems ship with NVSRAM configured for Windows NT hosts and have an access volume set to LUN 31. This should not present any problems for Solaris in recognizing the storage subsystem.
- Disable AVT/ADT using the script supplied on the Storage Manager 7.10 installation CD and following the instructions in “Disabling AVT/ADT” on page 56. AVT/ADT must be disabled for path redundancy to be effective.
- If the controllers are shipped with a firmware release prior to Version 04.01.02.21 and an NVSRAM release prior to NV3542R710NT008, they do not work under Solaris and must be upgraded. Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware and the NVSRAM:
www.storage.ibm.com/fast500/supserver.htm

Note: Versions of firmware and NVSRAM that ship with this product can be later releases than those described in this document.

Complete the following procedure to configure Storage Manager 7.10 for a Solaris system:

1. First upgrade the firmware and then upgrade the NVSRAM. In the Subsystem Management window, click **Storage Subsystem** → **Download** → **Firmware**.
2. Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware and the NVSRAM:
www.storage.ibm.com/fast500/supserver.htm
If you do not have the latest versions, download them and continue with step 3. If the version numbers are current, then go to step 10.
3. Type or select the full pathname of the firmware file, and then click **Update** → **OK**.
The firmware is downloaded to the controllers. When the download is finished, the firmware becomes unresponsive and you are returned to the Enterprise Management window.
4. Rescan the storage subsystem, and then click **Manage the Device** to return to the Subsystem Management window.
5. Click **Storage Subsystem** → **Download** → **NVSRAM**.
6. In the NVSRAM window, go to the directory where the latest NVSRAM file resides.
7. Type or select the full pathname of the NVSRAM file, and then click **Update** → **OK**.
8. When the NVSRAM download is finished, type the following command to halt the host system:

```
# halt
```

9. Turn the power to the storage subsystem off and on in the following sequence.
 - a. Turn off both controllers.
 - b. Turn off any attached drive enclosures.
 - c. Wait at least 30 seconds.
 - d. Turn on any attached drive enclosures.
 - e. Turn on both controllers.
 - f. Disable AVT/ADT following the instructions in “Disabling AVT/ADT” on page 56.
10. Restart the host system:

```
# boot -r
```

11. In the Subsystem Management window, click **Configure** → **View Logical Drive-To-LUN Mappings**.
12. In the Mappings window, create a new host group by clicking **Configure** → **Topology** → **Define New Host Group**.
13. Type the name of the new host group (for example, Solaris). Click **Add**, and then click **Close**.

14. Highlight the new host group and click **Configure** → **Topology** → **Define New Host**.
15. Define the new host. Type the name of the Sun host to which the storage subsystem is attached.
 - a. Click **Add** , and then click **Close**.
 - b. Right-click the host that you just added and select **Define New Host Port**.
 - c. Select the desired host port for the first HBA, and then change the host type to **Solaris** and click **Add**.
 - d. Choose the host port for the second HBA and click **Add**, and then click **Close**.
 - e. To view the added LUNs, click the host group, and then click **Configure** → **Logical Drive-To-LUN Mappings** → **Define New Mapping**.
 - f. Click **File** → **Exit**.
 - g. Obtain the device name for each volume (or LUN):

```
# format
```

The SM7client is now able to connect to the storage subsystem.

Chapter 3. Installing host software

After you have completed installing the Storage Manager 7.10 client software and performing the initial configuration of your storage subsystems (see “Chapter 2. Installing storage management station software” on page 11), you can follow the instructions in this chapter to install the Storage Manager 7.10 host software. See Table 1 on page 4 for information about the software packages and the installation sequence required by each host type.

Installing host software on AIX hosts

All AIX hosts in your storage subsystem must have the RDAC multipath driver installed on them. This section describes how to install that host software package.

Prerequisites

This section lists the prerequisites for installing the RDAC driver program temporary fixes (PTFs) on an AIX system and describes how to verify AIX host firmware.

Prerequisites for installing RDAC

The following PTF filesets must be at the specified versions or later.

Table 2. PTF filesets required for RDAC driver installation

PTF filesets	Version
devices.fcp.disk.array.diag	4.3.3.50
devices.fcp.disk.array.rte	4.3.3.75*
devices.fcp.disk.rte	4.3.3.75
devices.common.IBM.fc.rte	4.3.3.75
devices.pci.df1000f7.com	4.3.3.76
devices.pci.df1000f7.rte	4.3.3.75
devices.scsi.sccarray.rte	4.3.3.50
* The RDAC driver update Version 4.3.3.77 requires the presence of Version 4.3.3.75.	

Read the README file, located in the AIX directory of the installation CD, to verify the latest versions of PTFs. AIX PTFs can be obtained from the following Web site:

techsupport.services.ibm.com/rs6000/support/downloads/

Verifying AIX host firmware

Use the **lslpp** command to verify that the correct version numbers of the AIX host firmware are installed, where <filename> is one of the required filesets listed in Table 2:

```
# lslpp -ah <filename>
```

For example:

```
# lslpp -ah devices.fcp.disk.rte
```

Procedure

Complete the following procedures to update the RDAC PTF (devices.fcp.disk.array.rte) on an AIX system. Repeat this procedure for all AIX systems connected to the FAStT500 disk subsystem.

1. If the /cdrom mount point does not exist, create it:

```
# mkdir /cdrom
```

2. Mount the CD at the /cdrom mount point:

```
# mount -v cdrfs -o ro /dev/cd0 /cdrom
```

3. Change to the appropriate directory:

```
# cd /cdrom/AIX/usr/sys/inst.images
```

4. Start the installation process:

```
# installp -acXgd . all
```

The installation process begins. It displays information as it runs, including an installation summary when it is finished.

5. Verify that the correct version of the software was successfully installed:

```
# lslpp -ah devices.fcp.disk.array.rte
```

The verification process returns a table that describes the software installation, including the installation package fileset name, version number, action, and action status. If the verification process returns an error, contact your customer support representative. If it does not return an error, then you are finished installing the RDAC driver on this AIX system.

6. Unmount the CD with the following command, and then remove the CD from the CD-ROM drive:

```
# umount /cdrom
```

7. Shut down and restart the AIX system. This must be done for the software changes to take effect.

```
# shutdown -r
```

Installing host software on HP-UX hosts

All HP-UX hosts in your storage subsystem must have the SM7util and SM7agent software installed on them. This section contains the procedures for installing those host software packages.

Installing the utility software on HP-UX hosts

Complete the following procedure to install the utility software on an HP-UX host.

Prerequisites

Before installing the utility software, ensure that the following conditions are met:

- This is the HP 9000-series server that you have identified as the storage management station.
- This machine meets the minimum hardware and software requirements described in “Appendix A. HP-UX system requirements” on page 69.
- The SM7util software is not installed and you are ready to install it on this machine.

Procedure

In the following procedure, the installation CD is mounted at /cdrom. Adjust these instructions as necessary for your specific installation location.

1. Insert the HP-UX installation CD in the CD-ROM drive.
2. Start the installation process:

```
# swinstall -s /cdrom/HP-UX/SM7util-HP-07104502
```

The Software Selection window opens and displays the following message:

```
SM7util
```

3. Select **SM7util**.
4. From the toolbar, click **Actions** → **Install (Analysis)**.
5. Click **OK** when the analysis is finished.
6. In the Confirmation window, click **Yes** to start the installation.
7. When the installation is finished, click **Done** in the Install window and close the application.

Note: You must exit the **swinstall** command before running the **swverify** command.

8. Verify that the installation was successful:

```
# swverify -v SM7util
```

If no failure is reported, continue with step 9. If a failure is reported, follow the instructions in the /var/adm/sw/swutil.log file.

9. Remove the installation CD from the CD-ROM drive.

You have finished the SM7util software installation procedure on this HP-UX host.

Installing the agent software on HP-UX hosts

Complete the following procedure to install the agent software on each attached HP-UX host or server.

Prerequisites

Before installing the host-agent software, ensure that the SM7util software has been installed on this host, and that you are ready to install the SM7agent software.

Procedure

In this procedure, the installation CD is mounted at /cdrom. Adjust these instructions as required for your specific installation.

1. Insert the HP-UX installation CD in the CD-ROM drive.

2. Start the installation process:

```
# swinstall -s /cdrom/HP-UX/SM7agent-HP-07104502
```

The Software Selection window opens and displays the following message:

```
SM7agent  
JRE
```

3. Select **SM7agent**. The Java runtime environment (JRE) is automatically installed when you install SM7agent.
4. From the toolbar, click **Actions** → **Install (Analysis)**.
5. When the analysis is finished, click **OK**.
6. In the Confirmation window, click **Yes** to start the installation.
7. When the installation is finished, click **Done** in the Install window and close the application.

Note: You must exit the **swinstall** command before running the **swverify** command.

8. Verify that the installation was successful:

```
# swverify -v SM7agent
```

If no failure is reported, continue with step 9. If a failure is reported, follow the instructions in the `/var/adm/sw/swagent.log` file.

9. Remove the installation CD from the CD-ROM drive.

You have finished the SM7agent software installation procedure on this HP-UX host.

Installing host software on Solaris hosts

All Solaris hosts in your storage subsystem must have the following host software packages installed on them:

- RDAC
- SM7agent
- SM7util

This section contains the procedure for installing the software.

Prerequisites

Before installing the host software, ensure that the following conditions are met:

- This is the Sun SPARCstation workstation that you have identified as the storage management station.
- This machine meets the minimum hardware and software requirements described in “Appendix B. Solaris system requirements” on page 71.
- The SM7util and SM7agent software packages are not installed and you are ready to install them on this machine.

Note: If you plan to run Storage Manager 7.10 in an environment that includes storage arrays that you are not upgrading to 7.10, you must upgrade your existing storage manager to at least version 6.22. The Storage Manager 7.10

RDAC package replaces the version 6.22 RDAC files and is shared by version 6.22 and version 7.10 of the storage management software.

See the Storage Manager 6.x installation instructions for information about uninstalling the software.

Procedure

In the following procedure, the installation CD is mounted at /cdrom/sm710. Adjust these instructions as required for your specific installation location.

1. Insert the Solaris installation CD in the CD-ROM drive.
2. Type the following command to start installing the RDAC package:

```
# pkgadd -d /cdrom/sm710/SUN_Sparc/SM7rdac-Sparc-07100501.pkg
```

The installation process begins.

Information about packages that can be installed in the specified directory is displayed on the command line. The following is an example of what you might see displayed.

```
The following packages are available:

1 RDAC                               Redundant Disk Array Controller
                                   (sparc) <version number>

Select package(s) you wish to process (or 'all' to process all
packages). (default:all) [?,??,q]:
```

3. Type the value of the package you are installing and press Enter. The installation process begins.
4. The software automatically checks for package conflicts. If any conflicts are detected, a message is displayed indicating that some files are already installed and are in use by another package.

The following prompt is displayed:

```
Do you want to install these conflicting files [y, n, ?]
```

Type y and press Enter.

5. The following prompt is displayed:

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

Do you want to continue with the installation of <RDAC>

[y, n, ?]
```

Type y and press Enter.

The installation process continues.

6. When the RDAC package has been successfully installed, the following message is displayed:

```
Installation of <RDAC> was successful.
```

Note: Ensure that the *def_hba_binding* variable is set to the correct value in the following configuration files:

- If FCI-1063 cards are installed, set the *def_hba_binding* variable to *def_hba_binding="fca-pci"* in the */kernel/drv/fca-pci.conf* file.
- If FC64-1063 cards are installed, set the *def_hba_binding* variable to *def_hba_binding="fcaw"* in the */kernel/drv/fcaw.conf* file.

7. Type the following command to start installing the SM7agent package:

```
# pkgadd -d /cdrom/sm710/SUN_Sparc/SM7agent-Sparc-07100502.pkg
```

The installation process begins.

Information about packages that can be installed in the specified directory is displayed on the command line. The following is an example of what you might see displayed.

