IBM TotalStorage FAStT Storage Manager
Version 8.3

IBM

Installation and Support Guide for Novell NetWare

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> **Note**
>
> Before using this information and the product it supports, read the general information in "Notices" on page 61.

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About this document

This document provides information about setting up, installing, configuring, and working with IBM Fibre Array Storage Technology (FAStT) Storage Manager Version 8.3 in Novell NetWare 6.0 operating-system environments. Use this document to:

- Determine the hardware and software that are required to install the storage management software.
- Integrate the necessary hardware components into your network.
- Install the FAStT Storage Manager software.
- Upgrade the controller firmware, if necessary.
- Identify storage management features that are unique to your specific installation.

Note: Throughout this document, Storage Manager version 8.3 refers to software levels 8.30 or higher.

Who should read this document

This *Installation and Support Guide* is 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.

FAStT installation process overview

The following flow chart gives an overview of the installation process for the FAStT hardware and the FAStT Storage Manager. The arrows in the flow chart indicate the current publications that cover, in detail, each step in the installation process.
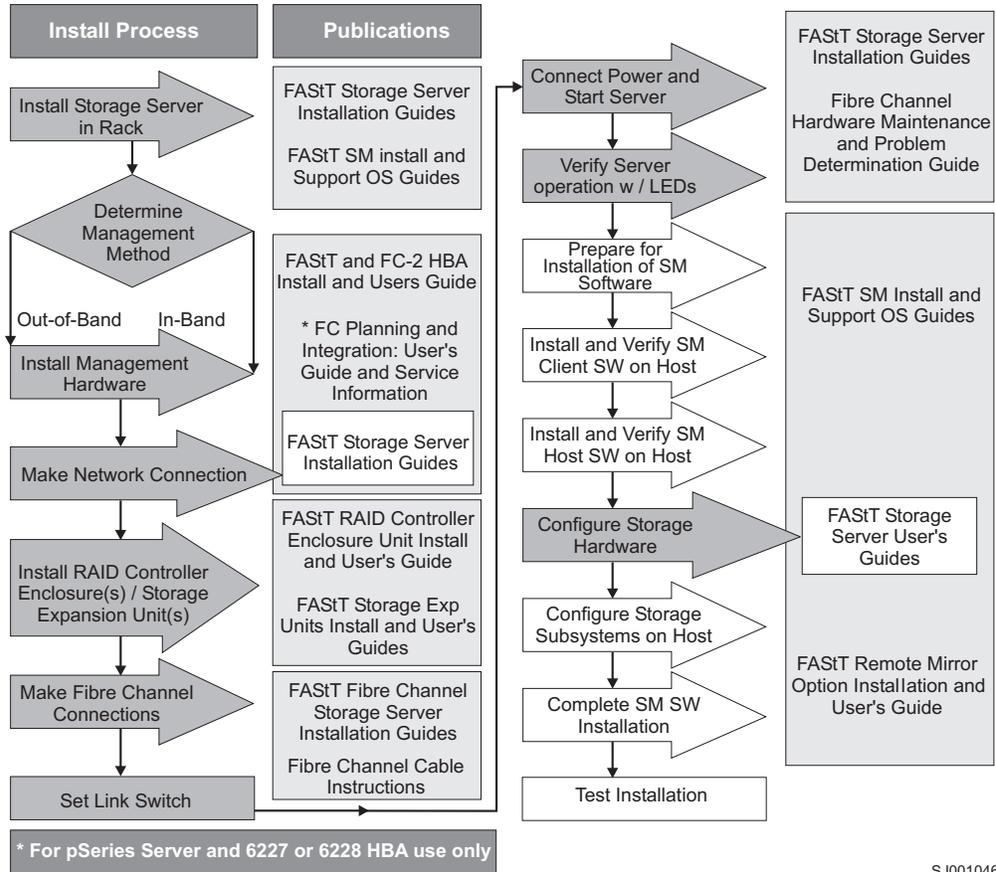
SJ001046

Figure 1. Process flow by current publications

FAStT documentation

The following tables present an overview of the FAStT Storage Manager and the FAStT900, FAStT700, the FAStT500, and the FAStT200 Fibre Channel Storage Server document libraries, as well as related documents. Each table lists documents that are included in the libraries and where to locate the information that you need to accomplish common tasks.

FAStT Storage Manager Version 8.3 library

Table 1 associates each document in the FAStT Storage Manager library with its related common user tasks.

Table 1. TotalStorage FAStT Storage Manager Version 8.3 titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
Installation and Support Guide for Windows® NT and Windows 2000, GC26-7522	✔		✔	✔		
Installation and Support Guide for Linux, GC26-7519	✔		✔	✔		
Installation and Support Guide for Novell NetWare, GC26-7520	✔		✔	✔		
Installation and Support Guide for UNIX and AIX Environments, GC26-7521	✔		✔	✔		
FAStT Remote Mirror Option Installation and User's Guide, 48P9821	✔		✔	✔	✔	
IBM FAStT Storage Manager Script Commands (see product CD)				✔		
IBM FAStT Storage Manager Version 7.10 Concepts Guide, 25P1661	✔	✔	✔	✔	✔	✔

FAStT900 Fibre Channel Storage Server library

Table 2 associates each document in the FAStT900 Fibre Channel Storage Server library with its related common user tasks.

Table 2. TotalStorage FAStT900 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
FAStT900 Installation and Support Guide, GC26-7530	✔	✔		✔		
FAStT900 Fibre Channel Cabling Instructions, 24P8135	✔	✔				
FAStT900 User's Guide, GC26-7534				✔	✔	✔
FAStT Host Adapter Installation and User's Guide, 59P5712		✔			✔	
FAStT FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532		✔			✔	
FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823		✔			✔	
Fibre Channel Planning and Integration: User's Guide and Service Information, SC23-4329	✔	✔			✔	✔
FAStT Management Suite Java User's Guide, 32P0081					✔	✔
Fibre Channel Hardware Maintenance Manual and Problem Determination Guide, GC26-7528						✔

FAStT700 Fibre Channel Storage Server library

Table 3 associates each document in the FAStT700 Fibre Channel Storage Server library with its related common user tasks.

Table 3. TotalStorage FAStT700 Fibre Channel Storage Server document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
FAStT700 Installation and Support Guide, 32P0171	✔	✔		✔		
FAStT700 Fibre Channel Cabling Instructions, 32P0343	✔	✔				
FAStT700 Fibre Channel Storage Server User's Guide, 32P0341				✔	✔	✔
EXP700 Storage Expansion Unit Installation and User's Guide, 32P0178	✔	✔		✔	✔	✔
FAStT Host Adapter Installation and User's Guide, 59P5712		✔			✔	
FAStT FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532		✔			✔	
TotalStorage FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823		✔			✔	
FAStT Management Suite Java User's Guide, 32P0081					✔	✔
Fibre Channel Hardware Maintenance Manual, 19K6130						✔
Fibre Channel Problem Determination Guide, 48P9804						✔

FAStT500 Fibre Channel Storage Server library

Table 4 associates each document in the FAStT500 Fibre Channel Storage Server library with its related common user tasks.

Table 4. TotalStorage FAStT500 and FAStT High Availablity Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
FAStT500 RAID Controller Enclosure Unit User's Guide, 48P9847				✔	✔	✔
FAStT EXP500 Storage Expansion Unit Installation and User's Guide, 59P5637	✔	✔		✔	✔	✔
FAStT Host Adapter Installation and User's Guide, 59P5712		✔			✔	
FAStT FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532		✔			✔	
TotalStorage FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823		✔			✔	
FAStT Management Suite Java User's Guide, 32P0081					✔	✔
Fibre Channel Hardware Maintenance Manual, 19K6130						✔
Fibre Channel Problem Determination Guide, 48P9804						✔

FAStT200 Fibre Channel Storage Server library

Table 5 associates each document in the FAStT200 Fibre Channel Storage Server library with its related common user tasks.

Table 5. TotalStorage FAStT200 and FAStT High Availablity Storage Server document titles by user tasks

Title	User Tasks					
	Planning	**Hardware Installation**	**Software Installation**	**Configuration**	**Operation and Administration**	**Diagnosis and Maintenance**
FAStT200 and FAStT200 HA Storage Servers Installation and User's Guide, 59P6243	✔	✔		✔	✔	
FAStT200 Fibre Channel Cabling Instructions, 21P9094	✔	✔				
FAStT Host Adapter Installation and User's Guide, 59P5712		✔			✔	
FAStT FC2-133 Dual Port Host Bus Adapter Installation and User's Guide, GC26-7532		✔			✔	
FAStT FC2-133 Host Bus Adapter Installation and User's Guide, 48P9823		✔			✔	
FAStT Management Suite Java User's Guide, 32P0081					✔	✔
Fibre Channel Hardware Maintenance Manual, 19K6130						✔
Fibre Channel Problem Determination Guide, 48P9804						✔

FAStT related documents

Table 6 associates each of the following documents related to FAStT operations with its related common user tasks.

