

IBM FAStT Storage Manager Version 7.10 for
UNIX and AIX Environments

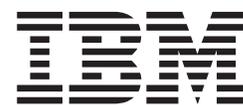


Installation and Support Guide

Read Before Using

The IBM Agreement for Licensed Internal Code is included in this book. Carefully read the agreement. By using this Machine or feature/MES you agree to abide by the terms of this agreement and applicable copyright laws.

IBM FAStT Storage Manager Version 7.10 for
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 79.

Second Edition (June 2002)

This publication replaces GC26-7475-00.

© Copyright International Business Machines Corporation 2002. All rights reserved.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

| | |
|---|------|
| Figures | vii |
| Tables | ix |
| About this document | xi |
| Who should read this document | xi |
| How this document is organized | xi |
| Related publications | xii |
| Documents | xii |
| Online help | xii |
| Web sites | xiii |
| How to send your comments | xiii |
| Chapter 1. Introduction | 1 |
| Other references | 1 |
| General documentation | 1 |
| Hardware documentation | 2 |
| Storage Manager 7.10 features | 2 |
| Storage Manager 7.10 software packages | 4 |
| Storage Manager 7 client software package | 4 |
| Storage Manager 7 agent software package | 4 |
| Storage Manager 7 utility software package | 5 |
| RDAC | 5 |
| Storage subsystem management methods | 5 |
| Host-agent (in-band) management method | 5 |
| Direct (out-of-band) management method | 7 |
| Operating system requirements | 8 |
| Setting up IP addresses for FASiT storage controllers | 8 |
| Chapter 2. Installing storage management station software | 11 |
| AIX | 11 |
| Installing the client software on AIX hosts | 11 |
| Performing the initial configuration of storage subsystems on AIX hosts | 13 |
| HP-UX | 16 |
| Installing the client software on HP-UX hosts | 16 |
| Performing the initial configuration of storage subsystems on HP-UX hosts | 17 |
| Solaris | 19 |
| Installing the client software on Solaris hosts | 19 |
| Performing the initial configuration of storage subsystems on Solaris hosts | 21 |
| Chapter 3. Installing host software | 25 |
| Installing host software on AIX hosts | 25 |
| Prerequisites | 25 |
| Procedure | 26 |
| Installing host software on HP-UX hosts | 26 |
| Installing the utility software on HP-UX hosts | 26 |
| Installing the agent software on HP-UX hosts | 27 |
| Installing host software on Solaris hosts | 28 |
| Prerequisites | 28 |
| Procedure | 29 |
| Chapter 4. Specific information for AIX operating systems | 31 |
| Hardware and firmware requirements | 31 |

| | |
|---|-----------|
| Software requirements | 31 |
| RDAC installation requirements | 32 |
| AIX restrictions | 32 |
| AIX configuration information | 33 |
| Installing and setting attributes of the RDAC driver for AIX | 33 |
| Identifying the controller ID numbers | 38 |
| Identifying device names and bus numbers | 39 |
| Identifying logical drives by operating system device names | 41 |
| Redistributing LUNs in case of failure | 44 |
| Creating a direct-attached configuration | 45 |
| Chapter 5. Specific information for HP-UX operating systems | 47 |
| Preparing for installation and system requirements | 47 |
| Additional hardware requirements | 47 |
| Identifying the primary and secondary paths to the storage subsystem logical drives | 47 |
| Identifying the controller ID numbers | 48 |
| Identifying device names and bus numbers | 49 |
| Identifying logical drives by operating system device names and determining primary and alternative paths | 51 |
| Chapter 6. Specific information for Solaris operating systems | 53 |
| Preparing for installation and system requirements | 53 |
| Additional hardware requirements | 53 |
| Uninstalling Storage Manager 7.10 software | 54 |
| Default partitioning for Solaris devices | 54 |
| Configuring JNI host bus adapter cards | 54 |
| Variable settings for JNI adapter cards | 55 |
| Importance of setting the host type on Solaris | 56 |
| Chapter 7. Completing the software installation. | 57 |
| Failover protection | 57 |
| Multipath driver with AVT/ADT enabled | 57 |
| No multipath driver with AVT/ADT enabled | 58 |
| Disabling AVT/ADT | 58 |
| Enabling AVT/ADT | 59 |
| Setting the Residual Reservation parameter | 59 |
| Changing the host type | 60 |
| Heterogeneous hosts overview | 60 |
| Configuring storage subsystems | 61 |
| Starting the Enterprise Management window | 61 |
| Configuring alert notifications | 63 |
| Starting the Subsystem Management window | 64 |
| Renaming storage subsystems | 65 |
| Performing optional subsystem management tasks | 65 |
| Setting IBM SAN fibre-channel switches | 66 |
| Chapter 8. Setting up the storage subsystem in a heterogeneous environment. | 67 |
| Chapter 9. Storage Manager 7.10 with high-availability cluster services | 69 |
| General information | 69 |
| Prerequisites for HP-UX | 69 |
| Prerequisites for Solaris and Veritas Cluster Server | 69 |
| General hardware requirements | 69 |
| System dependencies | 69 |

| | |
|---|-----------|
| Prerequisites for pSeries with FAStT500 HACMP support | 70 |
| HACMP support for FAStT500 with Storage Manager. | 70 |
| Concurrent mode configuration | 71 |
| Setting the Residual Reservation parameter | 71 |
| Prerequisites for pSeries with FAStT500 PSSP and GPFS support | 72 |
| PSSP and GPSF support for FAStT500 with Storage Manager 7.10 | 72 |
| GPFS configuration | 72 |
| Setting the Residual Reservation parameter | 74 |
| Appendix A. HP-UX system requirements | 75 |
| Appendix B. Solaris system requirements | 77 |
| Notices | 79 |
| Trademarks | 79 |
| IBM agreement for licensed internal code | 80 |
| Actions you must not take | 80 |
| Glossary | 83 |
| Index | 85 |

Figures

| | |
|--|----|
| 1. Host-agent (in-band) managed storage subsystems | 6 |
| 2. Direct (out-of-band) managed storage subsystems | 7 |
| 3. Controller Properties window | 39 |
| 4. Change Mapping window | 43 |
| 5. Volume Properties window | 44 |
| 6. Array path information | 48 |
| 7. Controller Properties window | 49 |
| 8. Device identification information | 50 |
| 9. Mappings window | 51 |
| 10. Device names | 52 |
| 11. Initial Automatic Discovery window | 62 |
| 12. Enterprise Management window | 63 |
| 13. Subsystem Management window | 65 |
| 14. Concurrent mode configuration. | 71 |
| 15. GPFS four-cluster configuration | 73 |
| 16. GPFS two-cluster configuration | 74 |

Tables

| | |
|--|----|
| 1. Installation sequences of Storage Manager 7.10 software packages by host type | 4 |
| 2. PTF filesets required for AIX 4.3.3 RDAC driver installation | 25 |
| 3. PTF filesets required for AIX 5.1 RDAC driver installation | 25 |
| 4. Supported versions of hardware for AIX systems | 31 |
| 5. PTF filesets required for AIX 4.3.3 RDAC driver installation | 32 |
| 6. PTF filesets required for AIX 5.1 RDAC driver installation | 32 |
| 7. Attributes for dar devices | 35 |
| 8. Attributes for dac devices. | 37 |
| 9. Attributes for LUN devices | 37 |
| 10. Supported versions of hardware for HP-UX systems | 47 |
| 11. Supported versions of hardware for Solaris systems | 53 |
| 12. JNI adapter configuration files | 55 |
| 13. Failover options by operating system | 57 |
| 14. HP-UX kernel parameter configuration requirements | 76 |

About this document

This document provides information about setting up, installing, configuring, and working with the IBM Fibre Array Storage Technology (FAStT) Storage Manager Version 7.10 in UNIX[®] and AIX[™] environments.

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

Use this document 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 document

This document 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 document 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 document.

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 25 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 47 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 53 provides information about installing and using Storage Manager 7.10 with the Solaris operating system.

Chapter 7, "Completing the software installation" on page 57 provides step-by-step instructions for performing post-installation tasks.

Chapter 8, “Setting up the storage subsystem in a heterogeneous environment” on page 67 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 69 provides information about the high-availability clustering system.

Appendix A, “HP-UX system requirements” on page 75 and Appendix B, “Solaris system requirements” on page 77 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 documents, online help systems, and Web sites. These resources provide related information that might be of interest to you.

Documents

The following documents 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 UNIX and AIX Environments, Installation and Support Guide* (this document)
- *IBM FAStT Storage Manager Concepts Guide*
- *IBM FAStT200 and FAStT200 HA Storage Servers Installation and User's 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. For operating-system-specific information, see the following chapters and appendices of this document.

- For AIX, see Chapter 4, “Specific information for AIX operating systems” on page 31.
- For HP-UX, see Chapter 5, “Specific information for HP-UX operating systems” on page 47 and Appendix A, “HP-UX system requirements” on page 75.

- For Solaris, see Chapter 6, “Specific information for Solaris operating systems” on page 53 and Appendix B, “Solaris system requirements” on page 77.

Web sites

For the most up-to-date information about IBM FAStT storage servers, go to the following Web site:

www.storage.ibm.com/hardsoft/disk/fastt/

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

www.ibm.com/storage/

How to send your comments

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

- E-mail

Submit your comments electronically to:

starpubs@us.ibm.com

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

- Mail or fax

Fill out the Readers' Comments form (RCF) at the back of this document and return it by mail or fax (1-800-426-6209) or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

International Business Machines Corporation
RCF Processing Department
Dept. M86/Bldg. 050-3
5600 Cottle Road
San Jose, CA 95193-0001
U.S.A.

Chapter 1. Introduction

The IBM FAStT Storage Manager Version 7.10 for UNIX and AIX environments, known as *Storage Manager 7.10*, is a set of client and host tools that allows you to manage IBM FAStT200 and FAStT500 storage servers in storage subsystems.

You can install Storage Manager 7.10 on a *storage management station*, which is the system that is responsible for managing all, or a portion of, a storage network. The storage 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). Storage management commands are sent to the storage subsystem controllers, where the controller firmware validates and runs the commands, and then returns status and configuration information to the client software.

This document provides system administrators with information about installing, configuring, and working 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 document 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 document. 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 document helps you determine and resolve the issues most commonly encountered with IBM Fibre Channel devices and configurations.

IBM FAStT200 and FAStT200 HA Storage Servers Installation and User's

Guide This document describes how to set up, install, connect, and operate IBM FAStT200 RAID/Storage Units, both the single controller model and the double controller model.

IBM Netfinity FAStT500 RAID Controller Enclosure Unit Installation Guide

This document describes how to set up, install, and connect IBM Netfinity FAStT500 RAID controller enclosure units.

IBM Netfinity FAStT500 RAID Controller Enclosure Unit User's Reference

This document provides an overview of the IBM Netfinity FAStT500 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.

Storage Manager 7.10 features

Storage Manager 7.10 supports FAStT200 and FAStT500 storage servers, and provides the features that are described in this section.

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 environment

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

Note: AIX and HP-UX systems cannot both be in the same heterogeneous environment.

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.

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

Auto volume transfer (AVT), also known as auto disk transfer (ADT) and referred to in this document 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 requires that AVT/ADT be disabled. If AIX is in a heterogeneous environment with Solaris, then AVT/ADT must be disabled.
- HP-UX requires that AVT/ADT be enabled. If HP-UX is in a heterogeneous environment with Solaris, then AVT/ADT must be enabled.
- Solaris supports AVT/ADT in a homogeneous environment. If Solaris is in a heterogeneous environment, then AVT/ADT can be enabled or disabled as required to support the other operating system.

Note: For best performance in a Solaris environment, disable AVT/ADT.

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 requires that access volumes be deleted.

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 Microsoft® Windows® systems that are attached to the same FAStT controller.

Direct-attached configuration

Storage Manager 7.10 supports FAStT200 and FAStT500 storage servers in a direct-attached, AIX homogenous or heterogeneous environment.