```
The following packages are available:
1 SM7agent                FAST500 Storage Manager 7 Agent
                           (sparc) <version number>

Select package(s) you wish to process (or 'all' to process all
packages). (default:all) [?,??,q]:
```

8. Type the value of the package you are installing and press Enter.

The installation process begins.

9. The software automatically checks for package conflicts. If any conflicts are detected, a message is displayed indicating that some files are already installed and are in use by another package.

The following prompt is displayed:

```
Do you want to install these conflicting files [y, n, ?]
```

Type y and press Enter.

10. The following prompt is displayed:

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

Do you want to continue with the installation of <SM7agent>

[y, n, ?]
```

Type y and press Enter.

The installation process continues.

11. When the SM7agent package has been successfully installed, the following message is displayed:

The IBM FAST500 Storage Manager 7 has been started and will be started after every system reboot.

Installation of <SM7agent> was successful.

12. Type the following command to start installing the SM7util package:

```
# pkgadd -d /cdrom/sm710/SUN_Sparc/SM7util-07100502.pkg
```

The installation process begins.

Information about packages that can be installed in the specified directory is displayed on the command line. The following is an example of what you might see displayed.

The following packages are available:

```
1 SM7util          FAST500 Storage Manager 7 Utility
                   (sparc) <version number>
```

Select package(s) you wish to process (or 'all' to process all packages). (default:all) [?,??,q]:

13. Type the value of the package you are installing and press Enter.

The installation process begins.

14. The software automatically checks for package conflicts. If any conflicts are detected, a message is displayed indicating that some files are already installed and are in use by another package.

The following prompt is displayed:

```
Do you want to install these conflicting files [y, n, ?]
```

Type y and press Enter.

15. The following prompt is displayed:

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

Do you want to continue with the installation of <SM7util>

[y, n, ?]

Type y and press Enter.

The installation process continues.

16. When the SM7util package has been successfully installed, the following message is displayed:

```
Installation of <SM7util> was successful.
```

17. Move to the root directory:

```
# cd /
```

18. Stop the system:

```
# halt
```

19. Restart the system:

```
# boot -r
```

20. Remove the installation CD from the CD-ROM drive.

You have finished installing the Storage Manager 7.10 software on this Solaris host.

Chapter 4. Specific information for AIX operating systems

This chapter provides the following specific information for AIX operating systems:

- Hardware requirements
- Firmware requirements
- Software requirements
- AIX restrictions
- AIX configuration information

Hardware requirements

Table 3 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 3. Supported versions of hardware

Product Name	Model	Product release and firmware version
IBM FAST500 RAID Controller Enclosure Unit	3552-1RU	Firmware 04.01.02.21, NVSRAM NV3552R710NT008
IBM FAST500 EXP500 Storage Expansion Unit	3560-1RU	ESM 9163, ESM 9165
IBM HA Emulex LP7000	FC 6227	3.22A0, 3.22A1
IBM HA Emulex LP9000	FC 6228	3.82A1
Brocade switch	FC 2109	2.4.1.e
McData switch	IBM 2031-16	01.02.02
McData switch	IBM 2032-001	03.02
McData switch	IBM 2032-064	01.02.02
INRANGE switch	IBM 2042	2.0.2, 3.0.0

Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware, NVSRAM, disk drive firmware, and host adapter device drivers:

www.storage.ibm.com/fast500/supserver.htm

Firmware and NVSRAM requirements

Storage Manager 7.10 is supported with AIX on controller machine type 3552, firmware version 04.01.02.21, and NVSRAM version NV3552R710NT008.

Verify that the correct version of disk drive firmware is installed on the FAST500 drives by going to the following Web site:

www.storage.ibm.com/fast500/supserver.htm

Software requirements

- AIX Version 4.3.3
- IBM RDAC driver: devices.fcp.disk.array.rte, Version 4.3.3.77 or later

- Other required PTF filesets that are listed in “RDAC installation requirements” and “SM7client for AIX requirements”

RDAC installation requirements

The following PTF filesets must be at the specified versions or later.

Fileset	Version
devices.fcp.disk.array.diag	4.3.3.50
devices.fcp.disk.array.rte	4.3.3.75*
devices.fcp.disk.rte	4.3.3.75
devices.common.IBM.fc.rte	4.3.3.75
devices.pci.df1000f7.com	4.3.3.76
devices.pci.df1000f7.rte	4.3.3.75
devices.scsi.sarray.rte	4.3.3.50
* The RDAC driver Version 4.3.3.77 requires the presence of Version 4.3.3.75.	

SM7client for AIX requirements

The following PTF filesets must be at the specified versions or later.

Fileset	Version
X11.adt.lib	4.3.3.10
bos.adt.include	4.3.3.75

AIX driver files can be obtained from the following Web site:

techsupport.services.ibm.com/server/fixes/

AIX restrictions

Note the following restrictions:

- F-RAID Manager is not supported.
- The FAStT500 is supported in a switched environment only. See “Setting up IP addresses for FAStT500 storage controllers” on page 9 for more configuration information.
- From 1 - 10 EXP500 storage expansion units are supported (up to 100 disk drives).
- Disable AVT/ADT using the script supplied on the Storage Manager 7.10 installation CD and following the instructions in step 8 on page 14 in “Performing the initial configuration of storage subsystems on AIX hosts”. AVT/ADT must be disabled for path redundancy to be effective.
- Concurrent NVSRAM upgrades are not supported. You must stop all I/O to the controllers before you upgrade NVSRAM.
- Delete access volumes (also known as UTM LUNs), following the instructions in step 9 on page 14 “Performing the initial configuration of storage subsystems on AIX hosts”. Access volumes are not supported in this release; failure to delete them can cause system errors.
- Up to four mini-hubs are supported on both the host and drive side of the RAID Controller.

This example shows the attribute settings for dac0:

```
# lsattr -El dac0
passive_control no           Passive controller      False
alt_held_reset no          Alternate held in reset False
controller_SN 1T04611221      Controller serial number False
ctrl_type 3552             Controller Type         False
cache_size 512             Cache Size in MBytes   False
scsi_id 0x210013           SCSI ID                 False
lun_id 0x0                 Logical Unit Number     False
utm_lun_id none            Logical Unit Number     False
location                               Location Label          True
ww_name 0x200800a0b80c1948 World Wide Name         False
GLM_type low                GLM type                False
```

This example shows the attribute settings for a LUN on the array (hdisk4):

```
# lsattr -El hdisk4
pvid none                    Physical volume identifier False
q_type simple                Queuing Type            False
queue_depth 30              Queue Depth             True
reserve_lock yes            RESERVE device on open True
write_cache yes             Write Caching enabled   True
size 69270                  Size in Mbytes          False
raid_level 5                RAID Level              False
rw_timeout 30               Read/Write Timeout value True
reassign_to 120             Reassign Timeout value True
scsi_id 0x210013           SCSI ID                 False
lun_id 0x0000000000000000 Logical Unit Number     False
cache_method fast_write     Write Caching method    True
prefetch_mult 0            Multiple of blocks to prefetch on read True
ieee_volname 600A0B8000C1A70000000013B45FEA8 IEEE Unique volume name False
```

Required attribute settings

This section lists the required attribute settings for dar and hdisk devices and shows how to set them using the **chdev -l** command. To make the attribute changes permanent in the Customized Devices object class, use the **-P** option.

Attribute settings for dar devices: For multi-initiator configurations, the *autorecovery* attribute must be set to **no**.

```
# chdev -l dar0 -a autorecovery=no
```

On single host systems, the *load_balancing* attribute can be set to **yes** to enhance performance.

```
# chdev -l dar0 -a load_balancing=yes
```

Note: On multihost systems, the *load_balancing* attribute must be set to **no**.

Attribute settings for hdisk devices: Setting the *queue_depth* attribute to the appropriate value is important for system performance. For large, multihost configurations, always set the attribute to less than 10.

Use the following formula to determine the maximum queue depth for your system:

$$512 / (\text{number-of-hosts} * \text{LUNs-per-host})$$

For example, a system with four hosts, each with 32 LUNs (the maximum number of LUNs per AIX host), would have a maximum queue depth of 4:

$$512 / (4 * 32) = 4$$

In this case, you would set the *queue_depth* attribute for *hdiskX* as follows:

```
# chdev -l hdiskX -a queue_depth=4 -P
```

Attention: If you do not set the queue depth to the proper level, you might experience loss of filesystems and system panics.

The *write_cache* attribute does not control whether or not write caching is on; the FAST500 controllers do. By default, write caching is on for the FAST500 controllers.

Definitions of attribute settings

The following tables provide information about the attributes of the following device types:

- dar
- dac
- LUN

Table 4. Attributes for dar devices

Attribute	Definition
<i>act_controller</i>	List of controllers in the active state at the time of configuration
<i>all_controller</i>	List of controllers that comprise this array; usually there are two dac devices
<i>held_in_reset</i>	Name of the controller that was in the held-in-reset state at the time of configuration, or none if no controllers were in that state
<i>load_balancing</i>	Indicator that shows whether load balancing is enabled (yes) or disabled (no); see the definition of the <i>balance_freq</i> attribute for more information
<i>autorecovery</i>	Indicator that shows whether the device will return the array to dual-active mode when it detects proper operation of both paths and controllers (yes) or not (no)
<i>lun_bitmap</i>	Bitmap that shows which controller own which LUN at the time of configuration
<i>hlthchk_freq</i>	Number that specifies how often health checks are performed, in seconds
<i>aen_freq</i>	Number that specifies how often polled AEN checks are performed, in seconds

Table 4. Attributes for dar devices (continued)

Attribute	Definition
<i>balance_freq</i>	If <i>load_balancing</i> is enabled, number that specifies how often the system performs load-balancing on the array, in seconds
<i>fast_write_ok</i>	Indicator that shows whether fast-write write-caching is available for this system (yes) or not (no)
<i>cache_size</i>	Cache size for both controllers, in megabytes; 0 if the sizes do not match

Table 5. Attributes for dac devices

Attribute	Definition
<i>passive_control</i>	Indicator that shows whether this controller was in passive state at the time of configuration (yes) or not (no)
<i>alt_held_reset</i>	Indicator that shows whether the alternate controller was in the held-in-reset state at the time of configuration (yes) or not (no)
<i>controller_SN</i>	Serial number of this controller
<i>ctrl_type</i>	Type of array this controller belongs to; a value of 3552 indicates FASt500
<i>cache_size</i>	Cache size of this controller, in megabytes
<i>scsi_id</i>	SCSI identifier of this controller
<i>lun_id</i>	Logical Unit Number of this controller
<i>utm_lun_id</i>	Logical Unit Number of this controller, or none if UTM (access volumes) is not enabled
<i>location</i>	User-defined location label for this controller; the system does not use this value
<i>ww_name</i>	FC worldwide name of this controller
<i>GLM_type</i>	GLM type used for this controller

Table 6. Attributes for LUN devices

Attribute	Definition
<i>pvid</i>	AIX physical volume identifier, or none if not set
<i>q_type</i>	Queueing type for this device; must be set to simple
<i>queue_depth</i>	Number that specifies the depth of the queue based on system configuration; reduce this number if the array is returning a BUSY status on a consistent basis
<i>reserve_lock</i>	Indicator that shows whether the fcpararray will issue a SCSI Remove command every time a device is opened or when a Test Unit Ready sequence is issued by the driver (yes) or not (no)

Table 6. Attributes for LUN devices (continued)