Table 6. TotalStorage FAStT related document titles by user tasks

Title	User Tasks					
	Planning	Hardware Installation	Software Installation	Configuration	Operation and Administration	Diagnosis and Maintenance
IBM Safety Information, P48P9741					✔	
IBM FAStT500 RAID Controller Enclosure Unit Installation Guide, 59P6244		✔			✔	
IBM FAStT500 RAID Controller Enclosure Unit User's Reference, 48P9847		✔			✔	
IBM Netfinity® Fibre Channel Cabling Instructions, 19K0906		✔				
IBM FAStT200 and FAStT200 HA Storage Servers Installation and User's Guide, 59P6243		✔			✔	
IBM FAStT200 Fibre Channel Cabling Instructions, 21P9094		✔				
IBM TotalStorage FAStT EXP700 Storage Expansion Unit Installation and User's Guide, 32P0178		✔			✔	
IBM FAStT EXP500 Installation and User's Guide, 59P5637		✔			✔	
IBM Fibre Channel SAN Configuration Setup Guide, 25P2509	✔		✔	✔	✔	

How this document is organized

Chapter 1, "Introduction", on page 1 provides an overview of the IBM TotalStorage FAStT Storage Manager Version 8.3 and describes storage-subsystem management methods, configuration types, types of installations, and installation requirements.

Chapter 2, "Planning and preparing for installation", on page 21 explains how you plan and prepare for a network installation including how to set up a Microsoft® Dynamic Host Configuration Protocol (DHCP) server, a UNIX® Boot Protocol (BOOTP) server, or a NetWare server. It also describes other setup tasks.

Chapter 3, "Installing the storage management software", on page 39 provides the procedure to install the software in standard and noncluster server environments.

Chapter 4, "Completing the installation", on page 45 explains how you start the Enterprise Management window, apply NVSRAM configuration scripts, add devices, and subsystem management tasks.

Chapter 5, "Using the storage management software", on page 53 explains Novell NetWare operating system limitations.

Appendix A, "Novell NetWare operating system limitations", on page 57 explains how you add and delete logical drives, use the Hot Add and SMdevices utilities, start and stop the host-agent software, and uninstall Storage Manager components.

Appendix B, "Storage Subsystem and Controller information record", on page 59 provides a template that you can use to create a controller information record.

"Getting information, help, and service" provides information about how to obtain help, service, or technical assistance.

Notices used in this document

This document contains the following notices designed to highlight key information:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM @server xSeries™ or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Check for technical information, hints, tips, and new device drivers at the IBM® Support Web site:

  www.ibm.com/pc/support
- Use an IBM discussion forum on the IBM Web site to ask questions.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documents that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documents that come with your system. This includes printed books, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software.

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For FAStT information, go to the web site at:

  www.ibm.com/pc/support

  The support page has many sources of information and ways for you to solve problems, including:
  – Diagnosing problems, using the IBM Online Assistant
  – Downloading the latest device drivers and updates for your products
  – Viewing frequently asked questions (FAQ)
  – Viewing hints and tips to help you solve problems
  – Participating in IBM discussion forums
  – Setting up e-mail notification of technical updates about your products
- For the latest information about IBM xSeries products, services, and support go to the Web site at:.

  www.ibm.com/eserver/xseries
- For the latest information about the IBM IntelliStation information go to the Web site at:

  www.ibm.com/pc/intellistation
- You can order publications through the IBM Publications Ordering System at:

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

Software service and support

Through IBM Support Line, for a fee you can get telephone assistance with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by the IBM Support Line in your country or region, go to the Web site at:

www.ibm.com/services/sl/products

For more information about the IBM Support Line and other IBM services, go to the following Web sites:
* www.ibm.com/services
* www.ibm.com/planetwide

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to the following Web site for support telephone numbers:

www.ibm.com/planetwide

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

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

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Chapter 1. Introduction

This installation and support guide provides information about how to prepare, install, configure, and start the IBM TotalStorage FAStT Storage Manager Version 8.3 in Novell NetWare 6.0 operating system environments.

Before you begin to install this product, consult the readme.txt file first. For the latest installation and user information about the storage-management software and hardware components, go to the following IBM Web site:

www.ibm.com/pc/support

When you finish the installation process, see the following online help systems:

- Enterprise Management window help - Use this online help system to learn more about working with the entire management domain.
- Subsystem Management window help - Use this online help system to learn more about managing individual storage subsystems.

You can access these help systems from within Storage Manager 8.3 Client. From either an Enterprise Management or Subsystem Management window, click **Help** or press F1.

After installing IBM FAStT Storage Manager Version 8.3, consider installing the FAStT MSJ diagnostic program. You can use this program to verify the status of the fibre-channel connections before using the storage subsystem. The *IBM FAStT MSJ User's Guide* and FAStT MSJ program are located on the IBM FAStT Storage Manager Version 8.3 CD.

Features

The IBM FAStT Storage Manager Version 8.3 software has standard and premium features. Each category of features is described in this section.

Standard features

This section describes the standard features that are part of the IBM FAStT Storage Manager Version 8.3 software. Your storage subsystem firmware must be at version 5.3x.xx.xx or later if you want to use any of the features that are listed in this section. If your controller firmware is at version 04.x or earlier, you must purchase a firmware upgrade option.

FAStT Storage Manager Version 8.3 software has these new features:

- Support for the IBM TotalStorage FAStT EXP700 Storage Expansion Unit.
- Support for the online Environmental Services Monitor (ESM) card firmware download. ESM cards are components in the FAStT expansion units. ESM firmware can be updated while the storage subsystem receives input/output (I/O) from the servers.
- Support for the off-line fibre-channel hard drive firmware and mode page download. I/O from the servers must be suspended during hard disk drive and mode page downloads.
- Support for Media Scan without parity repairs.
- Forcibly disable fibre-channel drive-level write caching.

• Support for the controller state dump function for diagnostics.

The storage-management software continues to include support for the following standard features:

EXP700 Support

Support for the IBM TotalStorage FAStT EXP700 Storage Expansion Unit.

Dynamic logical-drive expansion

This feature enables you to increase the capacity of an existing logical drive. You can use the free capacity of a logical drive on an existing array, or add unconfigured capacity (new or unassigned drives) to that array. You can expand a logical drive dynamically without losing access to it, or to any other logical drives.

2048 logical drive support

This feature enables you to increase the number of defined logical drives up to 2048 for each storage subsystem. The number of logical drives will depend on your controller model. For more information, see "Number of supported logical drives" on page 18

Storage Partitioning

This feature gives you support for up to 64 storage partitions. Specifically, there is support for up to two host ports in each host and up to eight ports in each host group (supporting a four-way host group of dual-adapter hosts).

Script Engine and Command Line Interface (CLI) Language

This feature expands support offered in the previous version to include:

• Creating and deleting a FlashCopy™ logical drive.

• Setting FlashCopy logical drive attributes.

• Supporting dynamic logical drive expansion for standard or repository logical drives.

• Disabling or recreating a FlashCopy.

• Creating or deleting logical drive-to-LUN mappings.

• Uploading Read Link Status data from a storage subsystem to a comma delimited file on a management station.

• Downloading a feature key file to a storage subsystem to enable a premium feature.

Read Link Status (RLS) Diagnostic

This feature enhances controller diagnostics, enabling you to isolate the source of link problems on a fibre-channel loop. During communication between devices, RLS error counts are detected within the traffic flow of the loop. Error count information is accumulated for every component and device on the loop. The baseline is automatically set by the controller; however, a new baseline is set manually through the Read Link Status Diagnostics window.

Redesigned user interface

This feature supports a more integrated process of creating logical drives and then mapping them to hosts or host groups and logical unit numbers to create storage partitions. The previous Storage Partitions window is now a Mappings view that you can switch to from the Logical/Physical view.

Controller default IP address

Unless a static IP address is assigned to the controller by the administrator, controllers A and B are automatically assigned the following IP addresses:

- Controller A (192.168.128.101)
- Controller B (192.168.128.102)

The subnet mask for the default IP address is 255.255.255.0.

Premium features

There are two premium features that can be enabled by purchasing a premium feature key. Descriptions of these premium features are as follows:

Flashcopy
> This feature allows you to create and manage FlashCopy logical drives. A FlashCopy logical drive is a logical point-in-time image of another logical drive, called a base logical drive, in the storage subsystem. A FlashCopy is the logical equivalent of a complete physical copy, but you create it much more quickly and it requires less disk space. Because a FlashCopy is host-addressable logical drive, you can perform backups using the FlashCopy while the base logical drive remains online and user-accessible. In addition, you can write to the FlashCopy logical drive to perform application testing or scenario development and analysis. The maximum number of FlashCopy logical drives that are allowed is one half of the total logical drives that are supported by your controller model.

Remote Mirror Option
> This feature is used for online, real-time replication of data between storage subsystems over a remote distance. In the event of a disaster or unrecoverable error on one storage subsystem, the Remote Mirror Option enables you to promote a second storage subsystem to take over responsibility for normal I/O operations. When you enable the Remote Mirror option, the maximum number of logical drives per storage subsystem is reduced. For more information, see "Number of supported logical drives" on page 18.

Supported machine types

Table 7 provides a list of machine type and supported storage management software.