Storage Manager 7.10 software packages

Storage Manager 7.10 contains the following software packages:

- Storage Manager 7 client software (SM7client)
- Storage Manager 7 host software:
 - Storage Manager 7 agent (SM7agent)
 - Storage Manager 7 utility package (SM7util)
 - Storage Manager 7 multipath device drivers (RDAC)

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 16) | SM7client (on Solaris 8 only; see “Installing the client software on Solaris hosts” on page 19) |
| 2 | RDAC (see “Installing host software on AIX hosts” on page 25) | SM7util (see “Installing the utility software on HP-UX hosts” on page 26) | RDAC (see “Installing host software on Solaris hosts” on page 28) |
| 3 | | SM7agent (see “Installing the agent software on HP-UX hosts” on page 27) | SM7util (see “Installing host software on Solaris hosts” on page 28) |

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.

Note: The only Solaris operating system that supports SM7client is Solaris 8.

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 on HP-UX host systems to manage storage subsystems through the host fibre-channel connection. The host-agent software

takes requests from a storage 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”.

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 host systems in your storage subsystem. The host computers are attached to the storage subsystem through the fibre channel.

RDAC

AIX and Solaris host systems require an RDAC driver for fibre-channel path redundancy. If a FASTT 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.

Note: The AIX RDAC driver files are not included on the installation CD; you must follow the instructions in “Installing host software on AIX hosts” on page 25 to download them from the appropriate Web site.

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.

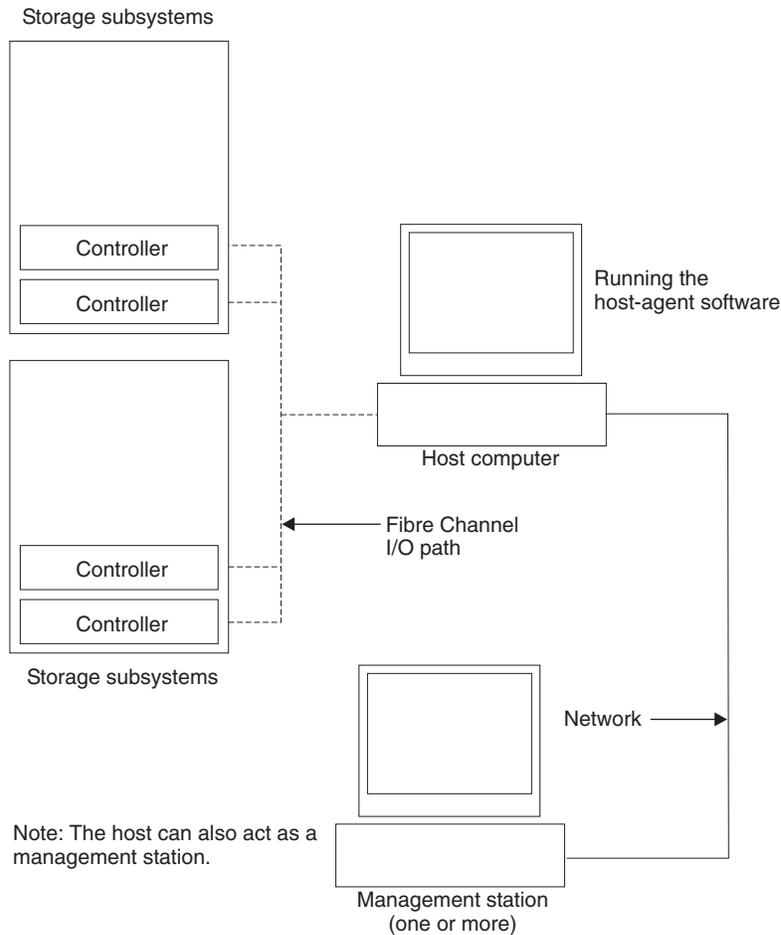
Note: You cannot use this management method on AIX systems.

- 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 storage management station through the network connection. Figure 1 on page 6 shows the host-agent (in-band) management method.

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



FL00001

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.

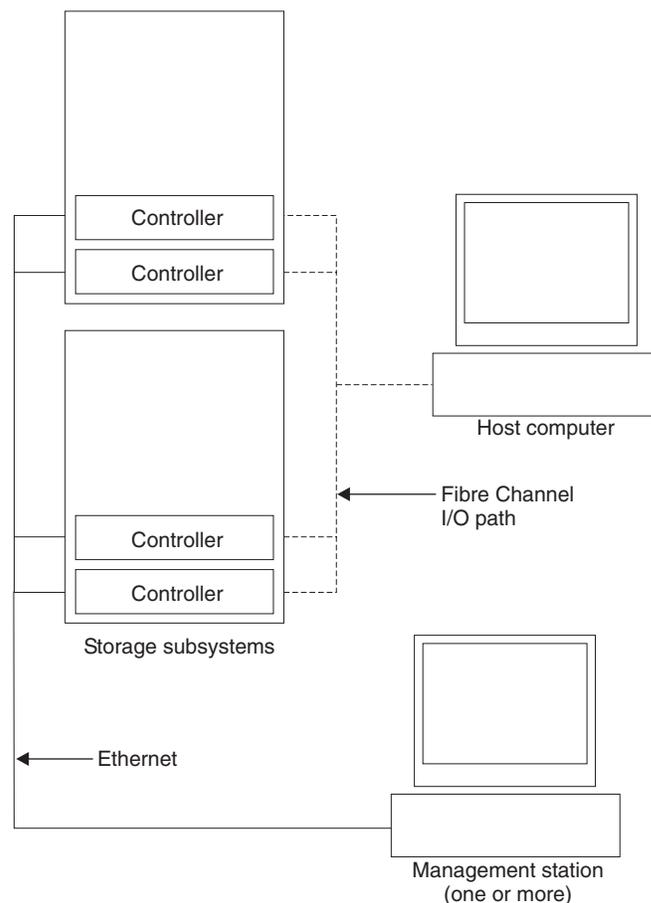
Important: The access volume uses one of the LUNs. If your host already has the maximum number of LUNs configured, either use the direct-management method or give up a LUN for use as the access volume. For information about your specific configuration, see the appropriate “Specific information” chapter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

Attention: IBM AIX does not support access volumes; they must be deleted. 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 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.



FL00002

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 storage 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
- For AIX and HP-UX host systems, you do not need to use an access volume to communicate with the controllers. You can configure the maximum number of LUNs that are supported by the operating system and the host adapter that you are using.

Note: Solaris host systems always use access volumes.

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.

Operating system requirements

Storage Manager 7.10 supports the FAStT200 and FAStT500 storage servers in the following environments:

- IBM AIX 4.3.3 or 5.1
- HP-UX 11.0 (32 bit or 64 bit), HP-UX 11.11, or HP-UX 11i (see Appendix A, “HP-UX system requirements” on page 75)
- Sun Solaris 2.6, 7, or 8 (see Appendix B, “Solaris system requirements” on page 77)

Setting up IP addresses for FAStT 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 FAStT controllers using CLI commands through serial cables that are connected to a terminal emulator.

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

1. Stop all I/O to the FAStT 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 on page 8 - 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 FAST200 and FAST500 storage servers 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 FAST200 or FAST500 storage servers in a 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 FAST storage servers
- 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 are 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 are present on the system.

Note: If the filesets are not present, follow the instructions in “Installing host software on AIX hosts” on page 25 to download them from the appropriate Web site.

– For AIX 4.3.3:

| Filename | Fileset | Version |
|-------------|--------------------------|----------|
| U482222.bff | devices.fcp.disk.array | 4.3.3.80 |
| U482600.bff | devices.pci.df1000f7.com | 4.3.3.82 |

– For AIX 5.1:

| Filename | Fileset | Version |
|-------------|--------------------------|----------|
| U481548.bff | devices.fcp.disk.array | 5.1.0.26 |
| U476921.bff | devices.pci.df1000f7.com | 5.1.0.27 |

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-number.bff SM7client.aix.rte
```

Where *number* varies by operating system level:

- For AIX 4.3.3, *number* is 07.10.G5.10. The complete filename is SM7client.aix-07.10.G5.10.bff.
- For AIX 5.1, *number* is 07.10.G5.11. The complete filename is SM7client.aix-07.10.G5.11.bff

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:

```
# lsllpp -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 storage servers 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.

- Disable AVT/ADT using the script that is supplied on the Storage Manager 7.10 installation CD. Follow 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). Follow the instructions in step 9 on page 15. Access volumes are not supported; failure to delete them can cause system errors.
- If the controllers are shipped with a firmware release prior to version 04.01.02.30 and an NVSRAM release prior to version NV3542R710NT014 (for FAStT200 storage servers) or NV3552R710NT008 (for FAStT500 storage servers), they must be upgraded. Anytime that the NVSRAM is upgraded, AVT/ADT and Residual Reservation parameters are set to defaults and must be set again. Read the README file that is shipped with the product and go to one of the following Web sites to ensure that you have the latest versions of the firmware and the NVSRAM:

ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt200
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500

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 FAStT storage controllers” on page 8 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 15; 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/3542 or /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/3542 or /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 57.
 - 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 FAStT storage servers. See “Installing host software on AIX hosts” on page 25 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 FAStT 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 75.
- 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, go 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 on page 16 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 25.

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 storage servers ship with NVSRAM configured for Windows NT hosts and have an access volume set to LUN 31.
- AVT/ADT is enabled by default; leave it in that state for HP-UX hosts.
- If the controllers are shipped with a firmware release prior to version 04.01.02.30 and an NVSRAM release prior to version NV3542R710NT014 (for FASTt200 storage servers) or NV3552R710NT008 (for FASTt500 storage servers), they must be upgraded. Read the README file that is shipped with the product and go to one of the following Web sites to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast200/supserver.htm
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 one of the following Web sites to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast200/supserver.htm

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.

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):

```
# tduil <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 (on Solaris 8 hosts only)
- 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 is running Solaris 8 and meets the other minimum hardware and software requirements described in Appendix B, “Solaris system requirements” on page 77.
- 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 FAST 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. Type the following command to verify that the installation was successful:

```
# pkgchk SM7client
```

The installation was successful if no output is displayed on the screen.

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 20 through step 6 on page 20, 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 25.

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 storage servers 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. Follow the instructions in "Disabling AVT/ADT" on page 58. AVT/ADT must be disabled for path redundancy to be effective.
- If the controllers are shipped with a firmware release prior to version 04.01.02.30 and an NVSRAM release prior to version NV3542R710NT014 (for FASTt200 storage servers) or NV3552R710NT008 (for FASTt500 storage servers), they must be upgraded. Read the README file that is shipped with the product and go to one of the following Web sites to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast200/supserver.htm
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 one of the following Web sites to ensure that you have the latest versions of the firmware and the NVSRAM:

www.storage.ibm.com/fast200/supserver.htm
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 on page 22.

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 58.
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. Type the following command to run the hot_add utility:

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

For information about the output of the utility, see “Default partitioning for Solaris devices” on page 54.

- g. Click **File** → **Exit**.
- h. 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 install the Storage Manager 7.10 client software and configure 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.

- For AIX 4.3.3:

Table 2. PTF filesets required for AIX 4.3.3 RDAC driver installation

| PTF filesets | Version |
|-----------------------------|----------|
| devices.fcp.disk.array.diag | 4.3.3.50 |
| devices.fcp.disk.array.rte | 4.3.3.80 |
| devices.common.IBM.fc.rte | 4.3.3.75 |
| devices.pci.df1000f7.com | 4.3.3.82 |
| devices.pci.df1000f7.rte | 4.3.3.75 |
| devices.scsi.scarray.rte | 4.3.3.50 |

- For AIX 5.1:

Table 3. PTF filesets required for AIX 5.1 RDAC driver installation

| PTF filesets | Version |
|-----------------------------|----------|
| devices.fcp.disk.array.diag | 5.1.0.0 |
| devices.fcp.disk.array.rte | 5.1.0.26 |
| devices.common.IBM.fc.rte | 5.1.0.10 |
| devices.pci.df1000f7.com | 5.1.0.27 |
| devices.pci.df1000f7.rte | 5.1.0.15 |
| devices.scsi.scarray.rte | 5.1.0.0 |

Note: The AIX RDAC driver files are not included on the installation CD; you must download them from one of the following Web sites:

ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt200
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500

For downloading instructions, see “Procedure” on page 26.

Verifying AIX host firmware

Use the **lslpp** command to verify that the correct version numbers of the AIX host firmware are installed:

```
# lslpp -ah filename
```

Where *filename* is one of the required filesets listed in “Prerequisites for installing RDAC” on page 25.

For example:

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

Procedure

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

1. Go to one of the following Web sites:

```
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt200  
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500
```

2. Scroll to the bottom of the Web page and click **Downloads**.
3. Scroll to the **Device drivers** section of the Web page.
4. Follow the link to the appropriate sets of files for your system and follow the installation instructions.
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. Shut down and restart the AIX system. This must be done for the software changes to take effect.