Attribute	Definition
<i>write_cache</i>	Indicator that shows whether write-caching is enabled on this device (yes) or not (no); see the definition of the <i>cache_method</i> attribute for more information
<i>size</i>	Size of this LUN
<i>raid_level</i>	Number that specifies the RAID level of this device
<i>rw_timeout</i>	Number that specifies the read/write timeout value for each read/write command to this array, in seconds; usually set to 30
<i>reassign_to</i>	Number that specifies the timeout value for FC reassign operations, in seconds; usually set to 120
<i>scsi_id</i>	SCSI identifier at the time of configuration
<i>lun_id</i>	Logical Unit Number of this device
<i>cache_method</i>	If <i>write_cache</i> is enabled, the write-caching method of this array; set to one of the following: <ul style="list-style-type: none"> • default. Default mode; the word "default" is not seen if <i>write_cache</i> is set to yes • fast_write. Fast-write (battery-backed, mirrored write-cache) mode • fw_unavail. Fast-write mode was specified but could not be enabled; write-caching is not in use • fast_load. Fast-load (non-battery-backed, non-mirrored write-cache) mode • fl_unavail. Fast-load mode was specified but could not be enabled
<i>prefetch_mult</i>	Number of blocks to be prefetched into read cache for each block read
<i>ieee_volname</i>	IEEE unique volume name identifier for this LUN

Initial device identification

After the FAST500 disk subsystem has been set up, volumes have been assigned to the host, and the RDAC driver has been installed, use the following command to probe for the new devices:

```
# cfgmgr -v
```

Next, use the **lsdev -Cc disk** command to see if the device driver recognizes each FAST500 LUN as a "3552 Disk Array Device." For example:

```
# lsdev -Cc disk
hdisk0 Available 10-88-00-8,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 20-58-01 3552 Disk Array Device
hdisk2 Available 20-58-01 3552 Disk Array Device
hdisk3 Available 20-58-01 3552 Disk Array Device
hdisk4 Available 20-58-01 3552 Disk Array Device
```

Identifying the controller ID numbers

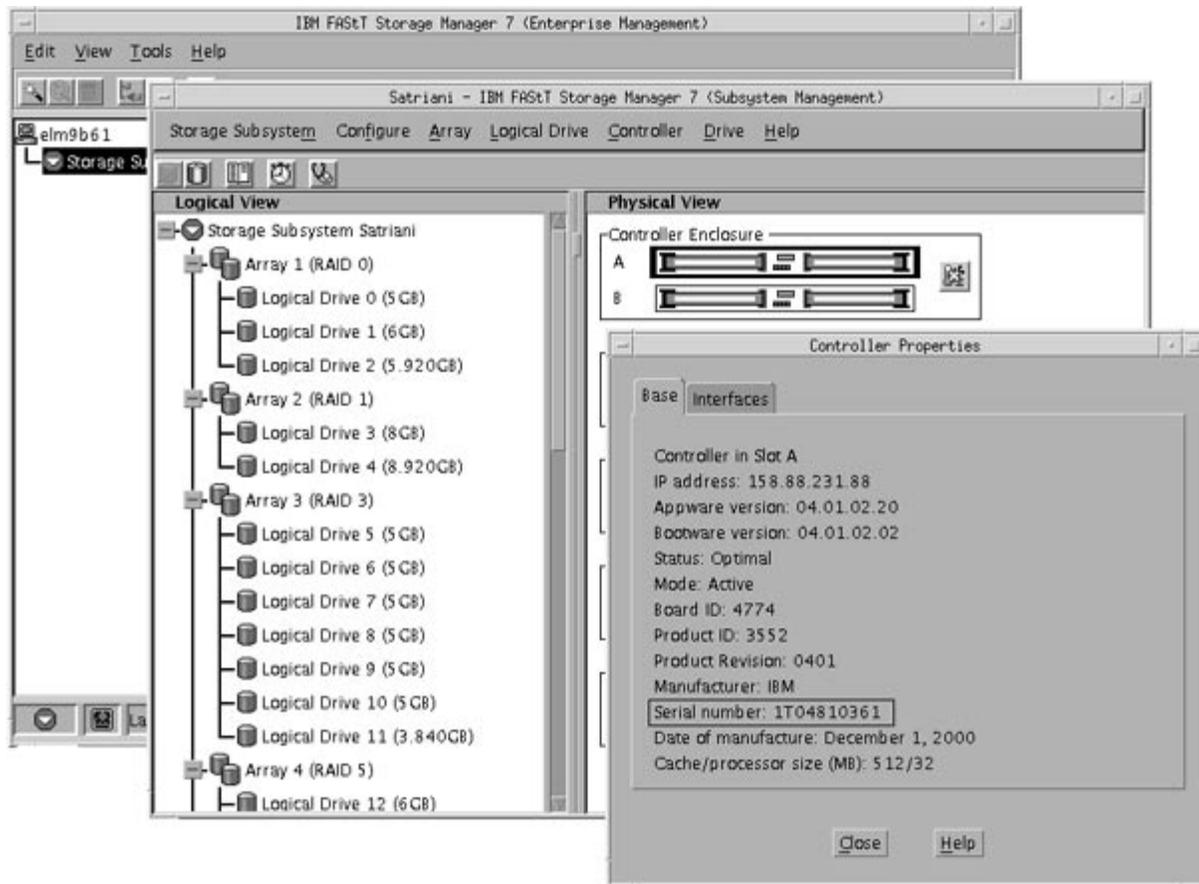
One of the attributes listed by the **lsattr -EI** command is the controller serial number (*controller_SN*) of that dac.

To display the FASTT500 Controller Properties window:

1. In the Physical View of the Subsystem Management window, select a controller.
2. Right-click **Controller** → **Properties**.

Figure 4 on page 39 shows the Controller Properties window of the controller in slot A. This controller has a serial number of 1T04810361 and is represented by dac1.

```
# lsattr -EI dac1
passive_control no Passive controller False
alt_held_reset no Alternate held in reset False
controller_SN 1T04810361 Controller serial number False
ctrl_type 3552 Controller Type False
cache_size 512 Cache Size in MBytes False
scsi_id 0x210513 SCSI ID False
lun_id 0x0 Logical Unit Number False
utm_lun_id none Logical Unit Number False
location Location Label True
ww_name 0x201200a0b807b856 World Wide Name False
GLM_type low GLM type False
```



FL00003

Figure 4. Controller Properties window

Identifying device names and bus numbers

After the operating system device names are found, those names must be correlated to the primary and secondary paths of the device, and then from each path to its associated logical drive.

Use the **lsdev**, **fget_config**, and **lsattr** commands to get information about device names and bus numbers.

Using the **lsdev** command

This section shows how to use the **lsdev** command to get information about disk array routers (dars), disk array controllers (dacs), and hdisks.

The following example uses the **lsdev** command to show the status of the dar, which represents the entire FASTT500 array. "darX" keeps track of the status of each dacX, and of the current and preferred paths to each hdisk.

```
# lsdev -C |grep dar
dar0      Available          3552 Disk Array Router
```

In this example, the **lsdev** command shows the two dacs that represent the disk array controllers. The third column is the location code column. Two distinct paths are represented by the "91-08-01" and 11-08-01" values. Each AIX system has its own set of location codes that describe the internal path of that device, including bus and host-adaptor locations. See the service manual for your system type to identify device locations.

```
# lsdev -C |grep dac
dac0      Available 91-08-01      3552 Disk Array Controller
dac1      Available 11-08-01      3552 Disk Array Controller
```

In this example, the **lsdev** command shows that there are eight disks (LUNs) of type 3552 (FASSt500) recognized by this AIX host system. The third column shows the location code of each device. Notice that there are four disks per path, or four disks per dac (controller).

```
# lsdev -Cc disk
hdisk0 Available 40-60-00-4,0 16 Bit LVD SCSI Disk Drive
hdisk1 Available 91-08-01      3552 Disk Array Device
hdisk2 Available 91-08-01      3552 Disk Array Device
hdisk3 Available 91-08-01      3552 Disk Array Device
hdisk4 Available 11-08-01      3552 Disk Array Device
hdisk5 Available 11-08-01      3552 Disk Array Device
hdisk6 Available 11-08-01      3552 Disk Array Device
hdisk7 Available 11-08-01      3552 Disk Array Device
hdisk8 Available 91-08-01      3552 Disk Array Device
```

Using the **fget_config** command

The **fget_config** command displays the current owner of each hdisk. The following example shows that it is a quick way to determine which LUN (hdisk) is actively owned by a controller.

```
# fget_config -l dar0
dac0 ACTIVE dac1 ACTIVE
dac0-hdisk1
dac0-hdisk2
dac0-hdisk3
dac1-hdisk4
dac1-hdisk5
dac1-hdisk6
dac1-hdisk7
dac0-hdisk8
```

Using the **lsattr** command

You can also use the **lsattr** command to find out which controller owns a particular hdisk. The following example shows portions of the outputs from several **lsattr** commands.

```

# lsattr -El dac0
passive_control no                Passive controller      False
alt_held_reset no                Alternate held in reset False
controller_SN 1T01710113         Controller serial number False
ctrl_type 3552                  Controller Type         False
cache_size 512                  Cache Size in MBytes   False
scsi_id 0x11100                 SCSI ID                 False
lun_id 0x0                      Logical Unit Number     False

# lsattr -El dac1
passive_control no                Passive controller      False
alt_held_reset no                Alternate held in reset False
controller_SN 1T03910039         Controller serial number False
ctrl_type 3552                  Controller Type         False
cache_size 512                  Cache Size in MBytes   False
scsi_id 0x11000                 SCSI ID                 False
lun_id 0x0                      Logical Unit Number     False

# lsattr -El hdisk1
----- Parts removed:
scsi_id 0x11100                 SCSI ID                 False
lun_id 0x0000000000000000       Logical Unit Number     False
cache_method fast_write         Write Caching method   True

```

In the example, hdisk1 belongs to the controller represented by dac0. The hdisk has the same SCSI ID as the controller (dac) that owns it.

Identifying logical drives by operating system device names

The **lsattr** command provides detailed information about a LUN, including information that allows you to map the system device name to the logical volume on the FASiT500 disk subsystem.

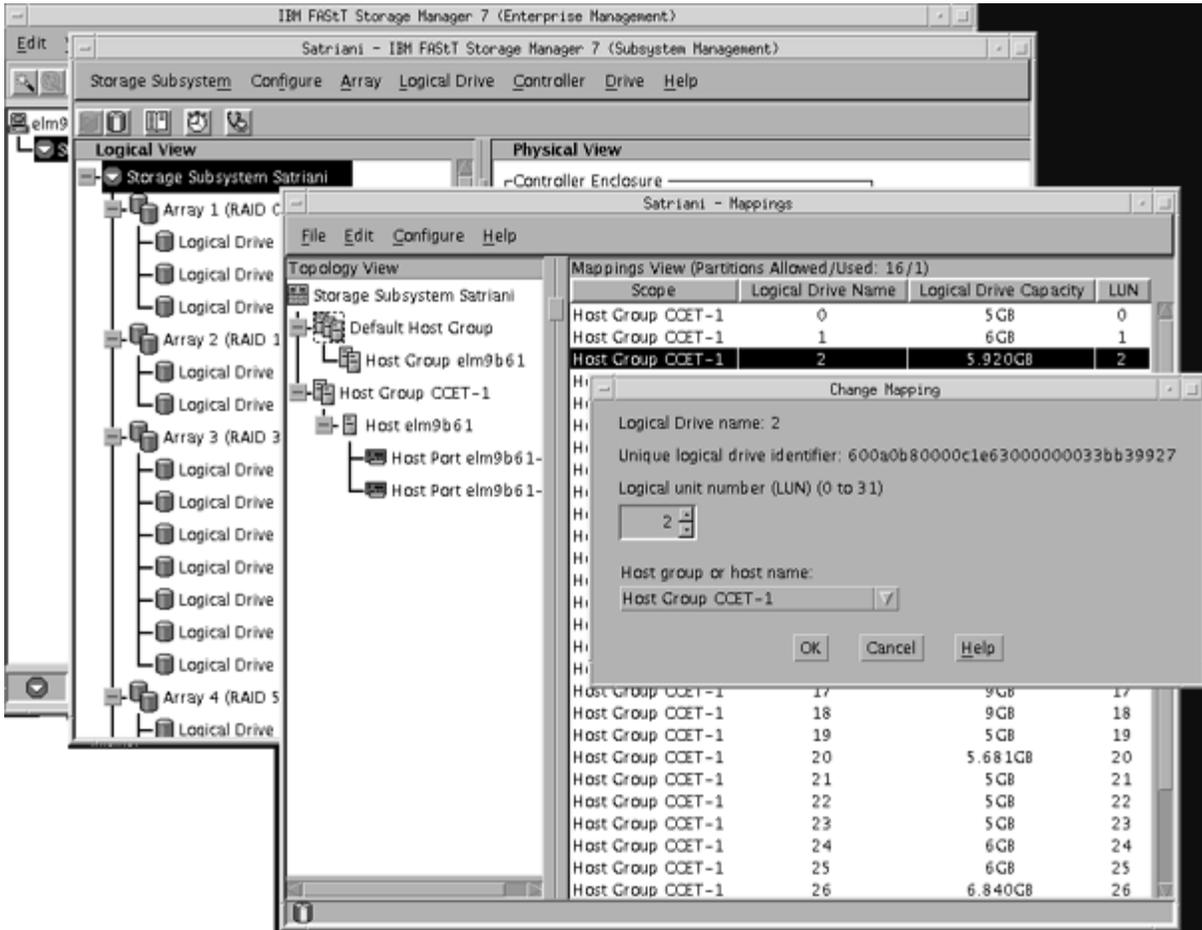
For example, if you use the **lsattr** command on the LUN named hdisk4, it provides the following information: it is a 6 GB LUN of type RAID, with a LUN ID of 2, and an IEEE volume name of 600A0B80000C1E63000000033BB39927 (see the following example). You can make a quick identification by locating the LUN ID on the far right side of the Mappings window (open the Mappings window by clicking **Subsystem Management** → **Configure** → **View Logical Drive-to-LUN Mappings**).

```

# lsattr -El hdisk4
pvid none                        Physical volume identifier False
q_type simple                    Queuing Type            False
queue_depth 30                  Queue Depth              True
reserve_lock yes                RESERVE device on open  True
write_cache yes                 Write Caching enabled   True
size 6062                       Size in Mbytes          False
raid_level 0                    RAID Level               False
rw_timeout 30                   Read/Write Timeout value True
reassign_to 120                 Reassign Timeout value  True
scsi_id 0x11000                 SCSI ID                  False
lun_id 0x0002000000000000       Logical Unit Number     False
cache_method fast_write         Write Caching method   True
prefetch_mult 0                 Multiple of blocks to prefetch on read True
ieee_volname 600A0B80000661F80000005E3B2F6618 IEEE Unique volume name False