Table 7. Machine types and supported storage management software

Product name	Machine type	Model	Firmware version	Supported storage management software version
IBM FAStT200 Storage Server	3542	1RU 1RX	4.x, 5.20.xx.xx, 5.3x.xx.xx	7.02, 7.10, 8.0, 8.2, 8.21, 8.3
IBM FAStT200 High Availability Storage Server	3542	2RU 2RX	4.x, 5.20.xx.xx, 5.3x.xx.xx	7.02, 7.10, 8.0, 8.2, 8.21, 8.3
Netfinity FAStT500 RAID Controller Enclosure Unit	3552	1RU 1RX	4.x, 5.00.xx.xx 5.20.xx.xx 5.21.xx.xx, 5.3x.xx.xx	7.02, 7.10, 8.0, 8.2, 8.21, 8.3
IBM TotalStorage FAStT700 Fibre Channel Storage Server	1742	1RU 1RX	5.00.xx.xx 5.20.xx.xx 5.21.xx.xx, 5.3x.xx.xx	8.0, 8.2, 8.21, 8.3

Table 7. Machine types and supported storage management software (continued)

Product name	Machine type	Model	Firmware version	Supported storage management software version
IBM TotalStorage FAStT900 Fibre Channel Storage Server	1742	9RU 9RX	5.3x.xx.xx	8.3

Note: Storage subsystem firmware must be at version 04.00.02.00 or later to be managed with Storage Manager 8.3.

Terms to know

If you are upgrading from a previous version of the storage management software, you will find that some of the terms you are familiar with have changed. It is important that you familiarize yourself with the new terminology. Table 8 provides some of the new terminology.

Table 8. New terminology

Term used in previous versions	New term
RAID module	Storage subsystem
Drive group	Array
Volume	Logical drive

It is important to understand the distinction between the following two terms when reading this document:

Management station
A management station is a system that is used to manage the storage subsystem. It can be attached to the storage subsystem in the following ways:

- Through a TCP/IP Ethernet connection to the controllers in the storage subsystem.
- Through a TCP/IP network connection to a host computer with host-agent software installed on it, which in turn is directly attached to the storage subsystem through the fibre-channel I/O path.

Host computer
A host computer is a system that is directly attached to the storage subsystem through a fibre-channel I/O path. This system is used to do the following:

- Provide data access (typically in the form of files) from the storage subsystem.
- Function as a connection point to the storage subsystem for a remote management station.

Notes:
1. The terms *host* and *host computer* are used interchangeably throughout this book.
2. A host computer can also function as a management station.

IBM FAStT Storage Manager Version 8.3 software

Storage Manager Version 8.3 contains software components for the following:
* Storage Manager 8.3 Client (SMclient)
* Storage Manager 8.3 Agent (SMagent)
* Storage Manager 8.3 Utility (SMutil)
* IBM Storage Area Network (IBMSAN) driver
* IBM Host Adapter device driver (QL2x00)
* IBM FAStT Management Suite Java (FAStT MSJ agent)

Storage Manager 8.3 Client

The Storage Manager 8.3 Client (SMclient) component provides the graphical user interface (GUI) for managing storage subsystems. The SMclient contains two main components:

Enterprise Management
> You can use the Enterprise Management component to add, remove, and monitor storage subsystems within the management domain.

Subsystem Management
> You can use the Subsystem Management component to manage the components of an individual storage subsystem. It monitors storage subsystems whenever the Enterprise Management window is open.

The Event Monitor is a separate program that is bundled with the SMclient. If installed, it monitors storage subsystems whenever the Enterprise Management window is closed. It runs continuously in the background and can send alert notifications if a critical problem occurs.

Storage Manager 8.3 Agent

The Storage Manager 8.3 Agent (SMagent) provides a management connection for the storage manager client to configure and monitor the subsystem through the fibre-channel I/O path. The agent also provides local or remote access to the client depending on whether the client is installed on the host computer or on a management station over the TCP/IP network.

Storage Manager 8.3 Utility

The Storage Manager 8.3 Utility (SMutil) registers and maps new logical drives to the operating system. The SMutil contains the following two components:

Hot Add utility
> You can use the Hot Add utility to register newly-created logical drives with the operating system. For information about how to use the Hot Add utility, see "Using the Hot Add utility" on page 54.

SMdevices utility
> You can use the SMdevices utility to associate storage subsystem logical drives with operating system device names. For more information about about how to use SMdevices, see "Using the SMdevices utility" on page 54.

IBMSAN driver

The IBM Storage Area Network (IBMSAN) driver is used in a Novell NetWare environment to provide multipath I/O support to the storage controller. The IBMSAN driver is a custom device module (CDM) that is installed with the IBM FAStT Host

Adapter device driver. If there is a failure along the I/O path, the driver sends the I/O requests through the alternate path and Automatic Logical Drive Transfer moves the logical drive within the FAStT Storage Server.

IBM FAStT Host Adapter device driver

The IBM FAStT Host Adapter device driver (QL2*x*00) enables your operating system to communicate with the host adapter. The IBM FAStT Host Adapter is a high-performance, direct memory access (DMA), bus-master, host adapter designed for high-end systems. The IBM FAStT Host Adapter supports all Fibre Channel (FC) peripheral devices that support private-loop direct attach (PLDA) and fabric-loop attach (FLA). See the *IBM TotalStorage FAStT FC2-133 Host Bus Adapter Installation and User's Guide*. For the current README file and latest multipath I/O device drivers, go to the following Web site: http://www.ibm.com/pc/support .

Storage subsystem management methods

The storage management software provides two methods for managing storage subsystems: the host-agent managed method and the directly managed method. Depending on your specific storage subsystem configurations, you can use either or both methods. The management methods that you select determine where you need to install the software components.

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 either be processed in the host or passed to the management station through the network connection, as shown in Figure 2 on page 7.

Managing storage subsystems through the host-agent has the following advantages:

- Ethernet cables do not have to be connected to the controllers.
- A Dynamic Host Configuration Protocol (DHCP)/BOOTP server is not needed to connect the storage subsystems to the network.
- The controller network configuration tasks that are described in Chapter 2, "Planning and preparing for installation", on page 21, do not need to be performed.
- A host name or IP address must only be specified for the host instead of for the individual controllers in a storage subsystem. Storage subsystems that are attached to the host are automatically discovered.
- If the fibre-channel connection is broken between the host and the subsystem, the subsystem cannot be managed or monitored.

The disadvantage of managing storage subsystems through the host agent is that the host agent requires a special logical drive, called an *access logical drive*, to communicate with the controllers in the storage subsystem. Therefore, you are limited to configuring one fewer logical drive than the maximum number that is allowed by the operating system and the host adapter that you are using.

Note: The access logical drive is also referred to as the *universal Xport device*.

Important: If your host already has the maximum number of supported logical drives configured, either use the direct (out-of-band) management method or give

up a logical drive for use in place of the access logical drive. For more information, see "Number of supported logical drives" on page 18.

Storage subsystems
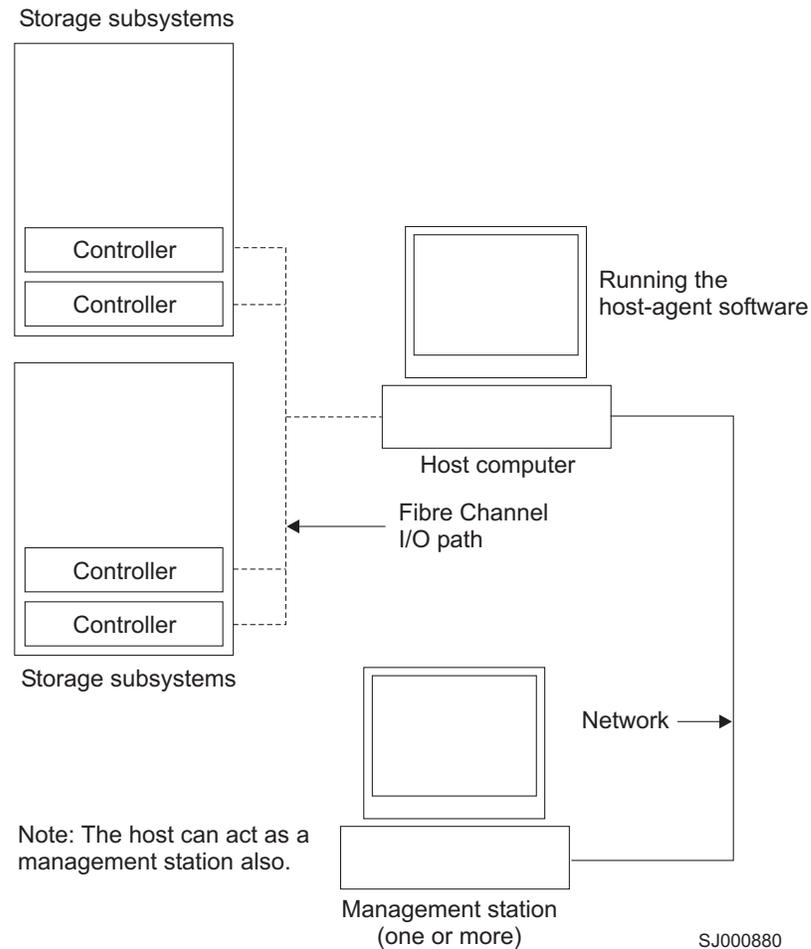
Figure 2. Host-agent (in-band) managed storage subsystems

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 an Ethernet connection to each controller. To manage the storage subsystem through the Ethernet connections, you must define the static IP address and host name for each controller. Each storage subsystem controller must be connected to an Ethernet network by a cable that is attached to the RJ-45 connector on each storage subsystem controller module, as shown in Figure 3 on page 9.