```
# shutdown -Fr
```

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 75.
- 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
- 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 is running Solaris 2.6, 7, or 8, and meets the minimum hardware and software requirements described in Appendix B, “Solaris system requirements” on page 77.
- The RDAC and SM7util 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-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 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: Make sure that the variables in the configuration files for your JNI adapter cards have been set to the correct values. For information about these configuration files and their variables, see “Variable settings for JNI adapter cards” on page 55.

7. 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                FAStT Storage Manager 7 Utility
                        (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. When the SM7util package has been successfully installed, the following message is displayed:

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

10. Move to the root directory:

```
# cd /
```

11. Stop the system:

```
# halt
```

12. Restart the system with either this command:

```
# boot -r
```

or this command:

```
# boot <bootdevices> -r
```

13. 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 and firmware requirements
- Software requirements
- AIX restrictions
- AIX configuration information

Note: An AIX system cannot be in a heterogeneous environment that includes HP-UX systems. For more information, see Chapter 8, “Setting up the storage subsystem in a heterogeneous environment” on page 67.

Hardware and firmware requirements

Table 4 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 4. Supported versions of hardware for AIX systems

| Product Name | Model | Product release and firmware version |
|---|--------------|--|
| IBM FAStT500 RAID Controller Enclosure Unit | 3552-1RU | Firmware 04.01.02.30, NVSRAM NV3552R710NT008 |
| IBM FAStT500 EXP500 Storage Expansion Unit | 3560-1RU | ESM 9163, ESM 9165 |
| IBM FAStT200 RAID and Storage Unit, Single Controller | 3542-1RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| IBM FAStT200 RAID and Storage Unit, Double Controller | 3542-2RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| 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 one of the following Web sites to ensure that you have the latest versions of the firmware, NVSRAM, disk drive firmware, and host adapter device drivers:

ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt200
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500

Software requirements

The following software must be at the specified versions.

- AIX 4.3.3 or AIX 5.1
- Filesets associated with IBM RDAC driver installations listed in Table 5 on page 32 or Table 6 on page 32

- Other required PTF filesets that are listed in “RDAC installation requirements”

RDAC installation requirements

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

- For AIX 4.3.3:

Table 5. PTF filesets required for AIX 4.3.3 RDAC driver installation

| PTF filesets | Version |
|-----------------------------|----------|
| devices.fcp.disk.array.diag | 4.3.3.50 |
| devices.fcp.disk.array.rte | 4.3.3.80 |
| devices.common.IBM.fc.rte | 4.3.3.75 |
| devices.pci.df1000f7.com | 4.3.3.82 |
| devices.pci.df1000f7.rte | 4.3.3.75 |
| devices.scsi.sccarray.rte | 4.3.3.50 |

- For AIX 5.1:

Table 6. PTF filesets required for AIX 5.1 RDAC driver installation

| PTF filesets | Version |
|-----------------------------|----------|
| devices.fcp.disk.array.diag | 5.1.0.0 |
| devices.fcp.disk.array.rte | 5.1.0.26 |
| devices.common.IBM.fc.rte | 5.1.0.10 |
| devices.pci.df1000f7.com | 5.1.0.27 |
| devices.pci.df1000f7.rte | 5.1.0.15 |
| devices.scsi.sccarray.rte | 5.1.0.0 |

Note: The AIX RDAC driver files are not included on the installation CD; you must download them from the following Web site:

techsupport.services.ibm.com/server/fixes

For downloading instructions, see “Installing host software on AIX hosts” on page 25.

AIX restrictions

The following restrictions apply to both FAStT200 and FAStT500 storage servers:

- FC Boot Support is not available.
- F-RAID Manager is not supported.
- The maximum number of partitions per AIX host, per FAStT storage server, is 1.
- Each AIX host has a minimum and maximum of two host bus adapters (6227 or 6228) and supports one FAStT partition. You can connect up to eight AIX hosts per FAStT storage server, one host per partition.
- Disable AVT/ADT using the script that is supplied on the Storage Manager 7.10 installation CD. Follow 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.

- Set or reset Residual Reservation parameters using the script that is supplied over the Web and follow instructions located under “Setting the Residual Reservation parameter” on page 59.
- Concurrent NVSRAM upgrades are not supported. You must stop all I/O to the controllers before you upgrade NVSRAM. If you upgrade NVSRAM, AVT/ADT is automatically enabled and you must disable it again.
- Delete access volumes (also known as UTM LUNs). Follow the instructions in step 9 on page 15 “Performing the initial configuration of storage subsystems on AIX hosts”. Access volumes are not supported; failure to delete them can cause system errors.

The following restrictions apply only to FAStT500 storage servers:

- From 1 - 10 EXP500 storage expansion units are supported (up to 100 disk drives).
- Up to four mini-hubs are supported on both the host and drive side of the RAID controller; however, only one connection to each mini-hub is supported.
- FAStT500 storage servers support up to eight hosts per IBM @server pSeries server.

AIX configuration information

This section contains the following AIX configuration information:

- Installing and setting attributes of the RDAC driver for AIX
- Identifying the controller ID numbers
- Identifying device names and bus numbers
- Identifying logical drives by operating system device names
- Redistributing LUNs in case of failure
- Creating a direct-attached configuration

Installing and setting attributes of the RDAC driver for AIX

The RDAC driver must be installed on all AIX hosts that will be attached to a FAStT storage subsystem. The RDAC driver creates the following devices that represent the FAStT storage subsystem configuration:

darX The disk array router represents the entire array, including current and deferred paths to all LUNs (hdiskX on AIX).

dac0, dac1

The disk array controller devices represent the two controllers of the array.

hdiskX

These devices represent individual LUNs on the array.

When these devices are configured, the Object Data Manager (ODM) is updated with default parameters. You must change some of these parameters for AIX to operate properly, while others can be changed to enhance the operability of your configuration. Use the **lsattr -El** command to view attribute settings on an AIX system, as shown in the following examples.

This example shows the attribute settings for a disk array router (dar0):


```
# 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 FASTT controllers do. By default, write caching is on for the FASTT controllers.

Definitions of attribute settings

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

- dar
- dac
- LUN

Table 7. 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 |

Table 7. Attributes for dar devices (continued)

| Attribute | Definition |
|-----------------------|--|
| <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 |
| <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 |
| <i>switch_retries</i> | Number that specifies how many times to retry failed switches, in integers |

Table 8. 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 3542 indicates FAStT200 and a value of 3552 indicates FAStT500 |
| <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 9. 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 fcarray 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) |
| <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 |

Table 9. Attributes for LUN devices (continued)

| Attribute | Definition |
|----------------------|---|
| <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 FAST storage 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:

```
# cfmgr -v
```

Next, use the **lsdev -Cc disk** command to see if the device driver recognizes each FAST200 LUN as a "3542 Disk Array Device", or each FAST500 LUN as a "3552 Disk Array Device". The following example shows the results of the command for a set of FAST500 LUNs:

```
# 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

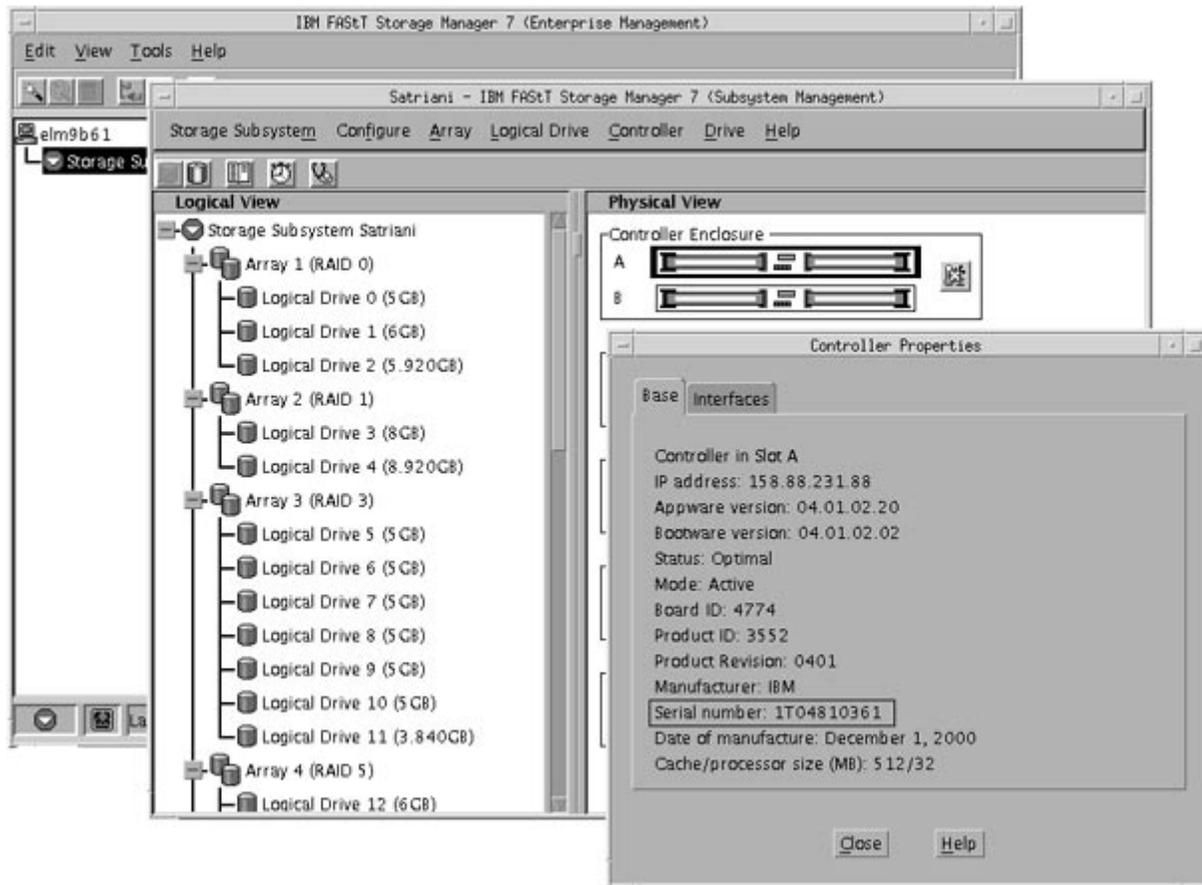
One of the attributes listed by the **lsattr -EI** command is the controller serial number (*controller_SN*) of that dac.

To display the FAST Controller Properties window:

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

Figure 3 shows the Controller Properties window of the controller in slot A. This controller has a serial number of 1T04810361 and is represented by dacl.

```
# lsattr -El dacl
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 3. 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.

Note: The examples in this section show dars of type 3552 in a FAST500 storage subsystem. The dars would be of type 3542 in a FAST200 storage subsystem.