```

You can make a more exact correlation using the distinctive *ieee_volname* attribute. The value of this attribute on the AIX host is the same as the Unique Logical Drive Identifier on the FASTT500 disk subsystem. The **ieee_volname** and Unique Logical Drive Identifier can be found in the Change Mappings window, which is shown in Figure 5. (Open the Change Mappings window from the View Logical Drive-to-LUN Mappings window by right-clicking **Logical Drive Name**—> **Change Mappings**.)



FL00006

Figure 5. Change Mapping window

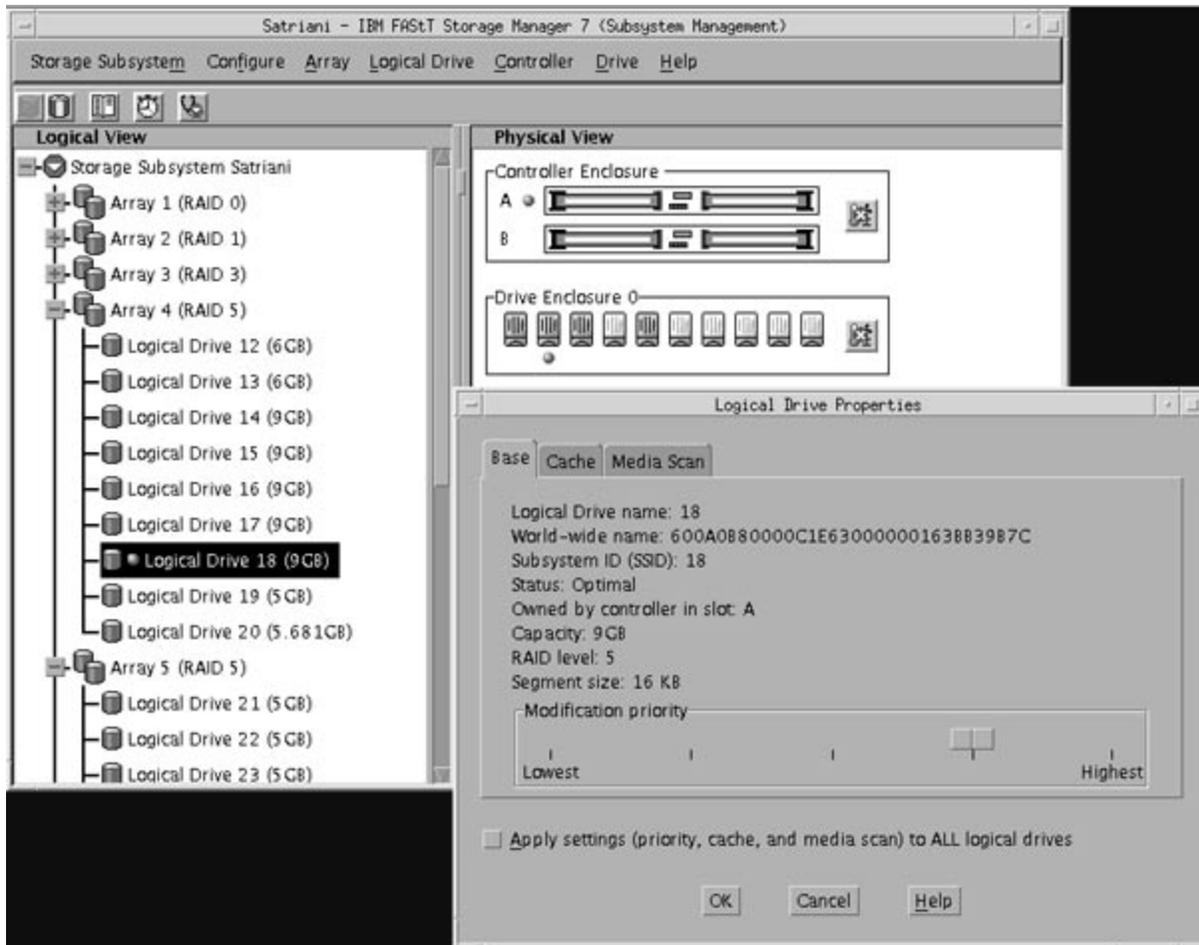
Another way to identify the system disk name based on the logical volume name is by using the Logical Drive Property window. Open this window by clicking the **Storage Management** window and right-clicking **Logical Drive Name**—> **Properties**. Look for the **World-wide name**, **Capacity**, and **RAID level** properties, as shown in Figure 6 on page 43.

The following example shows a portion of the output of the **lsattr** command for **hdisk20**. Notice that the *ieee_volname* and *lun_id* attributes have the same values as the **World-wide name** and **Subsystem ID (SSID)** properties shown in Figure 6 on page 43, respectively.

```

# lsattr -El hdisk20
write_cache yes Write Caching enabled True
size 9216 Size in Mbytes False
raid_level 5 RAID Level False
scsi_id 0x210513 SCSI ID False
lun_id 0x0012000000000000 Logical Unit Number False
cache_method fast_write Write Caching method True
prefetch_mult 0 Multiple of blocks to prefetch on read True
ieee_volname 600A0B80000C1E63000000163BB39B7C IEEE Unique volume name False

```



FL00007

Figure 6. Volume Properties window

Redistributing LUNs in case of failure

If a failure occurs that initiates a controller failover, follow this procedure to redistribute logical drives to their preferred paths.

1. Repair or replace any faulty components.
2. Complete these steps to mark the failed controller active.
 - a. Go to the Subsystem Management window.
 - b. Right-click controller A or B and click **Change → Mode Active**.

3. Redistribute volumes to their preferred paths by clicking **Subsystem Management** → **Storage Subsystem** → **Redistribute Logical Drive**.
4. Use the **fget_config** command to verify the active paths, as shown in this example:

```
# fget_config -l dar0
dac0 ACTIVE dac1 ACTIVE
dac0-hdisk1
dac0-hdisk2
dac0-hdisk3
dac1-hdisk4
dac1-hdisk5
dac1-hdisk6
dac1-hdisk7
dac0-hdisk8
```

Chapter 5. Specific information for HP-UX operating systems

This chapter provides specific information for HP-UX operating systems.

Preparing for installation and system requirements

For system-level hardware and software requirements, see “Appendix A. HP-UX system requirements” on page 69.

Additional hardware requirements

Table 7 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 7. Supported versions of hardware

Product Name	Model	Product release and firmware version
IBM FAStT500 RAID Controller Enclosure Unit	3552-1RU	Firmware 04.01.02.21, NVSRAM NV3552R710NT008
IBM FAStT500 EXP500 Storage Expansion Unit	3560-1RU	ESM 9163, ESM 9165
HP FC Adapter	A5158A	B.11.00.06
Brocade switch	FC 2109	2.4.1.e
McData switch	IBM 2031-16	01.02.02
McData switch	IBM 2032-001	03.02
McData switch	IBM 2032-064	01.02.02
INRANGE switch	IBM 2042	2.0.2, 3.0.0

Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware, NVSRAM, disk drive firmware, and host adapter device drivers:

www.storage.ibm.com/fast500/supserver.htm

Identifying the primary and secondary paths to the storage subsystem logical drives

After the operating system device names are found, the names must be correlated to their primary and secondary paths to the logical drives.

After you create the volume groups and pvlincs, type the following command to view the arrays and their associated information:

```
# vgdisplay -v /dev/<vglabel>
```

where <vglabel> is the name of the HP array.

The identification information for the specified device is displayed by the `vgdisplay` utility. Figure 7 on page 46 shows the information that you need to record.

```

--- Logical volumes ---
LV Name                /dev/vg08/lvol1
LV Status              available/syncd
LV Size (Mbytes)      3008
Current LE            47
Allocated PE          47
Used PV                1

--- Physical volumes ---
PV Name              /dev/dsk/c4t2d0
PV Name              /dev/dsk/c5t3d0
PV Status              available
Total PE              63
Free PE               16

```

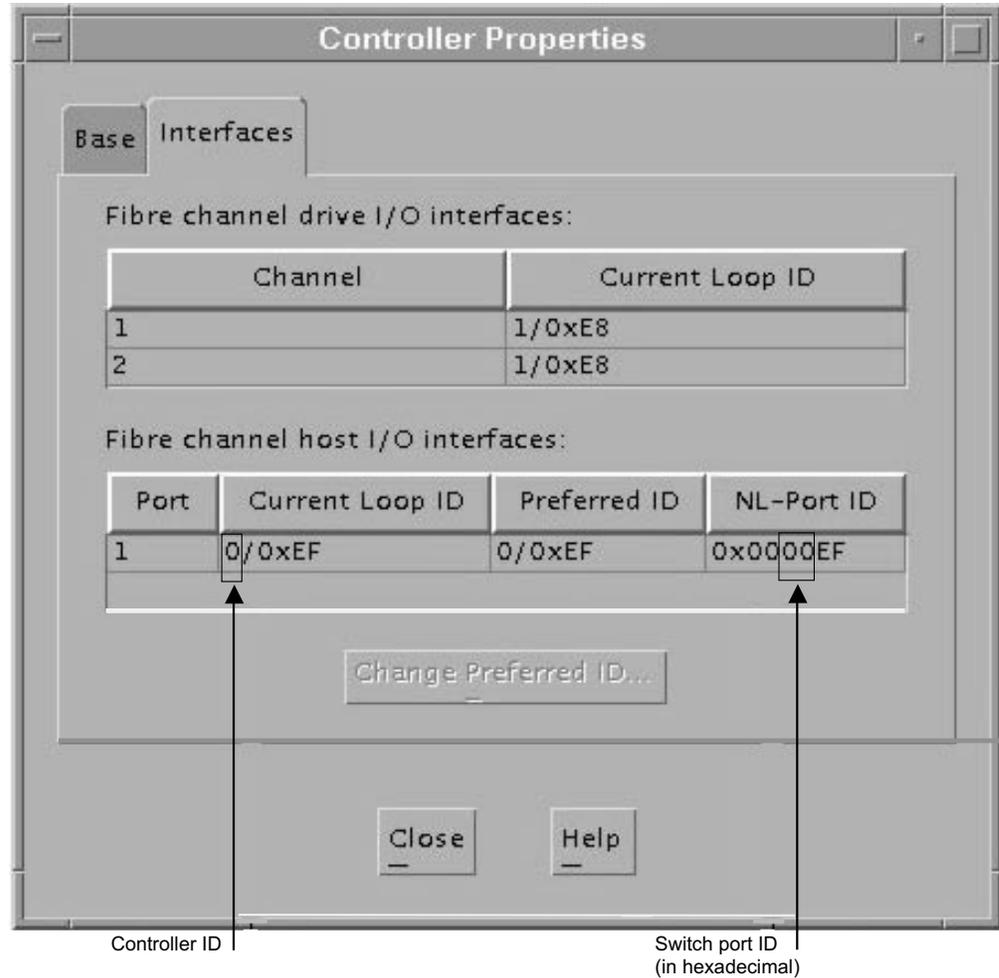
BT000096

Figure 7. Array path information

Identifying the controller ID numbers

Complete this procedure to identify the controller ID numbers:

1. Select a controller in the Physical View of the Subsystem Management window.
2. Click **Controller** → **Properties** → **Interfaces**. The Controller Properties window opens, as shown in Figure 8 on page 47.