Note: For more information about setting a static IP address, contact an IBM technical-support representative for Retain Tip HP171389, ″Unable To Setup Networking Without DHCP/BOOTP″.

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

• The Ethernet connections to the controllers enable a management station running the SMclient software to manage storage subsystems that are connected to a host running any of the Storage Manager 8.3-supported operating systems.

- An access logical drive is not needed to communicate with the controllers out-of-band. You can configure the maximum number of logical drives that are supported by the operating system and the host adapter that you are using.
- The storage subsystem can be managed and problems can be identified using the fibre-channel links.

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

- Two Ethernet cables are required to connect the storage subsystem controllers to a network.
- When adding devices, you must specify an IP address or host name for each controller.
- A DHCP/BOOTP server and network preparation tasks are required. For a summary of the preparation tasks, see "Preparing for a network installation — overview" on page 22.

  Note: If the storage subsystem controllers have firmware version 05.xx.xx, they have the following default settings:

Controller	IP address	Subnet mask
A	192.168.128.101	255.255.255.0
B	192.168.128.102	255.255.255.0

- Static IP addresses can also be assigned to the controllers. For more information about setting a static IP address, contact an IBM technical-support representative for Retain Tip HP171389, ″Unable To Setup Networking Without DHCP/BOOTP″.

If you choose to use the default IP addresses or static TCP/IP address, a DHCP/BOOTP server is not necessary and you do not have to perform the procedure in "Step 5: Setting up the DHCP or BOOTP-compatible server" on page 26.

Figure 3 shows a system in which storage subsystems are managed using the direct (out-of-band) management method.
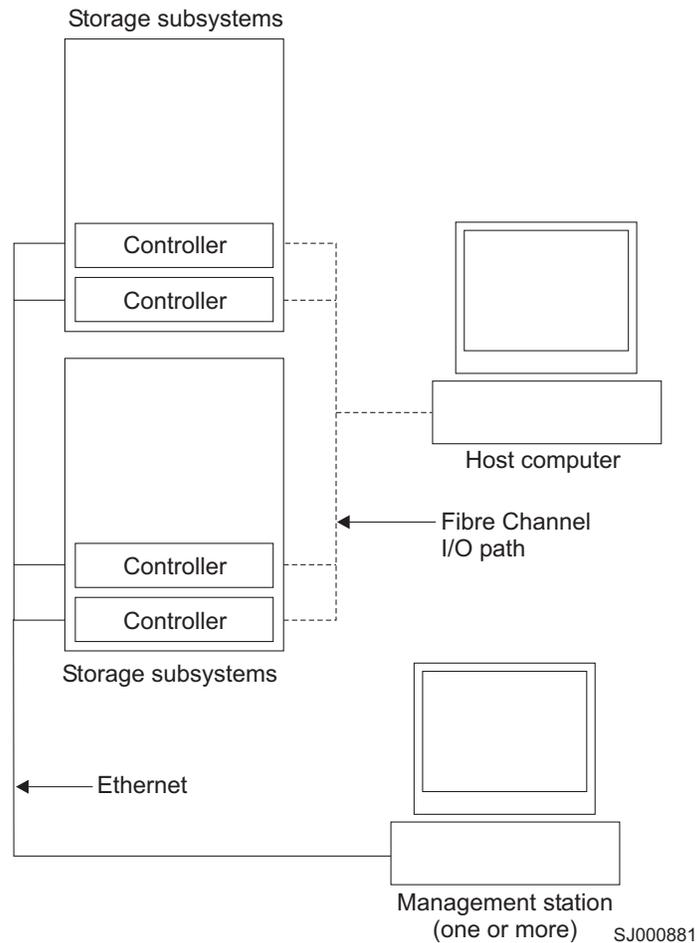
Figure 3. Direct (out-of-band) managed storage subsystems

Where to install software components

How you manage the storage subsystems determines where you need to install the software components.

Management stations

You must install the following software components on each management station:

- Storage Manager 8.3 Client (SMclient)
- FAStT MSJ

Host computers

You must install the following software components on each host computer:

- Java™ Virtual Machine
- Storage Manager 8.3 Utility (SMutil)
- IBM SAN driver (IBMSAN)
- IBM Host Adapter device driver (QL2x00)

Depending on how you intend to manage the storage subsystems, you might need to install the following software components:

- Storage Manager 8.3 Agent (SMagent)
- Storage Manager 8.3 Client (SMclient)

The SMagent must be installed on a host computer if you intend to manage the storage subsystems using the host-agent (in-band) management method.

The SMclient must be installed on a host computer if you intend the host computer to act as a management station. If the host computer is not connected to a network, it must have TCP/IP software installed, and you must assign an IP address to the host.

Configuration types

You can install Storage Manager 8.3 in one of two configurations:

- Standard (noncluster) configuration
- Cluster server configuration

Standard (noncluster) configuration

Figure 4 on page 11 shows a standard (noncluster) configuration.

Storage subsystems

Controller

Controller

QLRemote agent,
FAStT device driver,
SMutil, and host-agent
IBM SAN driver, and
SMclient

Host computer

Fibre Channel
I/O path

Controller

Controller

The client software is
installed on one or more
management stations,
or on the host computer.

Storage subsystems

Ethernet

Management station
FAStT MSJ, SMclient

SJ000876

Cluster server configuration

Figure 5 shows a cluster server configuration.

QLRemote agent, FAStT device driver, SMclient,
SMutil, IBM SAN driver, and SMagent

Ethernet

Cluster server
node 01

Cluster server
node 02

The SMclient software
is installed on one or more
management stations, or
on the cluster servers.

Management station
(one or more)

Managed hub or
switch

Fibre Channel
I/O path

Controller

Controller

Storage subsystems

SJ000877
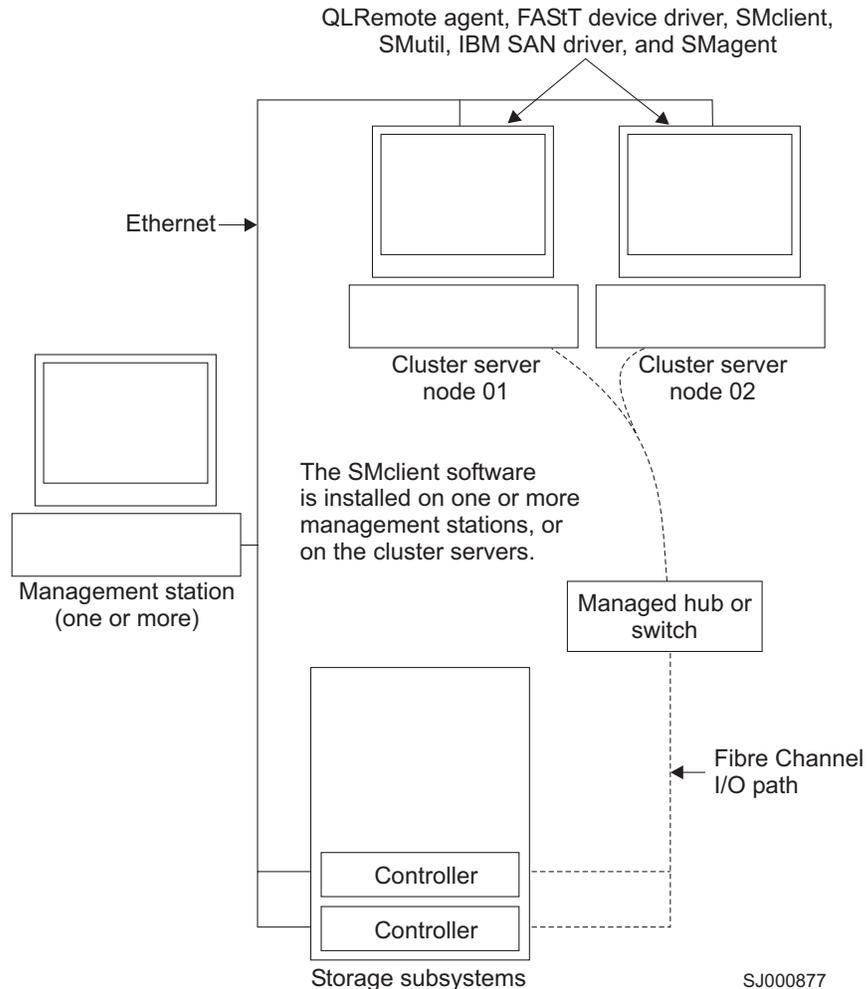
Figure 5. Sample cluster server configuration

Installation environments

You can install the storage management software in two types of hardware
environments:

New storage subsystem environment
You are installing the IBM TotalStorage FAStT Fibre Channel Storage
Server using firmware 5.3x.xx.xx and you plan to manage the storage
subsystems by using Storage Manager 8.3.