The following example uses the **lsdev** command to show the status of the dar, which represents the entire FAST 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
```

The following example uses the **lsdev** command to show the two dacs that represent the disk array controllers. The third column is the location code column. Two distinct paths are represented by the values 91-08-01 and 11-08-01. Each AIX system has its own set of location codes that describe the internal path of that device, including bus and host-adapter 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
```

The following example uses the **lsdev** command to show that there are eight disks (LUNs) of type 3552 recognized by this AIX host system (this is for a FAST500; disks of type 3542 would be found for a FAST200). 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

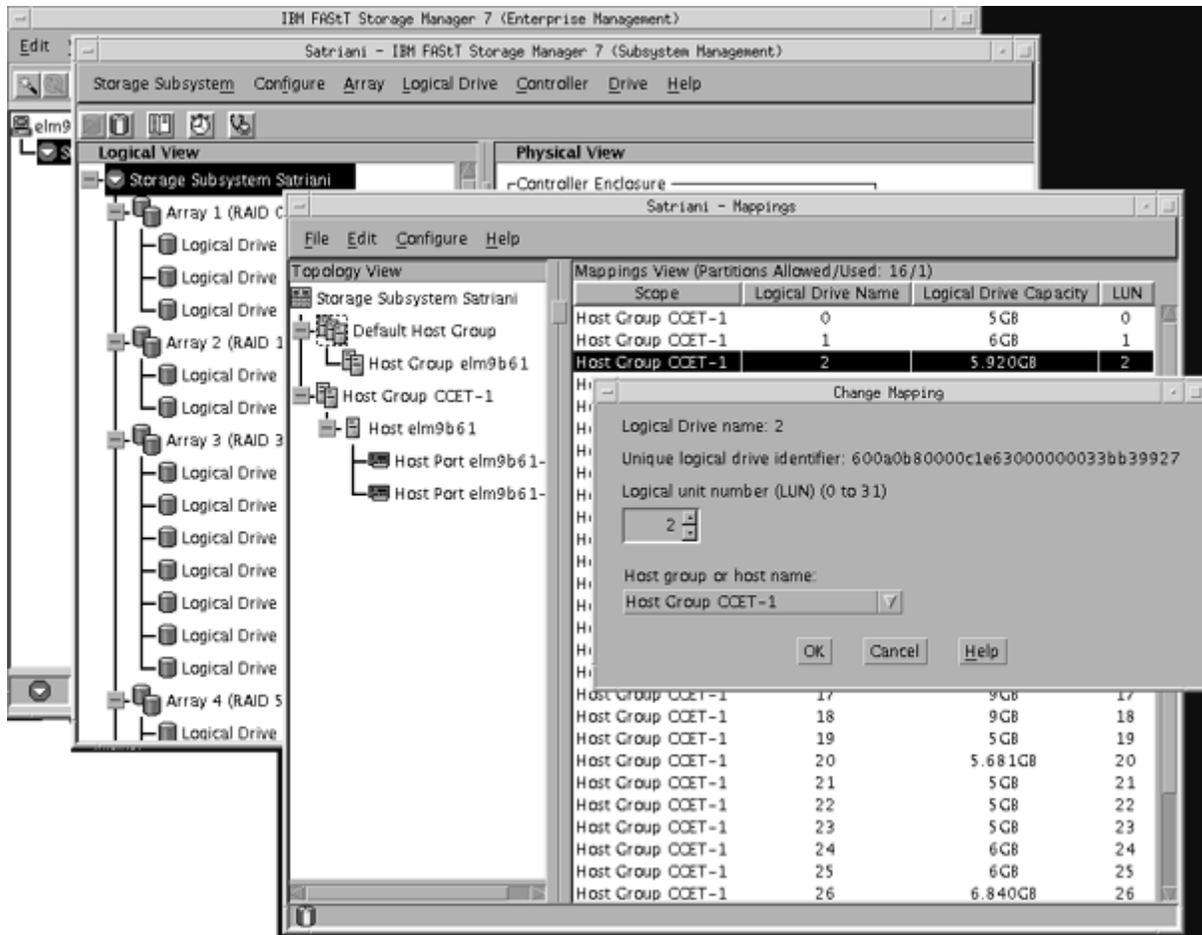
The **lsattr** command provides detailed information about a LUN, including information that allows you to map the system device name to the logical volume on the FASTt storage subsystem.

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 FAStT storage subsystem. The **ieee_volname** and Unique Logical Drive Identifier can be found in the Change Mappings window, which is shown in Figure 4 on page 43. (Open the Change Mappings window from the View Logical Drive-to-LUN Mappings window by right-clicking **Logical Drive Name**→ **Change Mappings**.)



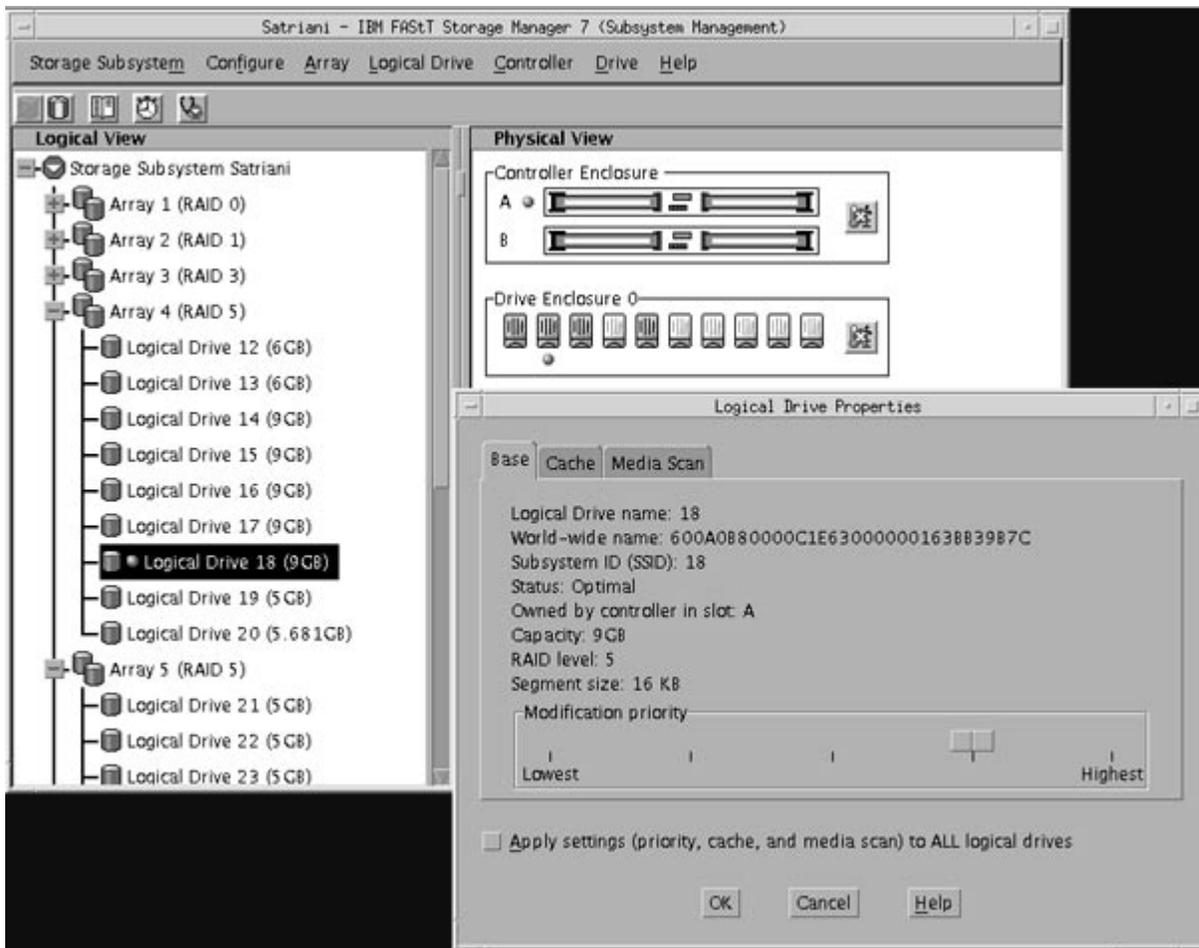
FL00006

Figure 4. 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 5 on page 44.

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 5 on page 44, respectively.

```
# lsattr -El hdisk20
write_cache    yes                Write Caching enabled           True
size          9216                Size in Mbytes                  False
raid_level1   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 5. 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 **controller B**, and then 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
```

Creating a direct-attached configuration

Storage Manager 7.10 supports FAStT200 and FAStT500 storage servers in direct-attached AIX (4.3.3 or 5.1) configurations.

To create a direct-attached configuration, you must ensure that:

- One or two AIX servers can be connected to the FAStT storage server.
 - FAStT200 can support one AIX server.
 - FAStT500 can support two AIX servers.
- Two server FAStT500 configurations require four host-side mini-hubs, each with exactly one FC connection from each HBA to a mini-hub.
- There are two or four HBAs (FC 6227 or FC 6228) per FAStT storage server. Each pair must be configured to one FAStT partition.
- No external hubs are being used.

To set up a direct-attached configuration, follow these steps:

1. Connect the HBAs to each controller or mini-hub port of the FAStT storage server.
2. Start the system.
3. Configure the devices as usual.

Chapter 5. Specific information for HP-UX operating systems

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

Note: An HP-UX system cannot be in a heterogeneous environment that includes AIX systems. For more information, see Chapter 8, “Setting up the storage subsystem in a heterogeneous environment” on page 67.

Preparing for installation and system requirements

For system-level hardware and software requirements, see Appendix A, “HP-UX system requirements” on page 75.

Additional hardware requirements

Table 10 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 10. Supported versions of hardware for HP-UX systems

| Product Name | Model | Product release and firmware version |
|--|--------------|--|
| IBM FASt500 RAID Controller Enclosure Unit | 3552-1RU | Firmware 04.01.02.30, NVSRAM NV3552R710NT008 |
| IBM FASt500 EXP500 Storage Expansion Unit | 3560-1RU | ESM 9163, ESM 9165 |
| IBM FASt200 RAID and Storage Unit, Single Controller | 3542-1RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| IBM FASt200 RAID and Storage Unit, Double Controller | 3542-2RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| 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 one of the following Web sites to ensure that you have the latest versions of the firmware, NVSRAM, disk drive firmware, and host adapter device drivers:

ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt200
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500

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 6 shows the information that you need to record.

```
--- Logical volumes ---
LV Name                /dev/vg08/lvo11
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
```

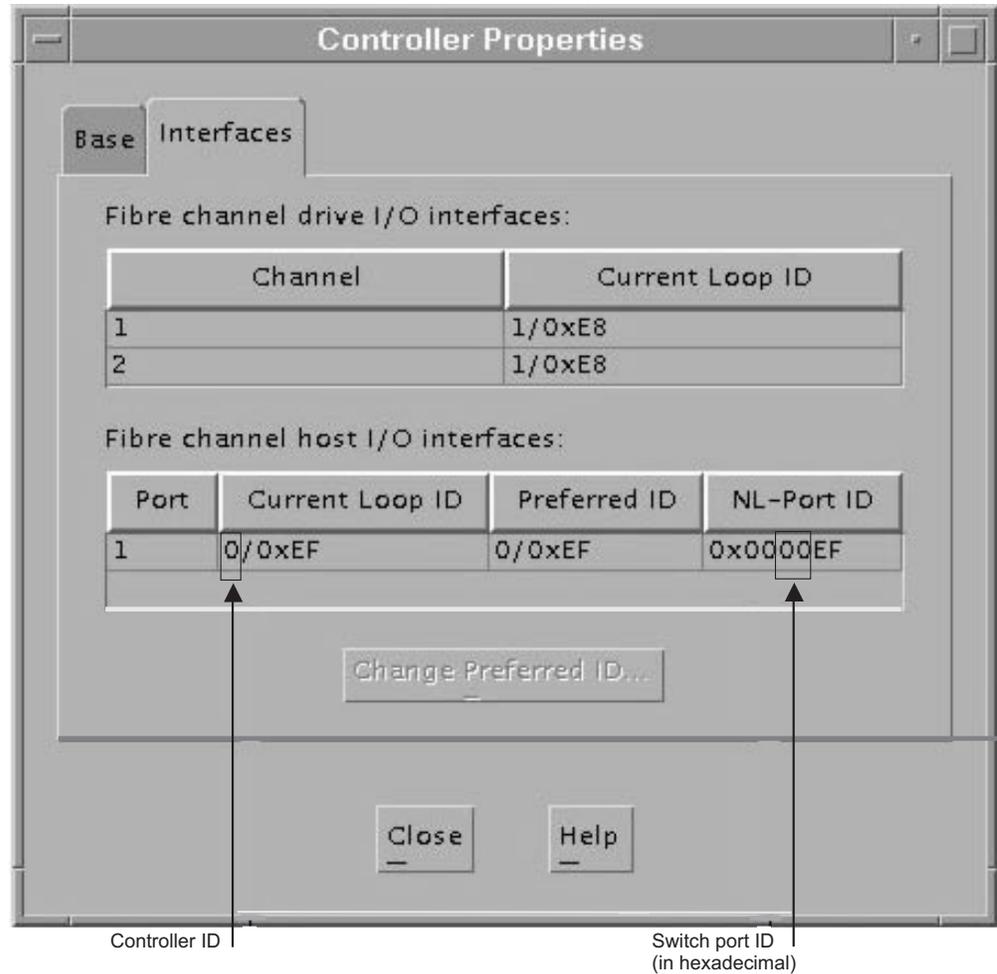
BT000096

Figure 6. 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 7 on page 49.