BT000102

Figure 8. Controller Properties window

3. The first number in the **Current Loop ID** field is the controller ID, which can be one or two digits. For hubs and directly-connected subsystems, the controller ID number and the switch port ID can be found in the same window by converting the middle hexadecimal number to a decimal number.

Identifying device names and bus numbers

Use the **ioscan** command to determine the full device names of data logical drives in the storage subsystem. This information allows you to determine the host adapter external bus numbers and the IDs of the controllers that the host adapters are connected to.

1. View the operating system list of devices:

```
# ioscan -f
```

2. The identification information for every device is displayed. See Figure 9 on page 48.

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
bc	0		root	CLAIMED	BUS_NEXUS	
bc	1	8	ccio	CLAIMED	BUS_NEXUS	I/O Adapter
fc	0	8/12	fcT1	CLAIMED	INTERFACE	HP Fibre Channel
Storage Cntl				CLAIMED	INTERFACE	HP Fibre Channel
fc	0	8/12.8	fc		INTERFACE	FCP Protocol Adapter
ext_bus	2	8/12.8.0.2	fcpdev	CLAIMED	INTERFACE	FCP Device Interface
target	39	8/12.8.0.2.0.0	tgt	CLAIMED	DEVICE	DEVICE
disk	130	8/12.8.0.2.0.0.0	sdis	CLAIMED	DEVICE	IBM INF-01-00
disk	35	8/12.8.0.2.0.0.7	sdisk	CLAIMED	DEVICE	IBM Universal Xport
target	39	8/12.8.0.2.0.1	tgt	CLAIMED	DEVICE	DEVICE
disk	131	8/12.8.0.2.0.1.0	sdisk	CLAIMED	DEVICE	IBM INF-01-00

Annotations in the table:

- External bus number of the host adapter: points to the 'I' column value '2' in the 'ext_bus' row.
- Controller ID number: points to the 'I' column value '39' in the 'target' row.
- Target address: points to the 'H/W Path' value '8/12.8.0.2.0.0' in the 'target' row.
- LUN number: points to the 'H/W Path' value '8/12.8.0.2.0.0.0' in the 'disk' row.
- Switch port ID number: points to the 'I' column value '131' in the 'disk' row.

BT000097

Figure 9. Device identification information

- Examine the information. LUN numbers range from 0 - 7 and target addresses from 0 - 3.

Device names have the following format: c<x>t<y>d<z> where:

<x>

Represents the controller ID number

<y>

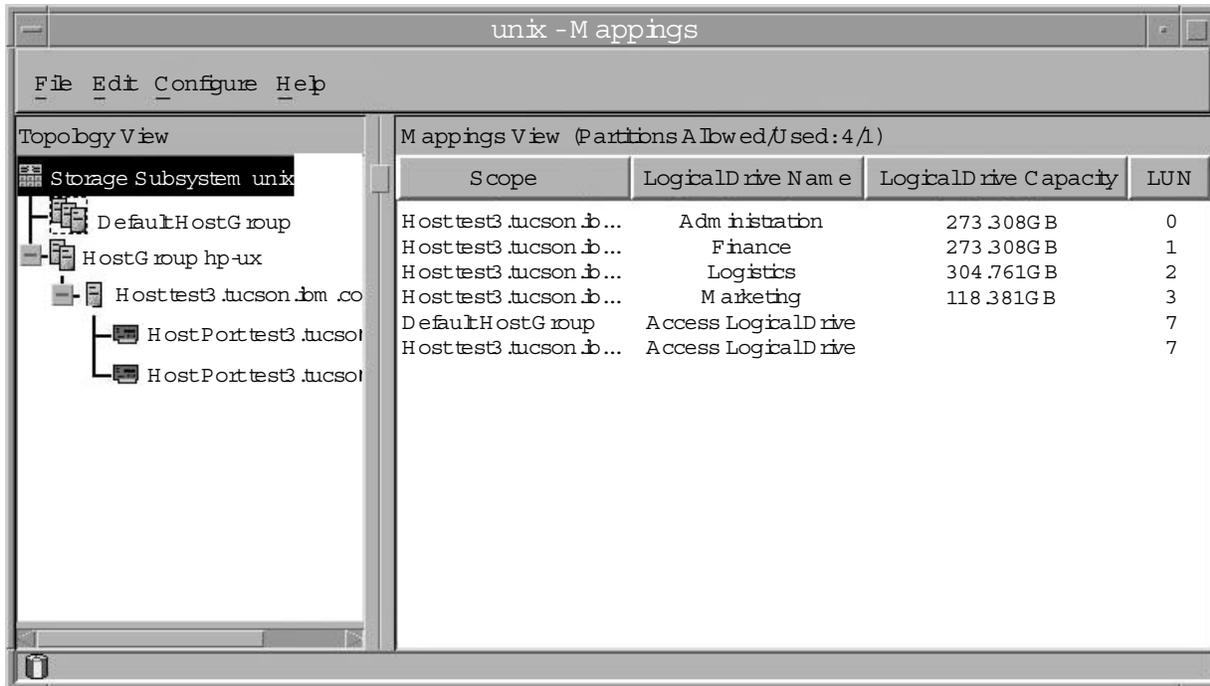
Represents the target address

<z>

Represents the LUN number

For example, disk 130 in Figure 9 has a device name of c2t0d0.

- Determine the entries for the logical drives using the controller ID and LUN numbers. Find the **ext_bus** row above the logical drive listing and note the bus number in the **I** column.
- For each storage subsystem, use the Mappings window (see Figure 10 on page 49). Click **Subsystem Management** → **Configure** → **View Logical Drive-to-LUN Mappings**.
 - Select the storage subsystem node in the Topology View to see a list of all logical drives in the Mappings View.
 - Use the LUN numbers in the Mappings View to associate the logical drives with their device names.



BT000103

Figure 10. Mappings window

Identifying logical drives by operating system device names and determining primary and alternative paths

Figure 11 on page 50 presents the view of the logical drives as seen through a host with two host-bus adapters, required for the access vector table. This view, as seen in SM7devices, shows each logical drive twice: once on its primary path and once on its alternate path.

Each logical drive is recognized by the operating system as one drive. The device name for a logical drive usually indicates the path to the specific logical drive.

If the logical drive ownership is transferred between controllers, the device name is updated.

There are four pieces of information that are required to identify the HP-UX device name and controller ID number for each logical drive in each storage subsystem:

- The LUN number that is used to access the logical drive
- The controller ID number (either a SCSI ID or the fibre-channel loop ID of the controller port that is associated with the host interface)
- The target address
- The external bus number of the host adapter that is connected to the controller

HP-UX device names are presented in the following format: c<x>t<y>d<z> where:

<x>

Represents the external bus number of the host adapter that is connected to the controller

<y>
Represents the target address

<z>
Represents the LUN number

See Figure 11 for examples of device names.

Notice the correlation between characters 12 - 16 in the worldwide name (WWN) of a logical drive and characters 12 - 16 in the WWN of the access logical drive. Where they match indicates the primary path.

The corresponding device name for the same LUN that is grouped under the other controller indicates the alternate path.

When building arrays on the host, the array must be created using the primary path and then extended with the alternate path. Running the **vgdisplay -v** command shows the primary and alternative paths (after configuration).

```
IBM FAST500 Storage Manager 7 Devices, Version 07.10.G5.00
Built Thu Feb 22 15:07:38 CST 2001
Copyright (C) IBM Corp 2001. All rights reserved.

/dev/rdisk/c13t0d0 [Storage Subsystem unix, Logical Drive Administration, LUN 0,
Logical Drive WWN <600a0b80000b11f6000000b43ad43902>]
/dev/rdisk/c6t0d0 [Storage Subsystem unix, Logical Drive Administration, LUN 0,
Logical Drive WWN <600a0b80000b11f6000000b43ad43902>]
/dev/rdisk/c6t0d7 [Storage Subsystem unix, Logical Drive Access volume, LUN 7,
Logical Drive WWN <600a0b80000b11f6000000b700000000>]
/dev/rdisk/c6t0d1 [Storage Subsystem unix, Logical Drive Finance, LUN 1,
Logical Drive WWN <600a0b8000075720000000703ad43904>]
/dev/rdisk/c6t0d2 [Storage Subsystem unix, Logical Drive Logistics, LUN 2,
Logical Drive WWN <600a0b80000b11f6000000b63ad43970>]
/dev/rdisk/c6t0d3 [Storage Subsystem unix, Logical Drive Marketing, LUN 3,
Logical Drive WWN <600a0b8000075720000000723ad43969>]
/dev/rdisk/c13t0d1 [Storage Subsystem unix, Logical Drive Finance, LUN 1,
Logical Drive WWN <600a0b8000075720000000703ad43904>]
/dev/rdisk/c13t0d2 [Storage Subsystem unix, Logical Drive Logistics, LUN 2,
Logical Drive WWN <600a0b80000b11f6000000b63ad43970>]
/dev/rdisk/c13t0d3 [Storage Subsystem unix, Logical Drive Marketing, LUN 3,
Logical Drive WWN <600a0b8000075720000000723ad43969>]
/dev/rdisk/c13t0d7 [Storage Subsystem unix, Logical Drive Access volume, LUN 7,
Logical Drive WWN <600a0b80000757200000007300000000>]
```

Figure 11. Device names

Note: Using the HP System Administrator Manager (SAM) is not recommended for configuring the volume groups.

Chapter 6. Specific information for Solaris operating systems

This chapter provides specific information for Solaris operating systems.

Preparing for installation and system requirements

For system-level hardware and software requirements, see “Appendix B. Solaris system requirements” on page 71.

Note: Do not install SM7client and SM7agent on servers running Solaris version 2.6, 7, or 8; they are not supported on those operating systems. Instead, use a different operating-system host type, such as Windows, to manage the storage subsystem.