Existing storage subsystem environment
You are installing the storage management software in an environment with
existing storage subsystems. See Table 9 on page 12 for your installation
options in an environment with existing storage subsystems.

Table 9. Installation options for existing storage subsystems

Current environment	Planned environment	Action
Machine type 3552 Existing storage subsystems with controllers that have firmware versions 04.00.02.xx through 04.01.xx.xx.	Upgrade firmware to version 5.3x.xx.xx. Manage all storage subsystems by using Storage Manager 8.3.	1. Purchase the upgrade option. Contact your IBM service representative for more information. 2. Uninstall Storage Manager 7.x. See "Uninstalling storage management software components" on page 56 for more information. 3. Install Storage Manager 8.3. See "Installation Overview" on page 39 for more information. 4. Discover the storage subsystems. See "Performing an initial automatic discovery of storage subsystems" on page 45 for more information. 5. Download firmware and NVSRAM version 5.3x.xx.xx. See "Downloading firmware and NVSRAM" on page 49 for more information.
Machine types 3542, 3552 Existing storage subsystems with controllers that have firmware versions 04.00.02.xx through 04.01.xx.xx.	Retain existing firmware versions. Manage all storage subsystems by using Storage Manager 8.3.	1. Uninstall Storage Manager version 7.x. See "Uninstalling storage management software components" on page 56 for more information. 2. Install Storage Manager 8.3. See "Installation Overview" on page 39 for more information. 3. Discover the storage subsystems. See "Performing an initial automatic discovery of storage subsystems" on page 45 for more information.
Machine type 3552 Existing storage subsystems with controllers that have firmware versions 04.00.xx.xx through 04.00.01.xx.	Upgrade firmware to version 04.00.02.xx or later. Manage all storage subsystems by using Storage Manager 8.3.	1. Uninstall Storage Manager version 7.x. See "Uninstalling storage management software components" on page 56 for more information. 2. Install Storage Manager 8.3. See "Installation Overview" on page 39 for more information. 3. Discover the storage subsystems. See "Performing an initial automatic discovery of storage subsystems" on page 45 for more information. 4. Upgrade the firmware to version 4.00.02.xx or later. Go to the IBM Web site; download the firmware and the matching NVSRAM.
Machine types 3552 Existing storage subsystems with controllers that have firmware versions 04.00.xx.xx through 4.00.01.xx.	Retain existing firmware versions. Manage existing storage subsystems by using Storage Manager 7.02.	Set up a separate management station with Storage Manager 7.02 installed to manage the storage subsystems with controllers that have back-level firmware.

Table 9. Installation options for existing storage subsystems (continued)

Current environment	Planned environment	Action
Machine type 1742 Existing storage subsystems with controllers that have firmware versions 05.00.xx.xx.	Upgrade firmware to version 5.3x.xx.xx. Manage all storage subsystems by using Storage Manager 8.3.	1. Uninstall Storage Manager 8.0. See "Uninstalling storage management software components" on page 56 for more information. 2. Install Storage Manager 8.3. See "Storage Manager 8.3 Client" on page 40 for more information. 3. Discover the storage subsystems. See "Performing an initial automatic discovery of storage subsystems" on page 45 for more information. 4. Download firmware and NVSRAM version 5.3x.xx.xx. See "Downloading firmware and NVSRAM" on page 49 for more information.
Machine type 3542 Existing storage subsystems with controllers that have firmware versions 04.00.02.xx through 04.01.xx.xx.	Upgrade the firmware to version 5.3x.xx.xx. Manage all storage subsystems using Storage Manager 8.3.	1. Purchase the upgrade option. Contact your IBM service representative for more information. 2. Uninstall Storage Manager 7.xx. See "Uninstalling storage management software components" on page 56 for more information. 3. Install Storage Manager 8.3. See "Storage Manager 8.3 Client" on page 40 for more information. 4. Discover the storage subsystems. See "Performing an initial automatic discovery of storage subsystems" on page 45 for more information. Go to the IBM Web site to download the 04.01.02.26 or later firmware and matching NVSRAM. **Note:** The storage subsystem controllers must be at firmware level 04.01.02.26 or later before downloading firmware level 5.3x.xx.xx and NVSRAM to the controllers. 5. Download firmware level 04.01.02.26 or later and its associated NVSRAM. See "Downloading firmware and NVSRAM" on page 49 for more information. 6. Download firmware and NVSRAM version 5.3x.xx.xx. See "Downloading firmware and NVSRAM" on page 49 for more information.

Managing coexisting storage subsystems

Storage subsystems are *coexisting storage subsystems* when the following conditions are met:

- There are multiple storage subsystems with controllers that have different versions of firmware.

- These storage subsystems are attached to the same host.

For example, a coexisting situation exists when you have a new storage subsystem with controllers that have firmware version 5.3x.xx.xx, and it is attached to the same host in one or more of the following configurations:

- A storage subsystem with controllers that have firmware versions 04.00.xx.xx through 04.00.01.xx, with a separate management station managed with Storage Manager 7.02.
- A storage subsystem with controllers that have firmware versions 04.00.02.xx through 04.01.xx.xx, which is managed with Storage Manager 8.3.

Important: The common host must have Storage Manager 8.3 Agent installed.

Figure 6 on page 15 shows an environment that includes coexisting storage subsystems.

Storage-management client
software must be installed on either
a management station or host.

Storage subsystems

Management station
(one or more)

Firmware version
4.01.x (minimum)

Controller

Controller

Host-agent

Firmware
version 5.x

Controller

Controller

Storage subsystems

Host computer

Fibre Channel
I/O path

Ethernet

Client software

Management station
(one or more)

SJ001043

Figure 6. Coexisting storage subsystems

System requirements

This section provides detailed information about the hardware, software, and
operating system requirements for Storage Manager 8.3.

Hardware requirements

Table 10 on page 16 lists the hardware that is required for installing Storage
Manager 8.3.

Table 10. Hardware requirements for Storage Manager 8.3

Hardware component	Requirements
A DHCP/BOOTP server (only for direct-managed storage subsystems) **Note:** If the controllers static address or default IP addresses are used, you do not need to set up the DHCP/BOOTP server.	One of the following BOOTP or BOOTP-compatible servers: • Microsoft BOOTP-compatible DHCP server for Windows NT® • Microsoft BOOTP-compatible DHCP server for Windows 2000 • UNIX BOOTP server • NetWare DHCP server
Storage subsystems (one or more)	Storage subsystems with controllers running firmware version 04.00.02.xx through 5.3x.xx.xx. **Note:** See "Installation environments" on page 11 for information about managing these storage subsystems when existing storage subsystems are physically connected to the same host that you will connect to the new storage subsystems.
Fibre-channel host adapters	The following fibre-channel host adapters are compatible with storage-management software: • IBM FAStT host adapter (part number: 00N6881) • IBM FAStT FC-2 host bus adapter (part number: 19K1246) • IBM TotalStorage FAStT FC2-133 host bus adapter (part number: 24P0960) For information about specific host adapter requirements: • See the readme file in the \Host_Adapter directory on the installation CD. • Read the host adapter documentation. • Go to the follwing Web site: http://www.ibm.com/pc/support
Fibre-channel fabric switches (if needed for the desired configuration)	The following fibre-channel fabric switches are compatible with storage management software: • IBM 8-port Fibre Channel switch (machine type: 2109-S08) • IBM 16-port Fibre Channel switch (machine type: 2109-S16) • IBM 16-port 2 Gbps Fibre Channel switch (machine type: 2019-F16) • IBM 8-port 2 Gbps Fibre Channel switch (machine type: 3534-F08) • IBM BladeCenter 2-port Fibre Channel switch module (P/N: 48P0762) For specific fibre-channel switch setup requirements: • Read the switch documentation. • Go to the following Web site: http://www.ibm.com/pc/fcswitch

Table 10. Hardware requirements for Storage Manager 8.3 (continued)

Hardware component	Requirements
Fibre Channel (FC) managed hub (if needed for the desired configuration)	The following managed hub is compatible with storage management software: • IBM Fibre Channel managed hub (machine type: 3534) For specific fibre-channel managed hub setup requirements: • Read the managed hub documentation. • Go to the following Web site : www.ibm.com/pc/fchub

Management station (for client software)	• Intel® Pentium® or Pentium-equivalent microprocessor (133 MHz or faster)
	• CD-ROM drive
	• Mouse or similar pointing device
	• System memory:
	  – For Windows NT 4.0: A minimum of 64 MB (128 MB that are recommended)
	  – For Windows 2000: A minimum of 128 MB (256 MB that are recommended)
	• Ethernet network interface adapter
	• AGP or PCI video adapter (AGP preferred), ISA adapters are not supported
	• Monitor setting of 1024 x 768 pixels with 64 000 colors. The minimum display setting that is allowed is 800 x 600 pixels with 256 colors.
	• Hardware-based Windows acceleration: Desktop computers that use system memory for video memory are not preferred for use with the storage-management software.
	