BT000102

Figure 7. 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 8 on page 50.

| 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 lan 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 | IBM INF-01-00 |
| disk | 130 | 8/12.8.0.2.0.0.0 | sdisk | 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 | IBM INF-01-00 |
| 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 '2' in the ext_bus row.
 - Controller ID number: points to '8' in the H/W Path column of the first row.
 - Target address: points to '8/12.8.0.2.0.0' in the target row.
 - LUN number: points to '0' in the disk row.
 - Switch port ID number: points to '0' in the I column of the first row.

BT000097

Figure 8. 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>

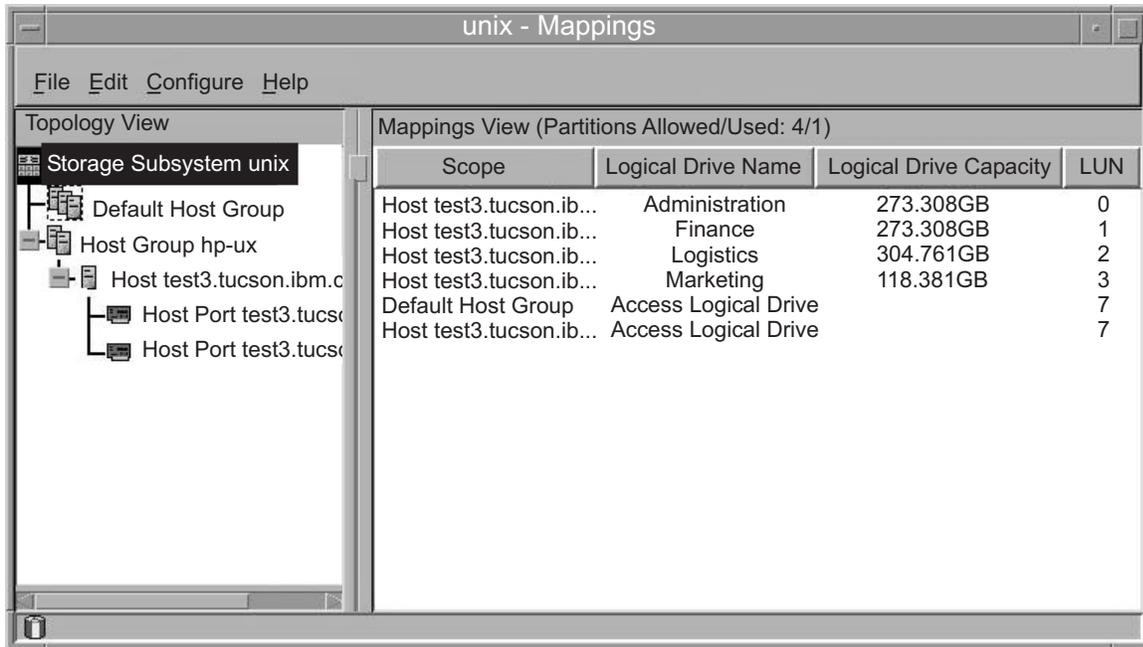
Represents the target address

<z>

Represents the LUN number

For example, disk 130 in Figure 8 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 9 on page 51). 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 9. Mappings window

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

Figure 10 on page 52 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 10 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 FASTT 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 10. 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 77.

Note: SM7client is supported on Solaris 8 only.

Additional hardware requirements

Table 11 lists the supported versions of hardware to use with Storage Manager 7.10.

Table 11. Supported versions of hardware for Solaris systems

| Product Name | Model | Product release and firmware version |
|---|-------------------------|--|
| IBM FAStT500 RAID Controller Enclosure Unit | 3552-1RU | Firmware 04.01.02.30, NVSRAM NV3552R710NT008 |
| IBM FAStT500 EXP500 Storage Expansion Unit | 3560-1RU | ESM 9163, ESM 9165 |
| IBM FAStT200 RAID and Storage Unit, Single Controller | 3542-1RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| IBM FAStT200 RAID and Storage Unit, Double Controller | 3542-2RU | Firmware 04.01.02.30, NVSRAM NV3542R710NT014 |
| JNI FC Adapter | FC64-1063 | fcaw2.5.pkg |
| JNI FC Adapter | FCE-1063 S-bus | JNIC.pkg, version 4.1 |
| JNI FC Adapter | FCE-1063 S-bus 64 bit | JNIC.pkg, version 4.1 |
| JNI FC Adapter | FCE-1473 S-bus 64 bit | JNIC146x.pkg, version 5.1 |
| JNI FC Adapter | FCE-6410-N 33 Mhz | JNIC.pkg, version 4.1 |
| JNI FC Adapter | FCE-6460-PCI 64 bit | JNIC146x.pkg, version 5.1 |
| JNI FC Adapter | FCE2-1063 S-bus 64 bit | JNIC.pkg, version 4.1 |
| JNI FC Adapter | FCE2-6412 66 Mhz 64 bit | JNIC.pkg, version 4.1 |
| JNI FC Adapter | FCI-1063 | fca-pci.2.5.pkg |
| Brocade switch | FC 2109 | 2.4.1.f |
| 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 |

Variable settings for JNI adapter cards

Table 12 lists the configuration file for each JNI adapter driver package.

Table 12. JNI adapter configuration files

| JNI adapter driver package | Configuration file |
|----------------------------|---------------------------|
| fcaw2.5.pkg | /kernel/drv/fcaw.conf |
| fca-pci.2.5.pkg | /kernel/drv/fca-pci.conf |
| JNIC.pkg, version 4.1 | /kernel/drv/jnic.conf |
| JNIC146x.pkg, version 5.1 | /kernel/drv/jnic146x.conf |

Ensure that the configuration file for your adapter meets the following criteria:

- The *FCLoopEnabled* and *FcFabricEnabled* variables must be set appropriately for your configuration; see the configuration file for details.
- If the *fca_nport* variable is in the file, set it to 1.
- If the *ip-disable* variable is in the file, set it to 1.
- In *jni*.conf* files, set *BusyRetryDelay* to 5000.
- In *fca*.conf* files, set *scsi_probe_delay* to 5000.
- The lines that contain these variables must be uncommented and set to the specified values:
 - *failover* or *FailoverDelay*, set to 30
 - *JniCreationDelay*, set to 10
 - *def_wwnn_binding*, remove the dollar-sign character (\$) from the line
 - *def_wwpn_binding*
 - *def_hba_binding*

Note: When the RDAC software is installed, the *def_hba_binding* variable in the *fca-pci.conf* and *fcaw.conf* files is set to *nonjni*. This is the correct behavior.

In all configuration files, set the following variables to the specified values:

- *target0_hba*, set to *jnic0* in the *jnic.conf* file, or to *jnic146x0* in the *jnic146x.conf* file.
- *target_wwpn*, set to the *wwpn* of the first controller (see the */var/adm/messages* file).
- *target1_hba*, set to *jnic1* in the *jnic.conf* file, or to *jnic146x1* in the *jnic146x.conf* file.
- *target1_wwpn*, set to the *wwpn* of the second controller (see the */var/adm/messages* file).

If you made any changes to the configuration file, type the following command to halt the host system:

```
# halt
```

When the OK prompt displays, type the following command to restart the host system:

```
# boot -r
```

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).

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 13.

Table 13. 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 | FAStT 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 67.

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” on page 60.

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 data 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 13 on page 57 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” on page 60.

Setting the Residual Reservation parameter

On a new storage system, or any time that the NVSRAM has been updated, the Residual Reservation parameter in NVSRAM needs to be set or reset. This is required in high-availability configurations, and when you use High Availability Cluster Multiprocessing (HACMP), Parallel System Support Programs (PSSP), or General Parallel File System (GPFS) software on pSeries or AIX servers.

To set or reset the Residual Reservation parameter, you must first download a script file to a location where the Storage Manager client can access it. Use the following procedure to download the script file from any server or OS type and directory structure and then to set or reset the Residual Reservation parameter:

1. Download the resrel.scr script from the following Web site:
ssddom02.storage.ibm.com/techsup/webnav.nsf/support/fastt500
2. Start the storage management software.
3. In the Enterprise Management window, highlight the storage system on which you want to set the Residual Reservation parameter.
4. Click **Tools** → **Execute Script**.
The Script Editor window opens.
5. Click **File** → **Load Script**.
The Load Script window opens.
6. Select resrel.scr from the Storage Manager client.
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.

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” on page 61.

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 67), refer to the *IBM FAS*St*T 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. Start the client software:
 - If you are using a Windows workstation, click **Start** → **Programs** → **FAS*St*T Storage Manager 7 Client**.
 - If you are using a UNIX-based system, 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 11 on page 62).

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



BT000104

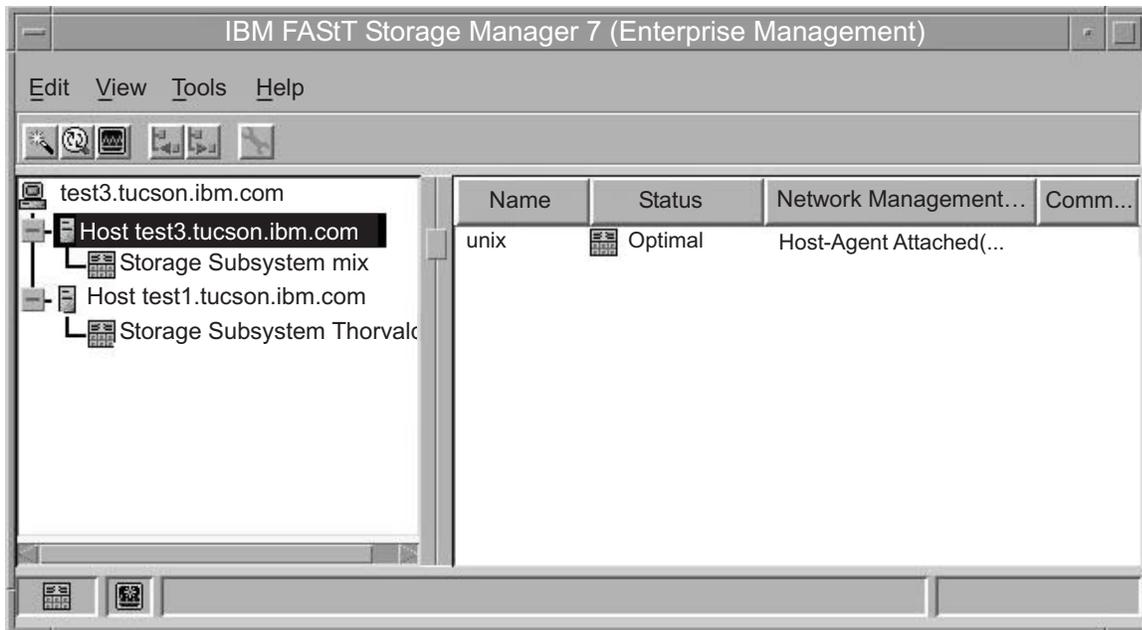
Figure 11. Initial Automatic Discovery window

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 8, 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 12 on page 63).



BT000105

Figure 12. 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”.

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 FASiT 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”.