Additional hardware requirements

Table 8 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 8. Supported versions of hardware

Product Name	Model	Product release and firmware version
IBM FASt500 RAID Controller Enclosure Unit	3552-1RU	Firmware 04.01.02.21, NVSRAM NV3552R710NT008
IBM FASt500 EXP500 Storage Expansion Unit	3560-1RU	ESM 9163, ESM 9165
JNI FC Adapter	FCI-1063	HBA driver fca-pci.2.5.pkg BIOS 13.3.7
JNI FC Adapter	FC64-1063	HBA driver fcaw2.5.pkg BIOS 13.3.7
Brocade switch	FC 2109	2.4.1.e
McData switch	IBM 2031-16	01.02.02
McData switch	IBM 2032-001	03.02
McData switch	IBM 2032-064	01.02.02
INRANGE switch	IBM 2042	2.0.2, 3.0.0

Read the README file that is shipped with the product and go to the following Web site to ensure that you have the latest versions of the firmware, NVSRAM, disk drive firmware, and host adapter device drivers:

www.storage.ibm.com/fast500/supserver.htm

Uninstalling Storage Manager 7.10 software

When you uninstall SM7client, RDAC, SM7agent, or SM7util software, the directory `/var/opt/SM7` might not be removed. Delete this directory to ensure a clean installation of the new software.

- If the card is going through the switch, set the `n_port` variable to 1; if it is directly attached, set `n_port` to 0.

If FC64-1063 cards are installed

Modify the `/kernel/drv/fcaw.conf` file:

- Uncomment the failover variable and set it to 30.
- If the card is going through the switch, set the `n_port` variable to 1; if it is directly attached, set `n_port` to 0.

Importance of setting the host type on Solaris

After you install the Storage Manager 7.10 software, you must set the host type to Solaris for the operating system to work properly with the storage subsystem. This should have been done automatically, but you should verify that it occurred.

Select one of the following options:

If partitioning is not enabled

In the Subsystem Management window, click **Configure** → **Change Storage Subsystem Host Type** and ensure that the host type is set to Solaris (Sparc).

If partitioning is enabled

In the Subsystem Management window, click **Configure** → **View Logical Drive-To-LUN Mappings**.

In the Mappings window:

1. Create a new host group.
2. Add the host to the newly created host group.
3. Add each port to the host and ensure that the host type is set to Solaris (Sparc).

HBA binding settings for JNI cards

Ensure that the `def_hba_binding` variable is set to the correct value in the following configuration files:

- If FCI-1063 cards are installed, set the `def_hba_binding` variable to `def_hba_binding="fca-pci"` in the `/kernel/drv/fca-pci.conf` file.
- If FC64-1063 cards are installed, set the `def_hba_binding` variable to `def_hba_binding="fcaw"` in the `/kernel/drv/fcaw.conf` file.

Chapter 7. Completing the software installation

This chapter describes how to complete the installation of Storage Manager 7.10 by performing these tasks:

- Setting failover protection
- Changing the host type
- Understanding the implications of using heterogeneous hosts in your storage subsystem
- Configuring the storage subsystem
- Starting the Subsystem Management window
- Setting the IBM SAN Fibre Channel Switch 2109

Failover protection

Failover protection is available by using multipath drivers with or without AVT/ADT with Storage Manager 7.10. A multipath driver is an I/O path failover driver that is installed on host computers that access the storage subsystem. AVT/ADT is a built-in feature of the controller firmware that allows logical-drive-level failover rather than controller-level failover. The following failover settings are available:

- Multipath driver software on one or more hosts and AVT/ADT enabled on the storage subsystem
- Multipath driver software on one or more hosts and AVT/ADT disabled on the storage subsystem

Note: This is the only valid AIX configuration.

- No multipath driver software on one or more hosts and AVT/ADT enabled on the storage subsystem (no failover)

Before using the storage management software for the first time, be aware of the failover options that are available for each operating system, as shown in Table 9.

Table 9. Failover options by operating system

Operating system	Multipath driver name	Supported failover options	
		Multipath driver with AVT/ADT enabled	Multipath driver with AVT/ADT disabled
AIX	fcp array		X
HP-UX	HP Logical Volume Manager (LVM)	X	
Solaris	FASt500 Storage Manager RDAC	X (see Note)	X

Note: Disable AVT/ADT if a large number of logical drives in a Solaris-only environment causes long startup times.

Multipath driver with AVT/ADT enabled

In this scenario, a pair of active controllers is located in a storage subsystem. When you create a logical drive, you assign a controller to own the logical drive (called the *preferred controller*) and to control the I/O between the logical drive and the application host along the I/O path. The preferred controller normally receives the

I/O requests to the logical drive. However, if a problem along the data path (like a component failure) causes an I/O to fail, the multipath driver issues the I/O to the alternate controller.

When AVT/ADT is enabled and used with a host multipath driver, it ensures that an I/O data path is available for the storage subsystem logical drives. The AVT/ADT feature changes the ownership of the logical drive that is receiving the I/O to the alternate controller. After the I/O data path problem is corrected, the preferred controller reestablishes ownership of the logical drive as soon as the multipath driver detects that the path is working again.

Attention: AVT/ADT is enabled on the storage subsystem as a global setting, so its setting applies for every host that connects to the storage subsystem. Keep this in mind if you are using heterogeneous hosts with your storage subsystem. Hosts in a heterogeneous environment should not share logical drives. For more information about heterogeneous hosts, see “Chapter 8. Setting up the storage subsystem in a heterogeneous environment” on page 65.

No multipath driver with AVT/ADT enabled

In this scenario, storage subsystems have no failover protection. A pair of active controllers can still be located in a storage subsystem and each logical drive on the storage subsystem can be assigned a preferred controller. However, logical drives do not move to the alternate controller because there is no multipath driver installed. When a component in the I/O path fails, such as a cable or the controller itself, I/O cannot get through to the storage subsystem. The component failure must be corrected before I/O can resume. (Switching logical drives to the alternate controller in the pair must be done manually.)

Connect hosts that are using operating systems without failover capability to the storage subsystem so that each host adapter has only one path to the controller.

With no multipath driver and AVT/ADT enabled, you do not have multiple host bus adapters in the host server. AVT/ADT in this instance is something that can be enabled or disabled on the storage subsystem; for example, you would disable AVT/ADT if you only had one controller. See the SM7client online help for additional information.

Disabling AVT/ADT

On a new storage subsystem, or any time that the NVSRAM has been updated, AVT/ADT is enabled by default. Use the following procedure to disable AVT/ADT:

1. Insert the installation CD in the storage management station CD-ROM drive.
2. Start the storage management software.
3. In the Enterprise Management window, highlight the storage subsystem on which you want to disable AVT/ADT.
4. Click **Tools** → **Execute Script**.
The Script Editor window opens.
5. Click **File** → **Load Script**.
The Load Script window opens.
6. Select `avtdisable.scr` from the `/cdrom/sm710/Scripts` directory on the CD.
7. Click **Open** to load the script.
8. Click **Tools** → **Execute Only**.

The script runs. A Script Execution Complete message is displayed when the script is finished.

9. Turn off the power to the controllers, then turn the power back on.
10. Go to “Changing the host type”.

Attention: If you have defined a host array in which more than one host is concurrently accessing the same array on a storage subsystem, consider disabling AVT/ADT. If AVT/ADT remains enabled in this situation, the storage subsystem still functions, but if path failover occurs there are undesirable effects on performance.

For example, say two hosts share access to a logical drive. If one of the hosts experiences a path failure, the controller ownership of the logical drive switches from the original controller owner to the second controller in the pair. Meanwhile, the second host continues to send I/O to the original controller owner, unaware of the path problem that the other host is experiencing. If the I/O path problem (experienced by the first host) is not related to the controller itself and the I/O reaches the storage subsystem, controller ownership transfers back to the original controller owner. As long as there is a path problem, the hosts continue to transfer controller ownership back and forth with every I/O sent, significantly degrading storage subsystem performance.

Enabling AVT/ADT

If AVT/ADT has been disabled on a storage subsystem, use the following procedure to enable it.

Attention: Refer to Table 9 on page 55 before enabling AVT/ADT on a storage subsystem.

1. Insert the installation CD in the storage management station CD-ROM drive.
2. Start the storage management software.
3. In the Enterprise Management window, highlight the storage subsystem on which you want to enable AVT/ADT.

4. Click **Tools** → **Execute Script**.

The Script Editor window opens.

5. Click **File** → **Load Script**.

The Load Script window opens.

6. Select avtenable.scr from the /cdrom/sm710/Scripts directory on the CD.

7. Click **Open** to load the script.

8. Click **Tools** → **Execute Only**.

The script runs. A Script Execution Complete message is displayed when the script is finished.

9. Turn off the power to the controllers, then turn the power back on.
10. Go to “Changing the host type”.

Changing the host type

The host type defines how the controllers in the storage subsystem work with the operating systems on the hosts that are connected to it.

When using the storage management software, you must set the correct host type by clicking **Configure** → **Change Storage Subsystem Host Type** in the Subsystem Management window.

If partitioning is enabled, click **Configure** → **View Logical Drive-to-LUN Mappings**. Select the desired host port in the left window and click **Configure** → **Topology** → **Change Host Type**.

For more information, see the topic on changing the host type of a storage subsystem in the Subsystem Management window online help.

If the Storage Partitioning feature is enabled, you must change the host type that is associated with each host port in the Mappings window. (For more information, see the topic on changing the host type of an individual host port in the Subsystem Management window online help.)

When you have selected the host type, continue with “Configuring storage subsystems”.

Heterogeneous hosts overview

The heterogeneous hosts feature enables hosts that are running different operating systems to access a single storage subsystem. In previous releases of Storage Manager, only hosts running the same operating system could access a single storage subsystem. Storage Manager 7.10 supports up to 16 storage partitions, which enables a multiple host-type subsystem to share storage capacity, consolidate storage, and reduce storage management costs.

Host computers can be running completely different operating systems (for example, AIX and Solaris) or variants of the same operating system (for example, Solaris running in a cluster environment). When a host type is specified in the Define New Host Port window, the heterogeneous hosts feature enables the controllers in the storage subsystem to tailor their behavior (such as LUN reporting and error conditions) to the needs of the operating system or variant of the host that is sending the information.

Attention: The heterogeneous hosts feature is available only with storage partitioning enabled.

In a heterogeneous environment, you must set each host type to the appropriate operating system during host-port definition so that the firmware on each controller can respond correctly for the operating system for that host. Before you begin setting up your heterogeneous hosts configuration (described in “Chapter 8. Setting up the storage subsystem in a heterogeneous environment” on page 65), refer to the *IBM FASiT Storage Manager Concepts Guide* available on your installation CD or at the following Web site:

www.ibm.com/pc/support/

Configuring storage subsystems

Use the following procedures to start the client software from either the storage management station or from a host that is acting as a storage management station (a host with the client software installed). Use the client software to configure each attached storage subsystem.

Attention: For cluster configurations, complete all applicable configuration procedures for each storage subsystem *before* installing the storage management software on a second host or cluster server.

Starting the Enterprise Management window

Use this procedure to start the Enterprise Management window from the storage management station where you have installed the client software.

1. If you are running the client software from Windows, click **Start** → **Programs** → **FASTt Storage Manager 7 Client**; or type `SM7client` at a shell prompt.

A splash screen is displayed while the client software starts. When the client software has been loaded, the Enterprise Management window and the Initial Automatic Discovery window opens (see Figure 12).

Note: The Enterprise Management window can take several minutes to open. No wait cursor, such as an hourglass, is displayed.