	Important: Many PC-based servers are not designed to run graphic-intensive software. If your server has difficulty running the storage-management software smoothly without video artifacts, you might need to upgrade the server video adapter.

Note: For more information about host adapters, fabric switches, and managed hubs, go to the following Web site:

www.ibm.com/pc/us/compat

Firmware requirements

To use the standard features and the premium features of Storage Manager 8.3, your storage subsystem must contain controllers with firmware version 5.3x.xx.xx for machine types 1742 and 3552 or firmware version 05.20.08.xx for machine type 3542. To manage storage subsystems with Storage Manager 8.3, your existing storage subsystems must contain controllers with firmware version 04.00.02.xx or higher.

If you want to use the Storage Manager 8.3 standard features on machine types 3542 and 3552, you must purchase a firmware upgrade option. The firmware upgrade option enables you to upgrade your firmware version from 04.00.xx.xx to 5.3x.xx.xx for machine type 3552 or to firmware version 05.20.xx.xx for machine type 3542. In addition, Storage Manager 8.3 also supports two premium features that must be purchased: FlashCopy and the Remote Mirror Option.

For more information about the firmware upgrade option or the FlashCopy and Remote Mirror premium feature options, contact your IBM reseller or IBM marketing representative.

Software requirements

Table 11 lists the disk space that is required for installing the Storage Manager 8.3 software.

Table 11. Installation requirements by software package

Package	Disk space requirement
Storage Manager 8.3 Client (SMclient)	35 MB
Storage Manager 8.3 Agent (SMagent)	1 MB
Storage Manager 8.3 Utility (SMutil)	22 MB
IBM SAN driver (IBMSAN)	1 MB
IBM FAStT Management Suite Java (FAStT MSJ)	1 MB
IBM HA device driver	1 MB
Java Virtual Machine	37 MB

Operating system requirements

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

Management stations:

Install one of the following operating systems:
- Windows NT 4.0 Server with Service Pack 6a
- Windows NT 4.0 Enterprise Edition with Service Pack 6a
- Windows NT 4.0 Workstation with Service Pack 6a
- Windows 2000 Server with Service Pack 3
- Windows 2000 Professional with Service Pack 3
- Windows 2000 Advanced Server with Service Pack 3

Host computers:
- Novell NetWare 6.0 with Service Pack 2

Cluster nodes:
- Novell NetWare 6.0 with Service Pack 2

Number of supported logical drives

There is a limit to how many logical unit numbers (LUNs) can access the logical drives on a single storage subsystem. The maximum number of logical drives that a FAStT storage subsystem supported with firmware version 5.3x.xx.xx can access depends on the model of the FAStT storage subsystem.

Table 12 on page 19 and Table 13 on page 19 indicate the maximum number of logical drives allowed by system model type under each possible condition.

Table 12. Logical drives without the Remote Mirror Option enabled

Model Type	Maximum logical drives	Maximum logical drives per storage unit partition	Maximum FlashCopy logical drives
3542	512 (See note 1)	32 (See note 5)	256 (See note 2)
3552	512 (See note 1)	32 (See note 5)	256 (See note 2)
1742	2048 (See note 1)	32 (See note 5)	1024 (See note 2)

Table 13. Logical drives using the remote mirror option

Model Type	Maximum logical drives	Maximum logical drives per storage unit partition	Maximum FlashCopy logical drives
3542	N/A	N/A	N/A
3552	128 (See notes 3 and 6)	32 (See note 5)	64 (See note 2)
1742	256 (See notes 1, 4, and 6)	32 (See note 5)	128 (See note 2)

Notes:

1. When using firmware version 5.xx.xx, the firmware reserves one logical drive to be used by the system.

2. Maximum of four FlashCopy logical drives for each standard logical drive.

3. Maximum of eight remote mirror pairs.

4. Maximum of 16 remote mirror pairs.

5. The host-agent management method uses a special logical drive, called an *access logical drive*, to communicate with the controllers on the storage subsystem. The access-logical drive uses one of the available LUNs. Therefore, managing storage subsystems with the host-agent software limits you to one fewer LUN than the maximum number that is supported by the operating system and the host adapter.The access logical drive is also referred to as the Universal Xport Device

6. For firmware version 5.3x.xx.xx, the maximum number of logical drives includes the flashcopy repository logical drives and the remote mirror logical drives, in addition to the standard data logical drives. If the Remote Mirror Option is enabled, two logical drives are reserved to be used by the system.

Chapter 2. Planning and preparing for installation

This chapter provides information to help you plan for the installation of the storage management software.

Table 14 shows the installation sequence for Storage Manager software components.

Table 14. Software component installation sequence in a Novell NetWare 6.0 environment

System type	Software installation sequence
Management station	Storage Manager 8.3 Client (SMclient).

Host computer / cluster node	1. Storage Manager 8.3 Client (SMclient).
	   • This optional component is necessary if you intend to manage the storage subsystem from the host computer.
	2. Storage Manager 8.3 Agent (SMagent).
	   • This optional component is necessary if you intend to use the host-agent management method.
	3. Storage Manager 8.3 Utility (SMutil).
	   • This required component contains the Hot Add, SMdevices, and SMflashcopyassist utilities.
	4. IBM Storage Area Network (SAN) driver.
	5. IBM Host Adapter device driver (QL2x00).

Storage subsystem management methods

If you have not already done so, see Chapter 1, "Introduction", on page 1 for information about the following two methods for managing storage subsystems:

- **Direct (out-of-band) management:** The storage subsystems are managed through a TCP/IP Ethernet connection to each controller on the storage subsystem.
- **Host-agent (in-band) management:** The storage subsystems are managed through host-agent software that is installed on a host computer connected to the storage subsystem.

You can use one or both methods. However, because many of the preparation tasks for installation depend on which method you use, decide how you want to manage the storage subsystems on your network before you begin.

Figure 7 on page 22 shows an example of a network that contains both a direct-managed storage subsystem (Network A) and a host-agent-managed storage subsystem (Network B).

Direct-managed storage subsystem: Network A is a direct-managed storage subsystem. Network A contains the following components:

- A DHCP/BOOTP server
- A network Management Station (NMS) for Simple Network Management Protocol (SNMP) traps
- A host that is connected to a storage subsystem through a fibre-channel I/O path
- A management station that is connected by an Ethernet cable to the storage subsystem controllers

Host-agent-managed storage subsystem: Network B is a host-agent-managed storage subsystem. Network B contains the following components:

* A host that is connected to a storage subsystem through a Fibre Channel I/O path
* A management station that is connected by an Ethernet cable to the host computer
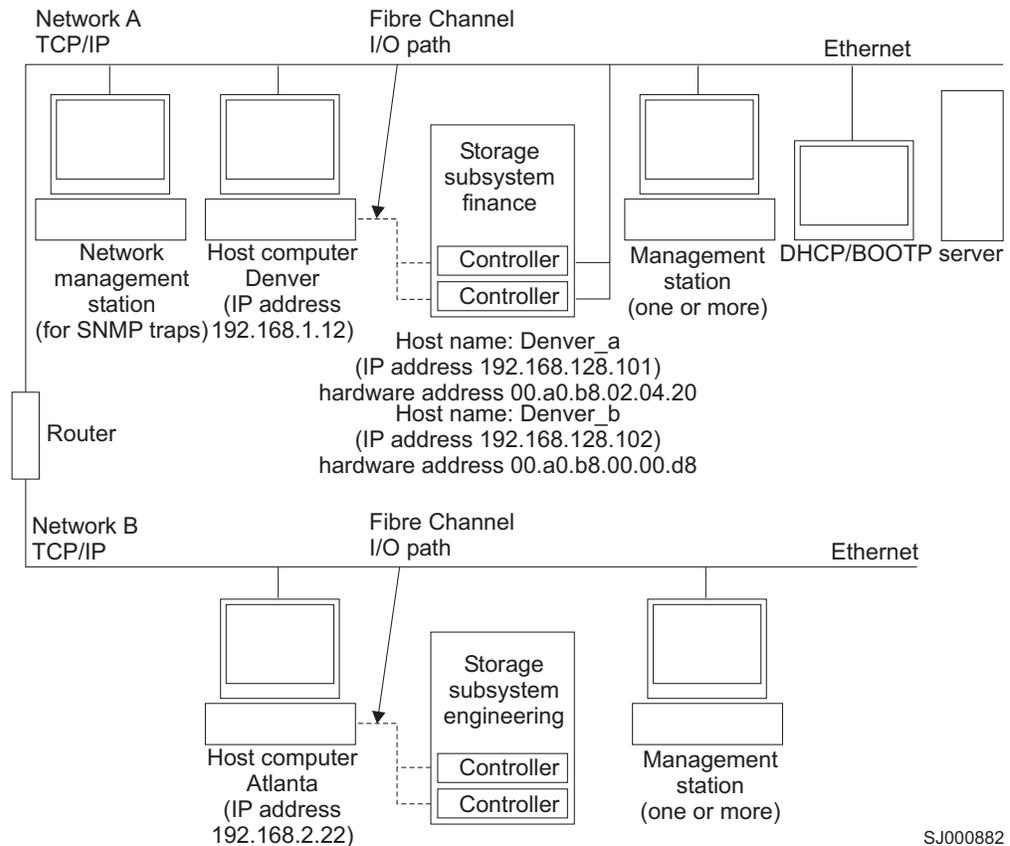
Figure 7. Sample network using direct-managed and host-agent-managed storage subsystems

Preparing for a network installation — overview

To begin installing the Storage Manager software, ensure that all hardware components (host computers, storage subsystems, and cables) are installed and operating correctly. Also be sure that you have all the host and controller information needed for the software to operate correctly. You might need to refer to the installation guides of the specific hardware components.