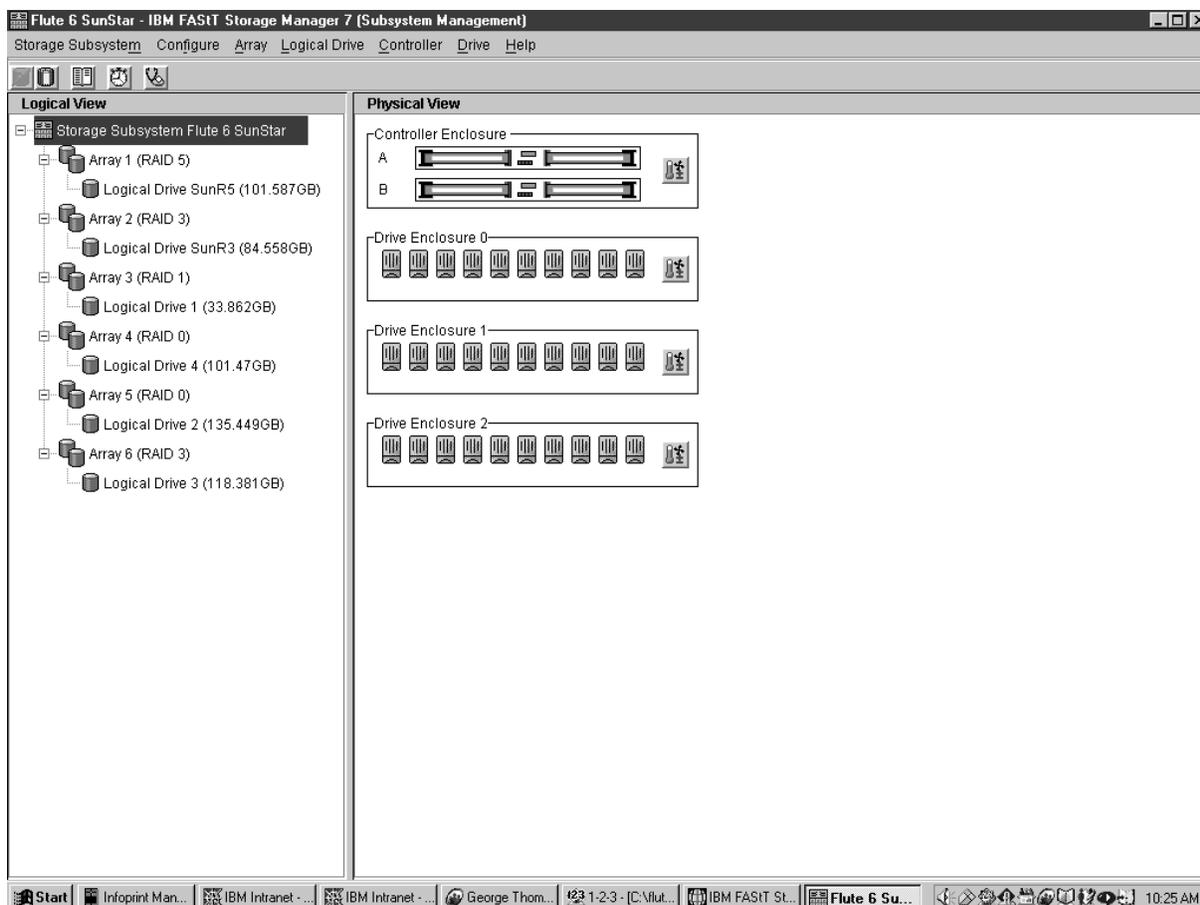
Starting the Subsystem Management window

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 13 on page 65).

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



BT000106

Figure 13. Subsystem Management window

Renaming storage subsystems

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

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 25 for installation instructions.

Setting IBM SAN fibre-channel switches

This section contains information about setting IBM SAN fibre-channel switches to work correctly with the Storage Manager 7.10 in any UNIX or AIX environment.

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 be set using the Ethernet port of the switch or the front panel of the switch. For detailed instructions, see the user’s guide for your switch.
- 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. Because the worldwide name is subject to change when the host is restarted, specify members by port name when you set up a zone.

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 25.

For switch zoning information, see “Setting IBM SAN fibre-channel switches” on page 66, 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 controllers
 - All attached drive enclosures
3. If an AIX host is part of the network configuration that uses the FAStT controller, then AVT/ADT, also known as the Automatic Logical Drive Transfer (ADT), must be disabled. See “Disabling AVT/ADT” on page 58.

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 server 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 3542 (for FAStT200) or the 3552 (for FAStT500), find and perform these steps:

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

Note: FAStT storage servers support up to 16 partitions and are 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 15 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 22 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 47
- Chapter 6, “Specific information for Solaris operating systems” on page 53

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

The high-availability clustering services provided by Storage Manager 7.10 allow 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 and 2.0 on Solaris systems
- Veritas Volume Manager 3.1 and 3.2 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

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

This section provides information about Veritas Volume Manager, RDAC IDs, and single points of failure.

Veritas Volume Manager and Data Multipathing (DMP)

If you are using the Veritas Volume Manager, you must disable DMP either for all devices, or for just FASTT storage servers, depending on your version of the Veritas Volume Manager.

For Veritas Volume Manager 3.1 or earlier, follow these steps to disable DMP for all devices:

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.

For Veritas Volume Manager 3.2 and later, you must disable DMP for FASTT storage servers only. Use option 17 and then option 5 of the submenu of the **vxdiskadm** utility to do so. Other devices can use DMP.