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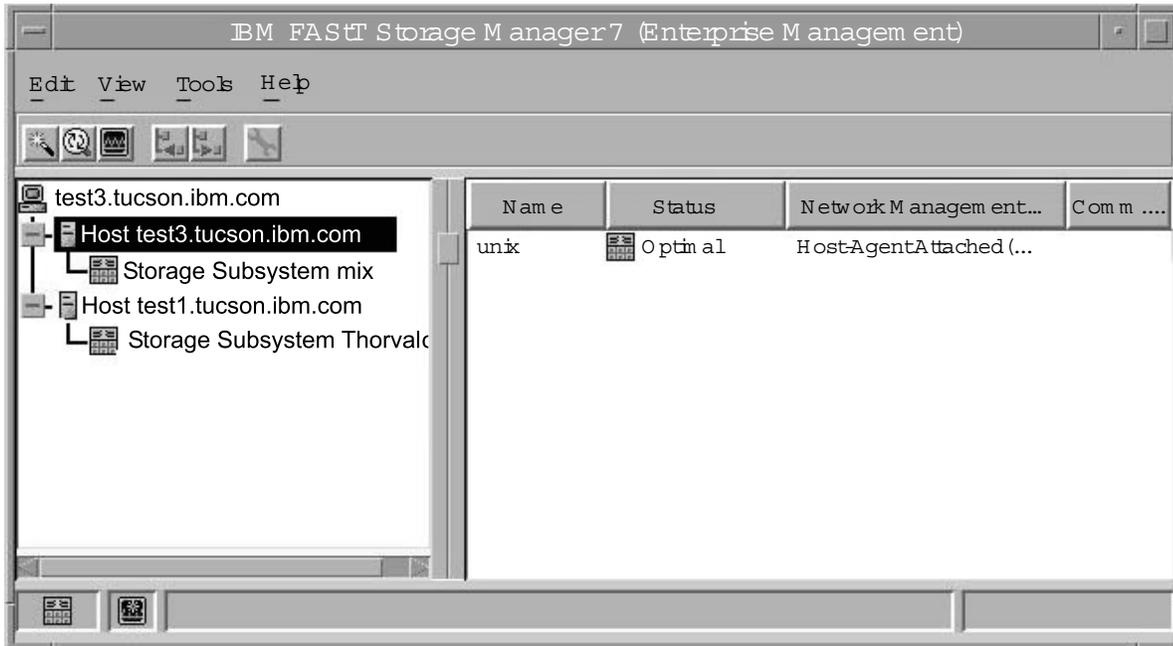
Figure 12. Initial Automatic Discovery window

2. If you are running the client software from AIX, change to the `/sm7client` directory and then type `SM7client`.
3. If you are running the client software from Solaris, type `SM7client`.
4. Click **Yes** to begin an initial automatic discovery of all attached hosts and storage subsystems that are attached.

The software sends a broadcast message across the local subnetwork that is connected to the storage management station. It discovers host-agent-managed storage subsystems if the respective hosts respond to the broadcast. The software discovers directly managed storage subsystems if the controllers in the attached storage subsystems respond to the broadcast message.

It can take up to one minute for the Enterprise Management window to refresh after an initial automatic discovery. If you need to stop the automatic discovery operation for any reason, close the Enterprise Management window.

When the initial automatic discovery is finished, all attached hosts and attached storage subsystems are displayed in the Enterprise Management window (see Figure 13).



BT000105

Figure 13. Enterprise Management window

5. Make sure that all the attached hosts and storage subsystems are displayed as expected. If not, do the following:
 - a. Check the hardware and connections for possible problems (see the hardware documentation for specific procedures).
 - b. See the Enterprise Management window help topic on discovering storage subsystems and take the appropriate action that is indicated.
 - c. Make sure that the device is on the local subnetwork. If it is not, use the **Add Device** option to add it. See the Enterprise Management window help topic on adding devices.
 - d. If a storage subsystem is duplicated in the device tree after an automatic discovery, remove the duplicate storage subsystem icon from the device tree using the **Remove Device** option in the Enterprise Management window.
6. Make sure that the status of each storage subsystem is **Optimal**.
 - If any device shows a status of **Unresponsive**, remove the device from the management domain, and then add it again. See the Enterprise Management window help topic on removing and adding devices.
 - If the device still shows an unresponsive status, contact your customer service representative.
7. Go to “Configuring alert notifications” on page 61.

Configuring alert notifications

After you have added devices to the management domain, it is recommended that you set up alert notification options to report critical events on the storage subsystems. The following alert notification options are available:

- Alert notifications are sent to a designated network management station (NMS) using simple network management protocol (SNMP) traps.
- Alert notifications are sent to a designated e-mail address. See the Enterprise Management window help for specific procedures. To send e-mail to IBM, contact your customer service representative.
- Alert notifications are sent to a designated alphanumeric pager when third-party software is used to convert e-mail messages. See the Enterprise Management window help for specific procedures.

For more information about notification options, see *IBM FAStT Storage Manager Concepts Guide*, available on your installation CD or at the following Web site:

www.ibm.com/pc/support/

Use the following procedure to set up alert notifications using SNMP traps. You need to set up the designated management station only once.

1. Make sure that the installation CD is inserted in the CD-ROM drive on your designated NMS.
2. From the installation CD, copy the SM7_10.MIB file from the SM7mib directory to the NMS.
3. Follow the steps required by your NMS to compile the MIB. For details, contact your network administrator or see the documentation for the storage management product you are using.
4. Go to "Starting the Subsystem Management window".

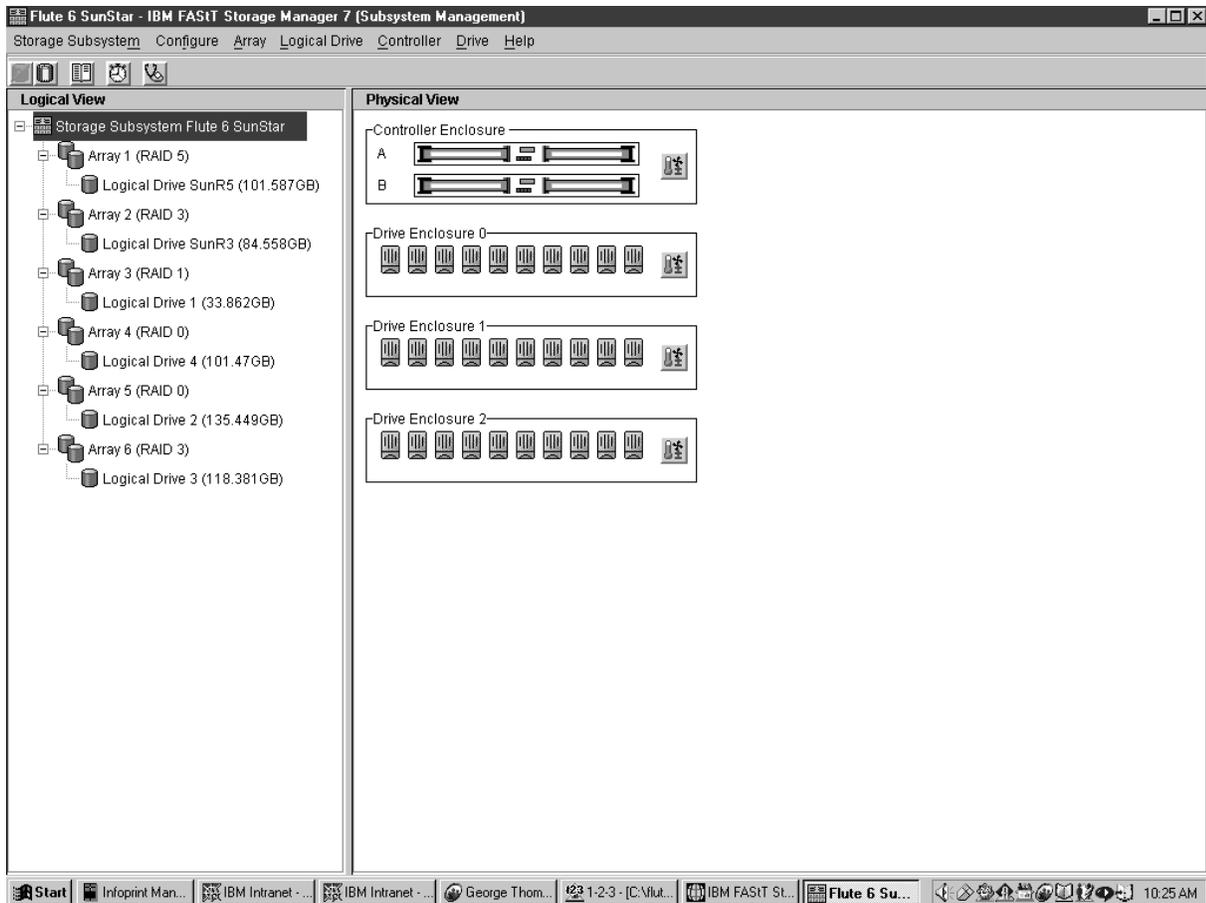
Starting the Subsystem Management window

In the Enterprise Management window, select a storage subsystem in one of these ways:

- Click **Tools** → **Manage Device**.
- Right-click the storage subsystem and click **Manage Device**.
- Double-click the storage subsystem.

The Subsystem Management window for the selected storage subsystem opens (see Figure 14 on page 62).

Note: You can manage one storage subsystem per Subsystem Management window. Open multiple windows to manage other storage subsystems.



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Figure 14. Subsystem Management window

Renaming storage subsystems

When you start the storage management software for the first time, the storage subsystems are unnamed. In the Subsystem Management window, rename each storage subsystem from <unnamed> to a name that is appropriate for your network.

Performing optional subsystem management tasks

You can also perform other subsystem management tasks at this time. To perform the following tasks and other storage subsystem management tasks, see the appropriate topics in the Subsystem Management window help.

- Locate a storage subsystem
- View a storage subsystem profile
- Configure a storage subsystem password
- Create and manage arrays and array groups
- Use the performance monitor
- Create storage partitions (if applicable)

If you are installing the storage management software in a cluster environment, repeat all applicable client software installation procedures for a second storage management station and for all applicable host software on a second host. See

“Chapter 2. Installing storage management station software” on page 11 and
“Chapter 3. Installing host software” on page 23 for installation instructions.

Setting the IBM SAN Fibre Channel Switch 2109

This section contains information about setting the IBM SAN Fibre Channel Switch 2109 to work correctly with the Storage Manager 7.10 and applies to AIX, HP-UX, and Solaris operating systems.

The primary references for configuring the IBM SAN Fibre Channel Switch 2109 Model S16 are the *IBM SAN Fibre Channel Switch 2109 Model S16 Installation and Service Guide* and the *IBM SAN Fibre Channel Switch 2109 Model S16 User's Guide*.

Keep the following points in mind when configuring the settings on the fibre channel switch:

- Ensure that the switch is set with an IP address. The IP address can either be set using the Ethernet port of the switch or on the front panel of the switch. Steps to accomplish this are fully detailed in the *IBM SAN Fibre Channel Switch 2109 Model S16 User's Guide*.
- Ensure that the Java Runtime Environment (JRE), version 1.2.2 or later, is installed on the server or workstation that will be used to manage the switch.
- Ensure that zoning is used to set up a SAN with heterogeneous hosts. When you set up a zone, specify members by port name rather than their worldwide name, because the worldwide name is subject to change when the host is restarted.

Chapter 8. Setting up the storage subsystem in a heterogeneous environment

Follow the steps in this chapter to set up and run a heterogeneous storage subsystem that is managed by Storage Manager 7.10.

1. Ensure that your network has been configured and Storage Manager 7.10 is already running on one of the network-attached hosts as described in “Chapter 2. Installing storage management station software” on page 11 and “Chapter 3. Installing host software” on page 23.

For switch zoning information, see “Setting the IBM SAN Fibre Channel Switch 2109” on page 63, or see your McData or INRANGE switch documentation.

2. Ensure that the following devices are powered up and ready:
 - All hosts
 - All fibre-channel switches
 - The storage management station
 - All FAStT storage controllers
 - All attached drive enclosures
3. If an AIX host is part of the network configuration that uses the FAStT storage controller, then AVT/ADT, also known as the Automatic Logical Drive Transfer (ADT), must be disabled. See “Disabling AVT/ADT” on page 56.

Attention: Because AVT/ADT must be *disabled* when running with an AIX host and *enabled* when running with an HP-UX host, an AIX host and an HP-UX host cannot both be connected to the same FAStT storage subsystem in a heterogeneous environment.

4. See the chapter about storage subsystem configuration in the *IBM FAStT Storage Manager Concepts Guide*.

In the sections about the 3552, find and perform these steps:

- a. Create logical drives
- b. Create storage partitions

Note: The FAStT storage subsystem supports up to 16 partitions and is shipped with storage partitioning enabled.