A high-level overview of the steps that are involved in setting up a network installation follows.

Step 1. Establish a naming convention for the storage subsystems connected to the network. See "Step 1: Naming the storage subsystems" on page 23 for more information.

Step 2. Record the storage subsystem names and management types in the Storage Subsystem and Controller information record. A blank information record form is provided in Table 19 on page 59.

> **Note:** Throughout the remaining steps, you will need to return to this form to record information such as hardware Ethernet addresses and IP addresses.

Step 3. (For a direct-managed system only) Identify the hardware Ethernet address for each controller in storage subsystems that are connected to the network. See "Step 3: Identifying the hardware Ethernet MAC address for each controller" on page 24 for more information.

Step 4. Obtain the following information from the network administrator.

For a direct-managed system	The IP addresses of each controller in the storage subsystems
For a host-managed system	The IP address and host name of the host computer on which the host-agent software will run

See "Step 4: Assigning IP addresses for hosts and controllers" on page 26 for more information. For a direct managed system only, if you are using a default controller IP address, go to 6.

Step 5. (For a direct-managed system only) Set up the DHCP/BOOTP server to provide network configuration information for a specific controller. If you are using a controller static IP address, skip this step.

Step 6. Verify that the TCP/IP software is installed. For more information, see "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37.

(For a direct-managed system only) Verify that the TCP/IP software is installed, and set up the host or Domain Name Server (DNS) table. For more information, see "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37

Step 7. Power on the devices that are connected to the network.

Step 1: Naming the storage subsystems

As you set up your network, decide on a naming convention for the storage subsystems. When you install the storage-management software and start it for the first time, all storage subsystems in the management domain are displayed as `<unnamed>`. Use the Subsystem Management window to rename the individual storage subsystems.

Consider the following when naming storage subsystems:

- There is a 30-character limit. All leading and trailing spaces are deleted from the name.
- Use a unique, meaningful naming scheme that is easy to understand and remember.
- Avoid arbitrary names or names that might quickly lose their meanings.
- The software displays storage-subsystem names with the prefix `<Storage Subsystem>`. Therefore, if you rename a storage subsystem to Engineering, it is displayed as:

`Storage Subsystem Engineering`

Step 2: Recording the subsystem names

After you decide on a naming scheme, record the storage subsystem names in the Storage Subsystem Controller and Information record. A blank information record form is provided in Table 19 on page 59.

Table 15 shows an example of a completed information record for the network shown in Figure 7 on page 22. This network contains storage subsystems that are managed using both the direct-management and host-agent management methods.

Table 15. Completed information record

Storage subsystem name	Management type	Controllers-Ethernet and IP addresses, and host name		Host-IP address and host name
		Controller A	Controller B	
Finance	Direct	Hardware Ethernet address = 00a0b8020420	Hardware Ethernet address = 00a0b80000d8	
		IP address = 192.168.128.101	IP address = 192.168.128.102	
		Host = Denver_a	Host = Denver_b	
Engineering	Host agent			IP address = 192.168.2.22
				Host = Atlanta

If you plan to manage your storage subsystem using the direct-management method, go to "Step 3: Identifying the hardware Ethernet MAC address for each controller". If you plan to manage your storage subsystem using the host-agent management method, go to "Step 4: Assigning IP addresses for hosts and controllers" on page 26.

Step 3: Identifying the hardware Ethernet MAC address for each controller

To manage your storage subsystem using the direct-management method, you need to identify the hardware Ethernet MAC address for each controller.

To identify the hardware Ethernet MAC address for machine type 3542, do the following:

1. Locate the Ethernet MAC address at the back of the unit, under the controller gigabit interface converter (GBIC) ports, as shown in Figure 8 on page 25. The number is in the form xx.xx.xx.xx.xx.xx (for example, 00.a0.b8.20.00.d8).
2. Record each Ethernet address in the information record (see Table 19 on page 59).

Hardware Ethernet
address label
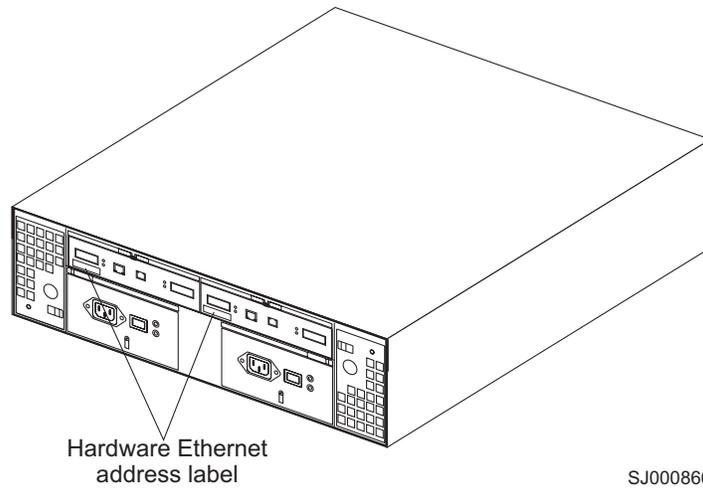
SJ000866

Figure 8. Locating the Ethernet MAC address for machine type 3542

To identify the hardware Ethernet MAC address for machine types 3552 and 1742, do the following:

1. Remove the front bezel from the storage subsystem, as shown in Figure 9. Carefully pull the bottom of the bezel out **1** to release the pins; then, slide the bezel down **2** .
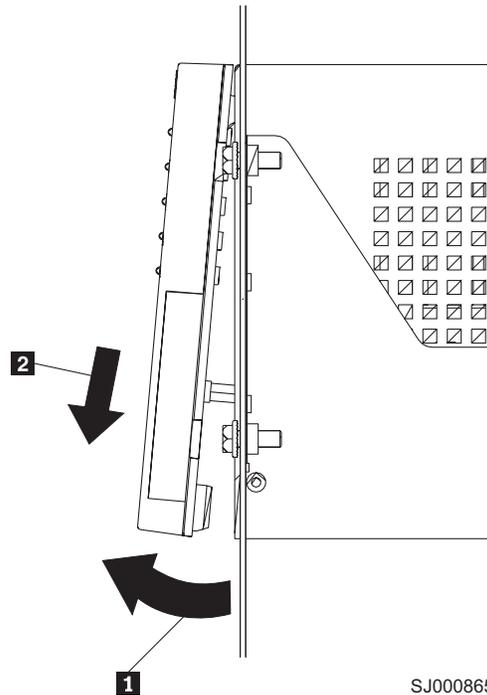
SJ000865

Figure 9. Removing the controller unit bezel (machine types 3552 and 1742)

2. On the front of each controller, look for a label with the hardware Ethernet MAC address. The number is in the form xx.xx.xx.xx.xx.xx (for example, 00.a0.b8.20.00.d8).

3. Record each Ethernet address in the information record (see Table 19 on page 59).

4. To replace the bezel, slide the top edge under the lip on the chassis **1** ; then, push the bezel bottom until the pins snap into the mounting holes **2** , as shown in Figure 10.

SJ000867
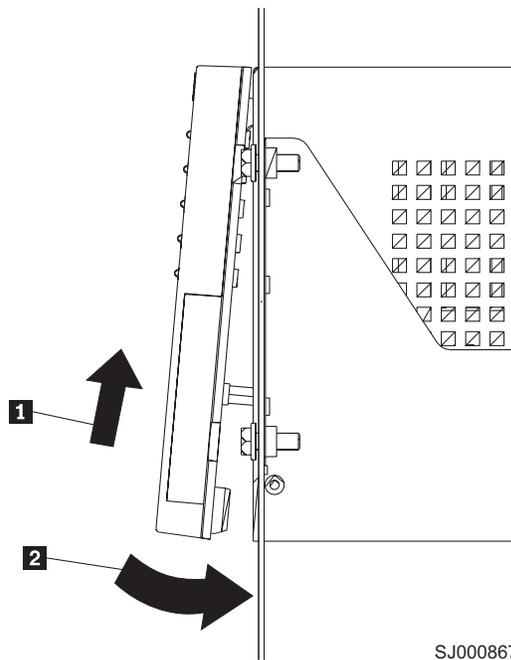
Figure 10. Replacing the controller unit bezel (machine types 3552 and 1742)

5. Continue with "Step 4: Assigning IP addresses for hosts and controllers".

Step 4: Assigning IP addresses for hosts and controllers

If you plan to manage your storage subsystem using the direct-management method, assign a unique IP address for every controller in each storage subsystem on the network. Record the IP address for each controller in the information record (see Table 19 on page 59). Then, go to "Step 5: Setting up the DHCP or BOOTP-compatible server".