RDAC IDs

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

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

```
# vi /etc/symasm/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/symasm/rmparms` file.

Single points of failure

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.

Prerequisites for pSeries with FASTT500 HACMP support

The following section contains general software requirements for High Availability Cluster Multiprocessing (HACMP) support on the FASTT500 with Storage Manager.

HACMP support for FASTT500 with Storage Manager

HACMP support for FASTT500 with Storage Manager requires the following software:

- Storage Manager 7.10
- HACMP 4.4.1
- AIX 5.1 with the PTF filesets described in Table 3 on page 25.
- AIX 4.3.3 with the PTF filesets described in Table 2 on page 25.

Concurrent mode configuration

Figure 14 illustrates a concurrent mode system configuration in practical use.

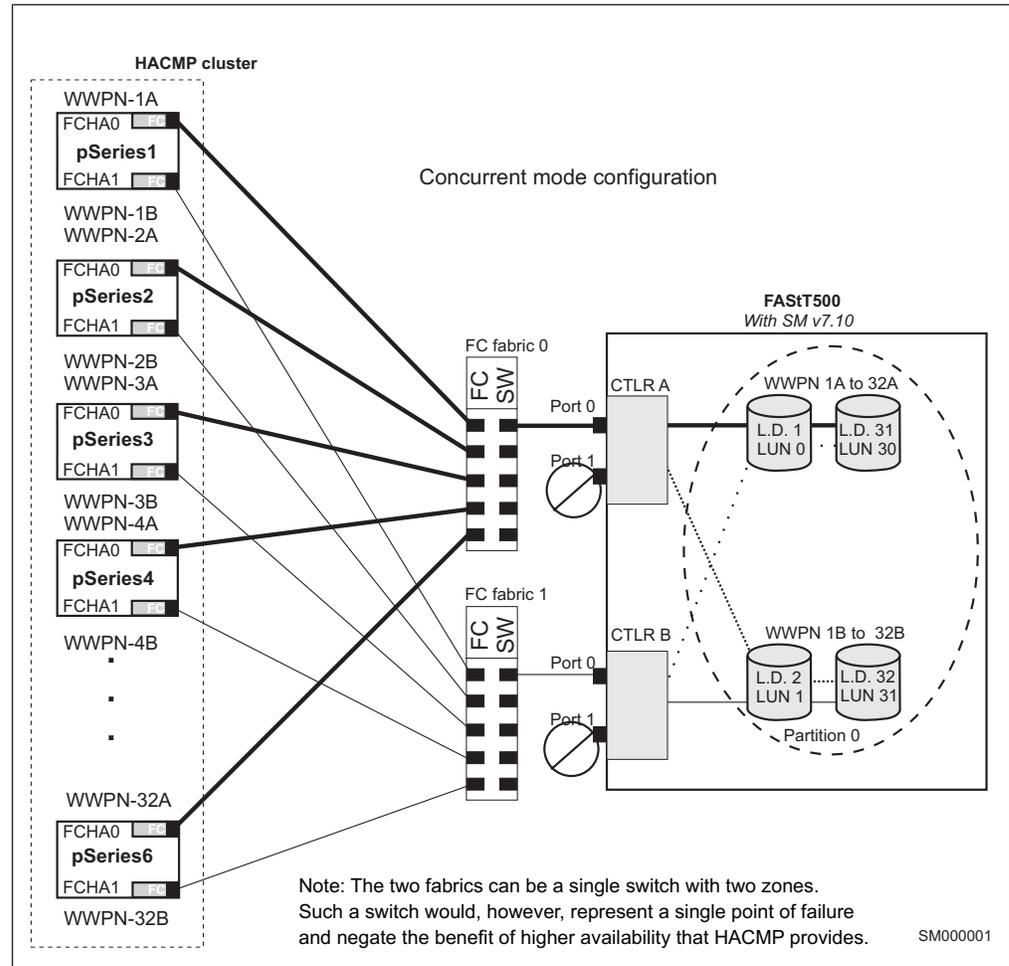


Figure 14. Concurrent mode configuration

HACMP support for FAST500 with Storage Manager, configured to run concurrent mode, has the following system requirements:

- Storage Manager 7.10
- HACMP 4.4.1 with ES CRM
- APARs IY31483 and IY31489
- All disks on the FAST500 reside in concurrent LVM volume groups.
- All AIX hosts that are attached to the FAST500 reside in the same HA cluster.
- The FAST500 has no heterogeneous host attachments.
- Oracle Parallel Server or analogous software.

For information about support of other configuration modes, contact your IBM sales representative.

Setting the Residual Reservation parameter

The Residual Reservation parameter in NVSRAM needs to be set or reset when you use High Availability Cluster Multiprocessing (HACMP), Parallel System Support

Programs (PSSP), or General Parallel File System (GPFS) on pSeries or AIX servers. To set or reset this parameter, follow the procedure outlined in “Setting the Residual Reservation parameter” on page 59.

Prerequisites for pSeries with FASt500 PSSP and GPFS support

The following section contains general software requirements for Parallel System Support Programs (PSSP) and General Parallel File System (GPFS) support on the FASt500 with Storage Manager.

PSSP and GPSF support for FASt500 with Storage Manager 7.10

PSSP or GPSF support for FASt500 with Storage Manager requires the following software:

- Storage Manager 7.10
- PSSP 3.2 and GPFS 1.4, which is supported with AIX 4.3. PSSP 3.2 APAR IY31012 (PTF 20)
- PSSP 3.4 or GPFS 1.5, which is supported with AIX 4.3 and AIX 5.1. PSSP 3.4 APAR IY31025 (PTF 9)
- AIX 4.3 with the PTF fileset that is described in Table 3 on page 25.
- AIX 5.1 with the PTF fileset that is described in Table 2 on page 25.

Storage Manager 7.10 supports PSSP and GPSF in the following FASt500 storage server configurations.

- Each FASt500 can be configured with up to four partitions.
- Each FASt500 partition can be configured with up to two (R)VSD servers per FASt partition.
- Each server must have only two fibre-channel connections and only one connection per FASt controller blade, attached to each FASt500 system. These two connections must be made using two fibre-channel host adapters. Multiple FASt500s can be attached using these same two host adapters (fan out) or by adding additional host bus adapter (HBA) pairs.
- Distribute the two connections across separate SAN fabrics to achieve highest availability and to minimize the effects of a SAN fabric failure.

GPFS configuration

Figure 15 on page 73 illustrates a FASt500 configured with four partitions and four GPFS clusters.

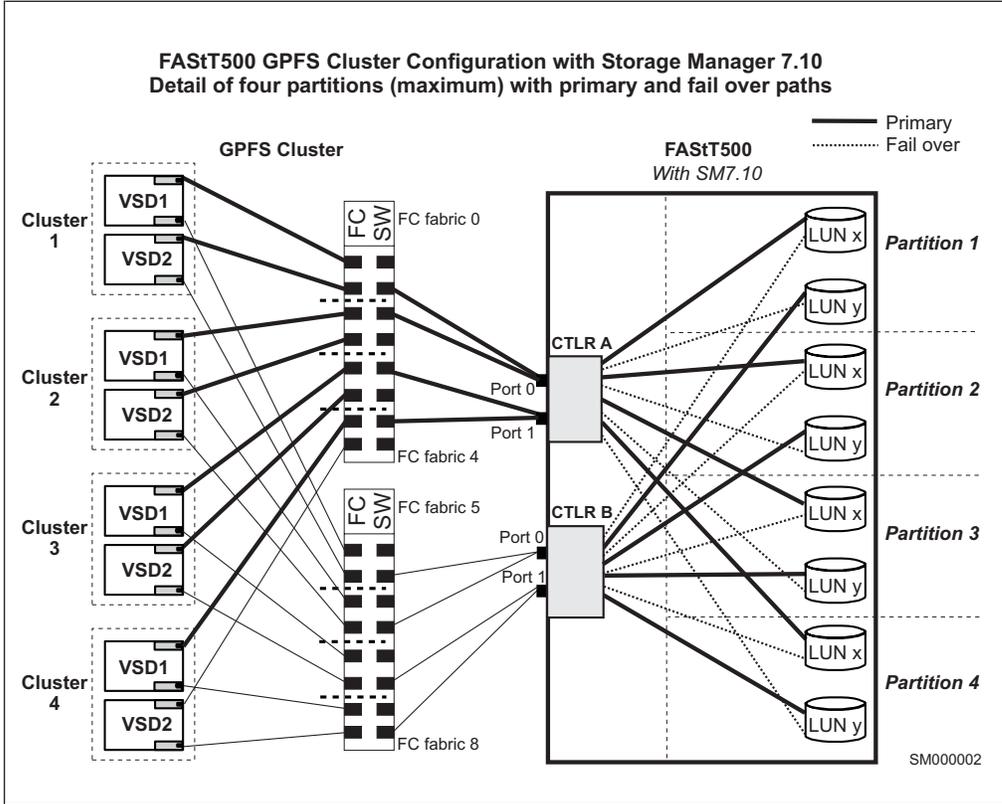


Figure 15. GPFS four-cluster configuration

Figure 16 illustrates a FASt500 configured with two partitions and two GPFS clusters.

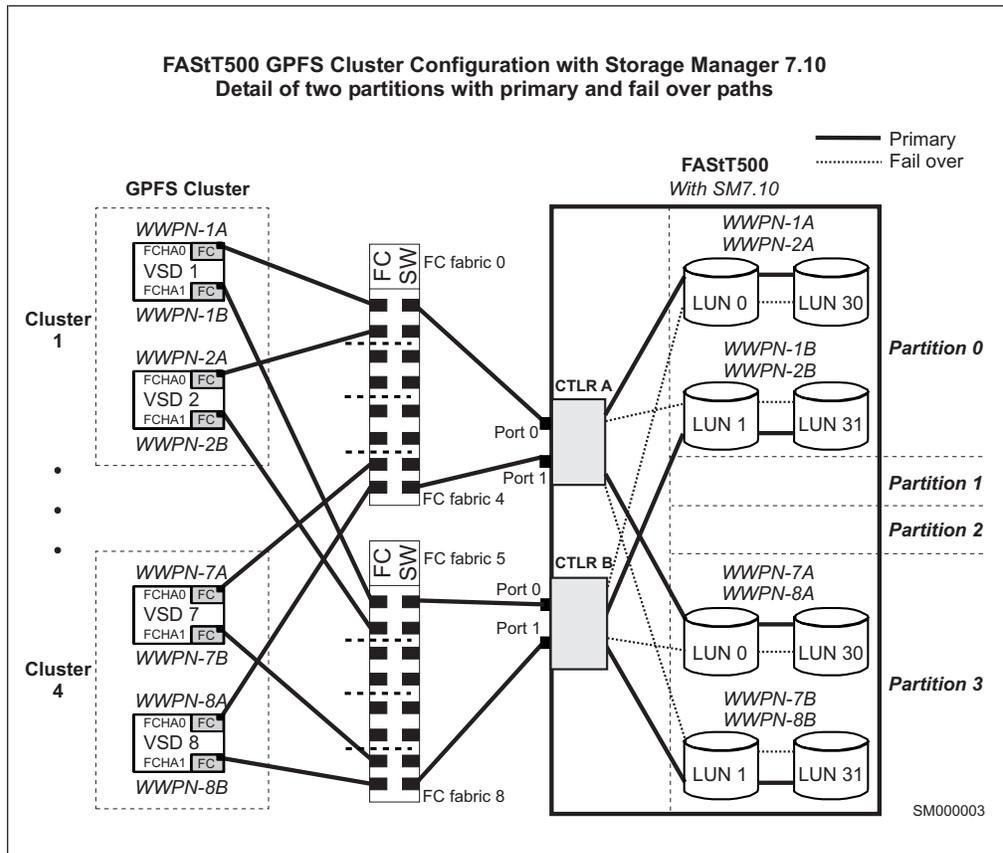


Figure 16. GPFS two-cluster configuration

Setting the Residual Reservation parameter

The Residual Reservation parameter in NVSRAM needs to be set or reset when you use High Availability Cluster Multiprocessing (HACMP), Parallel System Support Programs (PSSP), or General Parallel File System (GPFS) on pSeries or AIX servers. To set or reset this parameter, follow the procedure outlined in “Setting the Residual Reservation parameter” on page 59.

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 FAST200 or FAST500 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
- 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 11.0 (32 bit or 64 bit) with the following patches:
 - B.11.00.53.2
 - B.11.00.53.8
 - PHKL_23939, version 1.0
 - PHKL_24004, version 1.0
 - PHKL_24027, version 1.0
 - PHKL_24612, version 1.0
 - 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
- HP-UX 11.11 and HP-UX 11i with the following patches:
 - B.11.11.09
 - PHKL_25304
 - PHKL_25375
 - PHKL_25896
- For high-availability clusters of HP 9000/Series 800 computers, install the HP MC/Service Guard software package

Ensure that the following maximum kernel parameters are configured, as shown in Table 14 on page 76.

Table 14. 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 FAST200 or FAST500 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

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.

Note: SM7client is supported by Solaris 8 only. SM7util and RDAC are supported by Solaris 2.6, 7, and 8.

- Solaris 2.6 with the following patches:
 - 105181-31
 - 105356-18
 - 106429-02
- Solaris 7 with the following patches:
 - 106541-19
 - 107544-03
 - 108376-34
- Solaris 8 with the following patches:
 - 108528-13
 - 111293-04
 - 111310-01
 - 112334-01
- For high-availability clusters of Sparc S20 systems, install the Veritas Cluster Server software package

Notices

This publication was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.*

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATIONS "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publications. IBM may make improvements or changes (or both) in the product(s) or program(s) (or both), described in this publication at any time without notice.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

IBM
AIX
e(logo)
Netfinity

Microsoft, Windows, and Windows NT are registered trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

IBM agreement for licensed internal code

You accept the terms of this Agreement¹ by your initial use of a machine that contains IBM Licensed Internal Code (called “Code”). These terms apply to Code used by certain Machines IBM or your reseller specifies (called “Specific Machines”). International Business Machines Corporation or one of its subsidiaries (“IBM”) owns copyrights in Code or has the right to license Code. IBM or a third party owns all copies of Code, including all copies made from them.

If you are the rightful possessor of a Specific Machine, IBM grants you a license to use the Code (or any replacement IBM provides) on, or in conjunction with, only the Specific Machine for which the Code is provided. IBM licenses the Code to only one rightful possessor at a time.

Under each license, IBM authorizes you to do only the following:

1. execute the Code to enable the Specific Machine to function according to its Official Published Specifications (called “Specifications”);
2. make a backup or archival copy of the Code (unless IBM makes one available for your use), provided you reproduce the copyright notice and any other legend of ownership on the copy. You may use the copy only to replace the original, when necessary; and
3. execute and display the Code as necessary to maintain the Specific Machine.

You agree to acquire any replacement for, or additional copy of, Code directly from IBM in accordance with IBM’s standard policies and practices. You also agree to use that Code under these terms.

You may transfer possession of the Code to another party only with the transfer of the Specific Machine. If you do so, you must 1) destroy all your copies of the Code that were not provided by IBM, 2) either give the other party all your IBM-provided copies of the Code or destroy them, and 3) notify the other party of these terms. IBM licenses the other party when it accepts these terms. These terms apply to all Code you acquire from any source.

Your license terminates when you no longer rightfully possess the Specific Machine.

Actions you must not take

You agree to use the Code only as authorized above. You must not do, for example, any of the following:

1. Form Z125-4144

1. Otherwise copy, display, transfer, adapt, modify, or distribute the Code (electronically or otherwise), except as IBM may authorize in the Specific Machine's Specifications or in writing to you;
2. Reverse assemble, reverse compile, or otherwise translate the Code unless expressly permitted by applicable law without the possibility of contractual waiver;
3. Sublicense or assign the license for the Code; or
4. Lease the Code or any copy of it.

Glossary

This glossary includes terms for the IBM FASTT Storage Manager Version 7.10 for 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.

Abstract Windowing Toolkit (AWT).. A Java graphical user interface (GUI).

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. See *Abstract Windowing Toolkit*.

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).

field replaceable unit. An assembly that is replaced in its entirety when any one of its components fails. In some cases, a field replaceable unit might contain other field replaceable units.

FRU. See *field replaceable unit*.

GUI. An acronym for 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. An acronym for Java runtime environment.

LAN. See *local area network*.

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

local area network (LAN). A computer network located on a user's premises within a limited geographic area.

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. An acronym for network management station.

NVSRAM. An acronym for nonvolatile storage random access memory.

ODM. An acronym for Object Data Manager.

PDF. An acronym for portable document format.

program temporary fix (PTF). A temporary solution or bypass of a problem diagnosed by IBM in a current unaltered release of a program.

PTF. See *program temporary fix*.

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 communication 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 communication 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*.

Index

A

- about this document xi
- access volumes 3, 7, 15
- actions you must not take 80
- address
 - for e-mail comments xiii
 - for reader comment form xiii
 - of IBM xiii
 - of the IBM director of licensing 79
- agent software
 - installing 27
 - package 4
 - requirements 27
- agreement for licensed internal code 80
- AIX
 - access volumes, deleting 15
 - AVT/ADT, disabling 3, 14
 - client software
 - installing 11
 - procedure 12
 - requirements 11
 - configuration 13, 33
 - direct-attached configuration 3, 45
 - firmware
 - requirements 31
 - upgrading 14
 - verifying 26
 - hardware requirements 31
 - host software
 - installing 25
 - procedure 26
 - requirements 25
 - identifying
 - controller ID numbers 38
 - device names and bus numbers 39
 - logical drives by operating system device names 41
 - LUNs, redistributing in case of failure 44
 - NVSRAM
 - requirements 31
 - upgrading 14
 - operating system requirements 8
 - RDAC driver
 - configuring 33
 - installing 26, 33
 - requirements 3, 25, 32
 - requirements
 - client software 11
 - hardware 31
 - host software 25
 - operating system 8
 - RDAC driver 3, 25, 32
 - software 31
 - system 31
 - restrictions 3, 5, 7, 32
 - software requirements 31
 - system requirements 31

- alert notifications, configuring 63
- attributes
 - dac 34, 37
 - dar 33, 34, 35
 - definitions 35
 - hdisk 34, 35, 37
 - LUN 34, 35, 37
 - RDAC driver 33
- audience of this document xi
- AVT/ADT
 - description 2
 - disabling 14, 22, 58
 - enabling
 - multipath driver 57
 - no multipath driver 58
 - procedure 59

B

- books xii, 1, 2
- bus numbers and device names, identifying 39, 49

C

- changing the host type 60
- client software
 - AIX
 - installing 11
 - requirements 11
 - HP-UX