5. For each AIX host on the network, configure its partition by following these steps:
 - a. Complete step 8 on page 14 in “Performing the initial configuration of storage subsystems on AIX hosts” to disable AVT/ADT.
 - b. Complete step 9 on page 14 in the same section to delete the access volume (Access Logical Drive).

Attention: Only delete the Access Logical Drive from AIX hosts.

6. For each HP-UX host on the network, configure its partition by following the instructions starting at step 7 on page 18 in “Performing the initial configuration of storage subsystems on HP-UX hosts”.
7. For each Solaris host on the network, configure its partition by following the instructions starting at step 10 on page 21 in “Performing the initial configuration of storage subsystems on Solaris hosts”.
8. Each of the hosts should now be able to see their associated drive partition. Remember that up to 16 hosts can be connected to each storage subsystem.

For more host-specific information, refer to the following chapters of this book:

- “Chapter 4. Specific information for AIX operating systems” on page 31
- “Chapter 5. Specific information for HP-UX operating systems” on page 45
- “Chapter 6. Specific information for Solaris operating systems” on page 51

Chapter 9. Storage Manager 7.10 with high-availability cluster services

The high-availability clustering services provided by Storage Manager 7.10 allows application services to continue when a hardware or software failure occurs. This system protects you from software failures as well as from the failure of a CPU, disk, or LAN component. If a component fails, the redundant component takes over cluster services and coordinates the transfer between components.

General information

Storage Manager 7.10 is certified for use with the following cluster services:

- MC/Service Guard versions A.11.09 and A.11.12 on HP-UX systems
- Veritas Cluster Server 1.3 on Solaris systems
- Veritas Volume Manager 3.1 on Solaris systems

This document does not describe how to install and configure cluster services. See the documentation provided with your cluster service products.

Prerequisites for HP-UX

You can choose among many configurations when you set up clustering on an HP-UX system. A minimum configuration consists of two servers that are configured with both a primary and standby LAN, and one server for the data or heartbeat LAN.

Provide fibre connections to the storage subsystem through dual switches that provide the necessary redundant data path for the hosts. Ensure that each server has dual HP Tachyon A5158A host bus adapters.

Prerequisites for Solaris and Veritas Cluster Server 1.3

The following sections contain general hardware requirements and additional information about the cluster services.

General hardware requirements

Each Solaris system in the cluster requires the following hardware:

- At least three Ethernet ports:
 - One for the heartbeat 1 connection
 - One for the heartbeat 2 connection
 - One for the public network connection
- Two fibre host bus adapters for connection to the storage subsystem
- A SCSI connection for operating system disks
- Each Veritas Cluster Server system requires at least 128 MB of RAM and 35 MB of free disk space

System dependencies – Data Multipathing (DMP) and RDAC IDs

When running Veritas Volume Manager 3.1, complete the following steps to disable the DMP feature:

1. Open the /etc/system file in the vi text editor:

```
# vi /etc/system
```

2. Comment out the forceload: drv/vxdmp line.
3. Save and close the /etc/system file.

Note: If you are running Veritas Volume Manager Version 3.2 or later, you do not need to disable the DMP.

It is also recommended that you add up to eight additional IDs to the /etc/symsm/rmparms file. Complete the following steps to add them:

1. Open the /etc/symsm/rmparms file in the vi text editor:

```
# vi /etc/symsm/rmparms
```

2. Modify the Rdac_HotAddIDs line to look as follows:

```
Rdac_HotAddIDs:0:1:2:3:4:5:6:7:8
```

3. Save and close the /etc/symsm/rmparms file.

Additional Solaris information

When setting up cluster services, it is important to eliminate single points of failure because a single point of failure makes a cluster only as strong as its weakest component. Set up the storage subsystem for shared storage; for example, all the nodes in the cluster must recognize the same storage and the host types must be set correctly.

Note: If you decide to stop using the Veritas clustering feature, you must uninstall Veritas Cluster Server 1.3 and Veritas Volume Manager 3.1 before you use the system in a non-clustering environment. Otherwise, the system can experience undesirable side effects while running your programs. Refer to the Veritas Cluster documentation for information about uninstalling this software from your system.

Appendix A. HP-UX system requirements

This appendix lists the minimum hardware and software requirements that an HP-UX system must meet to be used in a storage subsystem that is managed by Storage Manager 7.10.

The HP-UX system must be an HP 9000/Series 800 server with:

- 180 MHz processor or faster
- Multiple CPUs (tested server models include: D370, D380, R390, K460, K570, K580, L2000, and N4000)
- 0.7 MB available on /opt and root (or root-equivalent) privileges for installing SM7util and SM7agent
- 47.5 MB available disk space on /opt and at least 95 MB available on /tmp for installation in a Java Runtime Environment (JRE)

Ensure that the HP-UX host is running one of the following operating systems with the appropriate patches. Because patches can be superseded by more recent versions, refer to your operating system documentation or contact your operating system supplier to ensure that you have the correct patches.

- HP-UX Version 11.0 (32-bit or 64-bit version) with the following patches:
 - December 1999 Extension Software (patch bundle) and the most recent version of the Y2K-1100 patch bundle
 - The following PHCO and PHKL patches:
 - PHCO_23792
 - PHCO_24148
 - PHCO_23651
 - PHKL_18543; note the following dependencies:
 - PHCO_23876
 - PHKL_24027
 - PHKL_25210
 - PHKL_20016
 - PHKL_20202
 - For applications that use Abstract Windowing Toolkit (AWT), the following PHSS patches must also be present:
 - PHSS_25091
 - PHSS_23566
 - PHSS_25138; note the following dependencies:
 - PHNE_25385
 - PHSS_20145
 - PHSS_23823
 - To run HP-UX SDK for Java 2 Platform applications and applets using GUIs, you must also ensure that the HP C++ runtime libraries are installed on the HP-UX system; the latest version is available as patch PHSS_1658
- For high-availability clusters of HP 9000/Series 800 computers, install the HP MC/ServiceGuard software package

Ensure that the following maximum kernel parameters are configured, as shown in Table 10 on page 70.

Table 10. HP-UX kernel parameter configuration requirements

Parameter	Description	Configuration
max_thread_proc 64	Maximum threads per process	1024
maxfiles	Soft-file limit per process	2048
maxuser	Influences other parameters	256 or greater
ncallout	Number of pending timeouts	4144

Appendix B. Solaris system requirements

This appendix lists the minimum hardware and software requirements that a Solaris system must meet to be used in a storage subsystem that is managed with Storage Manager 7.10.

The Solaris system must be an Sparc S20 processor with:

- 256 MB system memory
- CD-ROM drive
- Mouse or similar pointing device
- Ethernet network interface card
- 1 MB available on /opt and root (or root-equivalent) privileges for installing RDAC
- 24 MB available on /opt and root (or root-equivalent) privileges for installing SM7agent

Ensure that the Solaris host is running one of the following operating systems with the appropriate patches. Because patches can be superseded by more recent versions, refer to your operating system documentation or contact your operating system supplier to ensure that you have the correct patches.

- Solaris 2.6 with the following patches (minimum version):
 - 105181-29 kernel jumbo patch
 - 105359 (replaces obsolete 105797-07 SunOS 5.6/kernel/drv/sd patch)
 - 105600-19 SunOS 5.6/kernel/drv/isp patch
 - 105797-07
- Solaris 7 with the following patches (minimum version):
 - 106541-17 kernel jumbo patch
 - 108376-29 OpenWindows patch
 - 107648-09
- Solaris 8; no patches required
- For high-availability clusters of Sparc S20 systems, install the Veritas Cluster Server software package

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Glossary

This glossary includes terms for the IBM FASTt Storage Manager Version 7.10 for the FASTt500 in UNIX and AIX Environments.

This glossary also includes terms and definitions from: *IBM Dictionary of Computing*. New York: McGraw-Hill, 1994.

The following cross-reference convention is used in this glossary:

See Refers you to (a) a related term, (b) a term that is the expanded form of an abbreviation or an acronym, or (c) a synonym or more preferred term.

access volume. A special logical drive that allows the host-agent to communicate with the controllers in the storage subsystem.

agent. A server program that receives virtual connections from the network manager (the client program) in an SNMP-TCP/IP network managing environment. The interface to a managed device.

auto volume transfer (AVT)/auto disk transfer (ADT). Provides automatic failover in case of controller failure on a storage subsystem.

AVT/ADT. See *auto volume transfer (AVT)/auto disk transfer (ADT)*.

AWT. Abstract Windowing Toolkit, a Java GUI.

bootstrap protocol (BOOTP). A TCP/IP protocol used by a diskless workstation or network computer to obtain its IP address and other network information such as server address and default gateway. Upon startup, the client station sends out a BOOTP request in a UDP packet to the BOOTP server, which returns the required information. Unlike RARP, which uses only the layer 2 (Ethernet) frame for transport, the BOOTP request and response use an IP broadcast function that can send messages before a specific IP address is known.

BOOTP. See *bootstrap protocol*.

client. A computer system or process that requests a service of another computer system or process that is typically referred to as a server. Multiple clients can share access to a common server.

dac. Disk array controller devices that represent the two controllers of the array.

dar. Disk array router that represents the entire array, including current and deferred paths to all LUNs (hdisks on AIX).

FRU. Field replaceable unit.

GUI. Graphical user interface.

hdisk. An AIX term; an hdisk represents a LUN on the array.

host. A system that is directly attached to the storage subsystem through a fibre-channel I/O path. This system is used to serve data (typically in the form of files) from the storage subsystem. (A system can be both a storage management station and a host at the same time.)

host computer. See *host*.

internet protocol (IP). In the Internet suite of protocols, a connection-less 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*.

JRE. Java runtime environment.

LAN. Local area network.

logical unit number (LUN). An address that is used by the host to access a particular logical drive.

LUN. See *logical unit number*.

man pages. Manual pages. UNIX command. To get information about UNIX commands, type `man <command_name>`; for example, to get information about the `ls` command, type `man ls`.

management information base (MIB). The information that is on an agent. It is an abstraction of configuration and status information.

MIB. See *management information base*.

NMS. Network management station.

NVSRAM. Nonvolatile storage random access memory.

ODM. Object Data Manager.

PDF. Portable document format.

PTF. Program temporary fixes, for an RDAC driver.

RDAC. See *redundant dual active controller*.

redundant dual active controller (RDAC). Also known as redundant disk array controller, provides a multipath driver for a storage subsystem. Used with AIX and Solaris hosts.

router. A computer algorithm that determines the path of least resistance for traffic on a computer network.

SAM. System Administrator Manager.

SAN. See *storage area network*.

storage area network (SAN). Dedicated, high-speed networks of directly connected storage elements designed to move large amounts of data between host-independent distributed storage devices.

storage management station. A system that is used to manage the storage subsystem. This system does not need to be attached to the storage subsystem through the fibre-channel I/O path.

server. A functional hardware and software unit that delivers shared resources to workstation client units on a computer network.

simple network management protocol (SNMP). A TCP/IP protocol that generally uses the user datagram protocol (UDP) to exchange messages between a management information base and a management client residing on a network. Because SNMP does not rely on the underlying communication protocols, it can be made available over other protocols, such as UDP/IP. In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices that are managed is defined and stored in the application's management information base (MIB).

SNMP. See *simple network management protocol* and *SNMPv1*.

SNMPv1. The original standard for SNMP is now referred to as SNMPv1.

subnet. A part of a network that is identified by a portion of an IP address.

TCP. A communications protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It uses the Internet Protocol (IP) as the underlying protocol.

TCP/IP. See *transmission control protocol/internet protocol*.

transmission control protocol/internet protocol (TCP/IP). A set of communication protocols that support peer-to-peer connectivity functions for both local and wide-area networks.

trap. A mechanism for SNMP agents to notify the SNMP management station of significant events.

worldwide name (WWN). A unique identifier for a switch on local and global networks.

WWN. See *worldwide name*.

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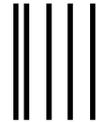
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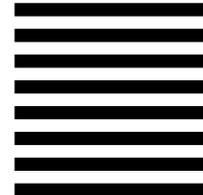
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