 - installing 16
 - requirements 16
 - package 4, 11
 - Solaris
 - installing 19
 - requirements 20
 - uninstalling 54
- cluster services
 - configurations 61
 - description 3
 - FASTt500 70
 - HACMP support 70
 - hardware requirements 69
 - HP-UX requirements 69
 - MC/Service Guard 69
 - software requirements 70
 - Solaris requirements 69, 70
 - system dependencies 69
 - Veritas Cluster Server 69
 - Veritas Volume Manager 69, 70
- command line interface 3
- commands
 - fget_config 40
 - lsattr 41
 - lsdev 40
- comments about this document, how to send xiii
- concurrent mode 71

- configuration replication 2
- configuring
 - AIX 33
 - alert notifications 63
 - direct-attached 3, 45
 - RDAC driver 33, 70
 - Solaris with JNI host bus adapter cards 54, 55
 - storage subsystems
 - AIX 3, 13, 45
 - HP-UX 17
 - procedures 61
 - Solaris 21
- controllers
 - diagnostics 3
 - firmware 1, 13, 17, 21, 26
 - ID numbers, identifying 38, 48
 - IP addresses 8
 - properties 48
 - volumes 2
- creating a direct-attached configuration 45

D

- dac attributes 34, 37
- dar attributes 33, 34, 35
- deleting access volumes, AIX 15
- devices
 - identification 38
 - names and bus numbers, identifying 39, 49
 - Solaris, default partitioning for 54
- diagnostics, controller 3
- direct (out-of-band) management method 7
- direct-attached configuration 3, 45
- disabling AVT/ADT 14, 22, 58
- documentation
 - books xii, 2
 - documents 1
 - files 1
 - hardware 2
 - online help xii, 1, 63, 65
 - Web sites xii, xiii, 1
- drives
 - AIX, identifying by operating system device names 41
 - HP-UX
 - identifying by operating system device names 51
 - identifying paths to 47, 51

E

- e-mail address xiii, 63
- edition notice ii
- enabling AVT/ADT 57, 58, 59
- Enterprise Management window
 - description 4
 - figure of 62
 - online help 1
 - starting 61
- event monitoring 2

F

- failover
 - options, by operating system 57
 - protection 3, 57
 - settings 57
- failure support
 - cluster services 3, 69
 - RDAC driver 3, 5
 - redistributing LUNs 44
- FASTT, introduction to 8
- fget_config command 40
- filesets, PTF 12, 25, 32
- firmware
 - AIX
 - requirements 31
 - upgrading 14
 - verifying 26
 - description 1
 - HP-UX
 - requirements 47
 - upgrading 18
 - Solaris
 - requirements 53
 - upgrading 21
 - versions 13, 17, 21

G

- general documentation 1
- GPFS
 - software requirements 72
- GPFS four-cluster configuration 72
- GPFS Support
 - FAST500 72
- GPFS two-cluster configuration 74
- GPSF
 - requirements 72

H

- HACMP
 - cluster services requirements 70
 - requirements
 - cluster services 70
- hardware documentation 2
- hardware requirements
 - AIX 31
 - HP-UX 47, 75
 - Solaris 53, 77
- hdisk attributes 34, 35, 37
- help xii, 1, 63, 65
- heterogeneous environment 2, 60, 67
- high-availability cluster services 3, 69
- host software
 - AIX 25
 - HP-UX 26
 - packages 4
 - Solaris 28
- host type 56, 60
- host-agent (in-band) management method 5

how this document is organized xi

how to send your comments xiii

HP-UX

agent software

installing 27

procedure 27

requirements 27

AVT/ADT requirements 3

client software

installing 16

procedure 16

requirements 16

cluster services, requirements 69

configuration of storage subsystem 17

firmware

requirements 47

upgrading 18

hardware requirements 47, 75

host software

installing 26

procedure 27

identifying

controller ID numbers 48

device names and bus numbers 49

logical drives by operating system device

names 51

paths to storage subsystem logical drives 47, 51

NVSRAM

requirements 47

upgrading 18

operating system requirements 8

requirements

agent software 27

AVT/ADT 3

client software 16

cluster services 69

firmware 47

hardware 47, 75

NVSRAM 47

operating system 8

software 75

system 75

utility software 26

software requirements 75

system requirements 75

utility software

installing 26

procedure 27

requirements 26

HyperTerminal version 9

I

IBM

address xiii

agreement for licensed internal code 80

director of licensing address 79

e-mail address xiii, 63

identifying

AIX

controller ID numbers 38

identifying (*continued*)

AIX (*continued*)

device names and bus numbers 39

logical drives by operating system device

names 41

HP-UX

controller ID numbers 48

device names and bus numbers 49

logical drives by operating system device

names 51

paths to storage subsystem logical drives 47, 51

in-band (host-agent) management method 5

index.pdf 1

installing

AIX

client software 11

host software 25

RDAC driver 26

host software 25

HP-UX

agent software 27

client software 16

host software 26

utility software 26

post-installation tasks 57

sequence of 4

Solaris

client software 19

host software 28

RDAC driver 29

utility software 30

storage management station software 11

IP addresses for FASTt controllers 8

J

JNI host bus adapter cards 54, 55

L

licensed internal code, agreement 80

logical drives

AIX, identifying by operating system device

names 41

HP-UX

identifying by operating system device names 51

identifying paths to 47, 51

lsattr command 41

lsdev command 40

LUNs

and access volumes 7

attributes 34, 35, 37

redistributing in case of failure 44

M

management method

direct (out-of-band) 7

host-agent (in-band) 5

management station 11

management station (*continued*)
 See storage management station
Mappings window 50
MC/Service Guard 69

N

notices
 edition ii
 general 79
NVSRAM
 AIX
 requirements 31
 upgrading 14
 HP-UX
 requirements 47
 upgrading 18
 Solaris
 requirements 53
 upgrading 22

O

online help xii, 1, 63, 65
operating system
 AIX 8, 31
 failover options 57
 HP-UX 8, 47, 75
 Solaris 8, 53, 77
organization of this document xi
out-of-band (direct) management method 7

P

partitioning for Solaris devices 54
paths to storage subsystem logical drives,
 identifying 47, 51
PDF files, descriptions of 1
prerequisites
 AIX
 client software 11
 firmware 31
 hardware 31
 host software 25
 operating system 8
 RDAC driver 3, 25, 32
 software 31
 system 31
 cluster services 69, 70
 GPFS 72
 HACMP
 cluster services 70
 HP-UX
 agent software 27
 AVT/ADT 3
 client software 16
 cluster services 69
 firmware 47
 hardware 47, 75
 NVSRAM 47
 operating system 8

prerequisites (*continued*)
 HP-UX (*continued*)
 software 75
 system 75
 utility software 26
 PSSP 72
 Solaris
 client software 20
 cluster services 69, 70
 firmware 53
 hardware 53, 77
 host software 28
 NVSRAM 53
 operating system 8
 RDAC driver 3, 28
 software 77
 system 77
 utility software 28
 products, developed 79
 prohibited actions 80
 protection, failover 57
 PSSP
 requirements 72
 software requirements 72
 PSSP Support
 FAST500 72
 PTF filesets 12, 25, 32

R

RDAC driver
 AIX
 configuring 33
 installing 26, 33
 requirements 3, 25, 32
 attributes 33
 description 3, 5
 IDs 70
 Solaris
 installing 29
 requirements 3, 28
 uninstalling 54
reader comment form xiii
README.txt file 1
related publications xii
requirements
 AIX
 client software 11
 firmware 31
 hardware 31
 host software 25
 operating system 8
 RDAC driver 3, 25, 32
 software 31
 system 31
 cluster services 69, 70
 GPFS 72
 HACMP
 cluster services 70
 HP-UX
 agent software 27

- requirements *(continued)*
 - HP-UX *(continued)*
 - AVT/ADT 3
 - client software 16
 - cluster services 69
 - firmware 47
 - hardware 47, 75
 - NVSRAM 47
 - operating system 8
 - software 75
 - system 75
 - utility software 26
 - PSSP 72
 - Solaris
 - client software 20
 - cluster services 69, 70
 - firmware 53
 - hardware 53, 77
 - host software 28
 - NVSRAM 53
 - operating system 8
 - RDAC driver 3, 28
 - software 77
 - system 77
 - utility software 28
- residual reservation parameter 59, 71, 74
- resources
 - documents xii, 1, 2
 - e-mail address xiii, 63
 - files 1
 - online help xii, 1, 63, 65
 - Web sites xii, xiii, 1
- restrictions
 - AIX 3, 5, 7, 32
 - Solaris 3

S

- SAN fibre channel switch, setting 66
- sending your comments to IBM xiii
- services offered in the U.S.A. 79
- setting
 - host type on Solaris 56
 - IBM SAN fibre channel switch 66
 - IP addresses 8
 - NMS for SNMP notification 64
- settings, failover 57
- SM7agent
 - See agent software 4
- SM7client
 - See client software 4
- SM7util
 - See utility software 5
- SNMP notification 64
- software requirements
 - AIX 31
 - HP-UX 75
 - Solaris 77
- Solaris
 - AVT/ADT, disabling 3, 22

- Solaris *(continued)*
 - client software
 - installing 19
 - procedure 20
 - requirements 20
 - uninstalling 54
 - cluster services requirements 69, 70
 - configuration of storage subsystem 21
 - devices, default partitioning 54
 - firmware
 - requirements 53
 - upgrading 21
 - hardware requirements 53, 77
 - host software
 - installing 28
 - procedure 29
 - requirements 28
 - JNI host bus adapter cards 54, 55
 - NVSRAM
 - requirements 53
 - upgrading 22
 - operating system requirements 8
 - RDAC driver
 - installing 29
 - requirements 3, 28
 - uninstalling 54
 - requirements
 - client software 20
 - cluster services 69
 - firmware 53
 - hardware 53, 77
 - host software 28
 - NVSRAM 53
 - operating system 8
 - RDAC driver 3, 28
 - software 77
 - system 77
 - utility software 28
 - restrictions 3
 - setting the host type 56
 - software requirements 77
 - system requirements 77
 - utility software
 - installing 30
 - requirements 28
 - uninstalling 54
- storage management station 1, 11
- Storage Manager software
 - features 2
 - installation sequence 4
 - introduction 1
 - software packages 4
 - uninstalling, Solaris 54
- storage subsystem
 - cluster services 69
 - configuration replication 2
 - configuring
 - AIX 13
 - HP-UX 17
 - procedures 61
 - Solaris 21

- storage subsystem *(continued)*
 - event monitoring 2
 - heterogeneous environment 2, 67
 - introduction 1
 - logical drives
 - identifying by operating system device names 41, 51
 - identifying paths to 47, 51
 - management methods
 - direct (out-of-band) 7
 - host-agent (in-band) 5
 - management tasks 65
 - renaming 65
- Subsystem Management window
 - description 4
 - figure of 64
 - online help 1
 - starting 64
- system requirements
 - AIX 31
 - HP-UX 75
 - Solaris 77

- who should
 - read this document xi
 - use this document xi

T

- trademarks 79

U

- uninstalling Storage Manager software, Solaris 54
- upgrading
 - AIX
 - firmware 14
 - NVSRAM 14
 - HP-UX
 - firmware 18
 - NVSRAM 18
 - Solaris
 - firmware 21
 - NVSRAM 22
- utility software
 - HP-UX
 - installing 26
 - requirements 26
 - package 5
 - Solaris
 - installing 30
 - requirements 28
 - uninstalling 54

V

- variable settings for JNI adapter cards 55
- Veritas Cluster Server 69
- Veritas Volume Manager 69, 70

W

- Web sites xii, xiii, 1

Readers' Comments — We'd Like to Hear from You

IBM FAStT Storage Manager Version 7.10 for
UNIX and AIX Environments
Installation and Support Guide

Publication No. GC26-7475-01

Overall, how satisfied are you with the information in this book?

| | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very Dissatisfied |
|----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Overall satisfaction | <input type="checkbox"/> |

How satisfied are you that the information in this book is:

| | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very Dissatisfied |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Accurate | <input type="checkbox"/> |
| Complete | <input type="checkbox"/> |
| Easy to find | <input type="checkbox"/> |
| Easy to understand | <input type="checkbox"/> |
| Well organized | <input type="checkbox"/> |
| Applicable to your tasks | <input type="checkbox"/> |

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? Yes No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name

Address

Company or Organization

Phone No.



Fold and Tape

Please do not staple

Fold and Tape



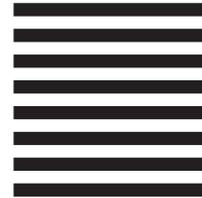
NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
RCF Processing Department
Dept. M86/Bldg. 050-3
5600 Cottle Road
San Jose, CA 95193-0001



Fold and Tape

Please do not staple

Fold and Tape



Printed in U.S.A.

GC26-7475-01



Spine information:



IBM FAStT Storage Manager
Version 7.10 for
UNIX and AIX Environments

Installation and Support Guide