Note: If you want to assign static IP addresses for the controllers, see Retain Tip H171389 ″Unable To Setup Networking Without DHCP/BOOTP″. Then, go to "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37.

If you plan to manage your storage subsystem using the host-agent management method, assign an IP address for each host on which you will install the host-agent software. Record the IP address for each host in the information record (see Table 19 on page 59). Then, go to "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37.

Step 5: Setting up the DHCP or BOOTP-compatible server

To manage your storage subsystems directly through the Ethernet connection to each controller, you need to set up a DHCP or BOOTP-compatible server and configure the following options:
- Router or Gateway

- DNS Server
- Hostname
- DNS Domain Name

This section provides instructions for setting up a DHCP server on Windows NT, Windows 2000, and Novell NetWare, as well as instructions for setting up a UNIX BOOTP server.

Note: The remote management station (RMS) and network management station (NMS) entries that were used in previous versions of the storage management software are not required when using Storage Manager 8.3.

Setting up a Windows NT DHCP server

You must use a version of DHCP that supports BOOTP static addressing. To use a DHCP server, you must have a DHCP Manager installed. If a DHCP Manager is installed on the system, go to "Setting up a DHCP server". If a DHCP Manager is not installed, use the following procedure to install one.

Installing the DHCP Manager
To install the DHCP Manager, do the following:
1. Click **Start —> Settings —> Control Panel**.
2. Click **Network**. The Network window opens.
3. Click **Services**.
4. From the **Services** tab, click **Add**.
5. Click **Microsoft DHCP Server**; then, click **OK**.
6. Specify the path to the Windows NT Install file; then, click **Continue**. A dialog windows opens, stating that a static IP address is required.
7. Click **OK**. The Network window opens.
8. Click **Protocols**.
9. Click **TCP/IP Protocol**; then, click **Properties**.
10. Verify that the IP address information is correct; then, click **OK**.
11. Continue to "Setting up a DHCP server".

Note: After installing the DHCP Manager, you can refer to its online help for additional information.

Setting up a DHCP server
Use the following procedure, along with the information that you recorded in the Storage Subsystem and Controller Information record to set up a DHCP server.
1. Click **Start —> Programs —> Administrative Tools —> DHCP Manager**. The DHCP Manager window opens.
2. Create a scope. A scope defines a group of controllers that you want to configure using the DHCP server.
   a. Click **Local Machine**.

b. Click **Scope —> Create**. The Create Scope - (Local) window opens as shown in Figure 11.
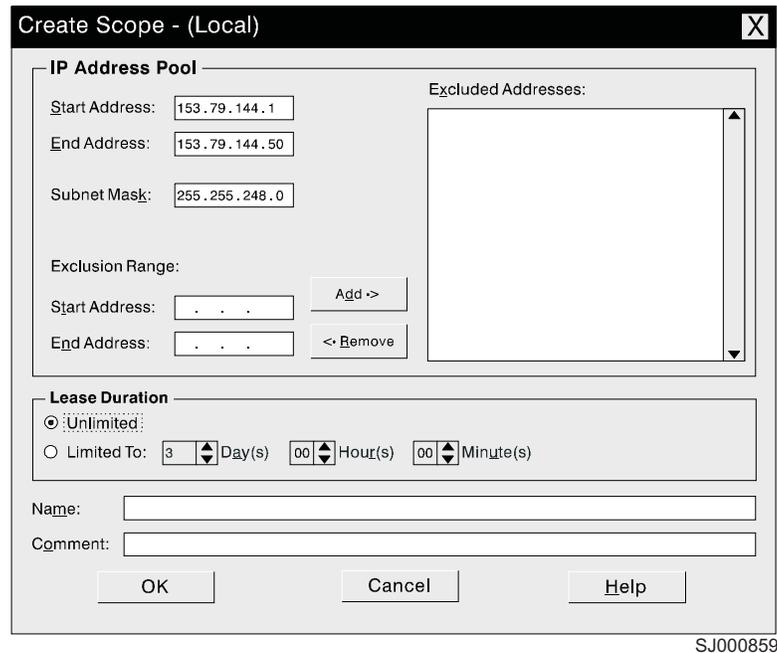
Figure 11. Create Scope - (Local) window

c. Type the starting and ending IP addresses of the controllers that you are configuring for the network.

For example, if you are configuring 50 controllers on a 153.79.144.0 subnet, set the starting address to 153.79.144.1 and the ending address to 153.79.144.50.

Note: If each field does not contain at least three characters, press the period (.) key to advance to the next field. If you have only one controller, type its address for both the starting and ending address.

d. Type the subnet mask (which you obtained from your network administrator).

e. In the **Lease Duration** field, click **Unlimited**. This makes the DHCP connection permanent.

f. Type a scope name and comment.

g. Click **OK**.

h. When the scope successfully completes, click **Yes** to activate it. This returns you to the DHCP Manager window.

3. Configure global scope options. Table 16 shows the global options that need to be set.

Table 16. Global options for a Windows NT DHCP server

Number	Description	Notes
003	Router or Gateway	
006	DNS Server	
012	Host name	Unique for each controller
015	DNS domain name	For example, ibm.com

You can apply options to specific controllers later. The procedure is described in step 5 on page 30.

a. Click **DHCP Options —> Global**. The DHCP Options: Global window opens, as shown in Figure 12.

SJ000860
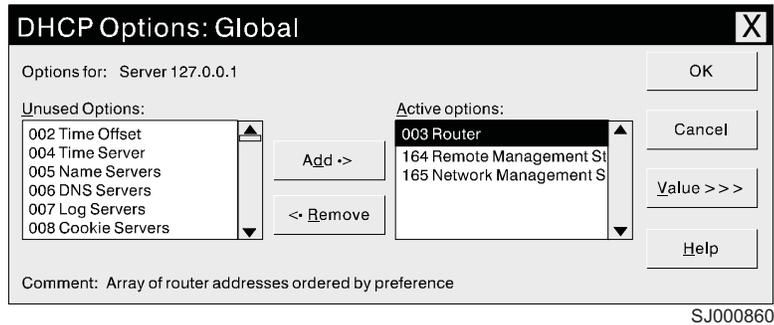
Figure 12. DCHP Options: Global window

b. To make a global option active, select an item in the Unused Options list; then, click **Add** to move it to the Active options list.

c. Click **Value** to assign a value to the active option.

If the **Value** field is not available, click **Edit Array**; the Edit Array Editor window opens. Do one of the following:

• If you need to add an IP address, complete the following procedure:

1) Click **Edit Array**. The IP Address Array Editor window opens, as shown in Figure 13.

SJ000861
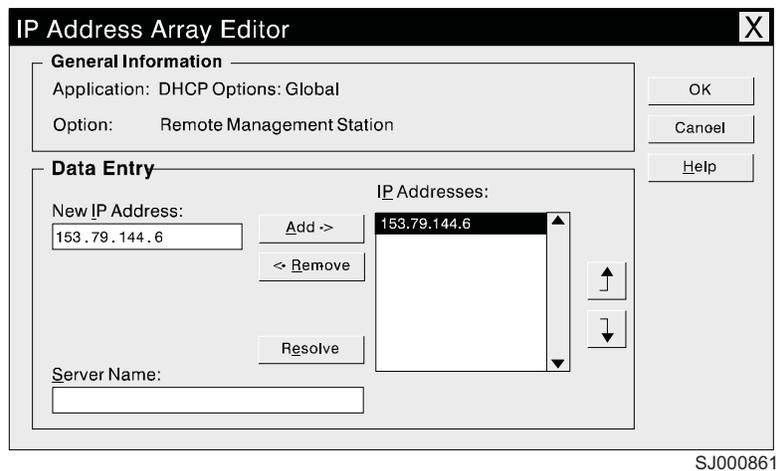
Figure 13. IP Address Array Editor window

2) Type a unique IP address for the option that you added.

3) Click **Add** to move the new IP address to the IP Addresses list.

4) Click **OK**. This returns you to the DHCP Options: Global window.

• If you do not need to add an IP address, click **Cancel**. This returns you to the DHCP Options: Global window.

d. Repeat step 3b through step 3c until all global options are added.

e. When you finish adding the global scope options, click **OK** at the DHCP Options: Global window.

4. Create a reservation for each controller. Use the Storage Subsystem and Controller information record to make sure that you include all of the controllers on the network.

   a. Click **Scope —> Add Reservations**.

   b. In the **IP Address** field, type the IP address for the first controller on your information record.

   c. In the **Unique Identifier** field, type the controller hardware Ethernet address. Do not type decimal points or spaces.

   d. In the **Client Name** field, type the controller eight-character name.

   e. Click **Add**.

   f. Repeat step 4b through step 4e for each controller that is listed on information record.

   g. When you finish adding the information for all of the controllers, click **Close**. This returns you to the DHCP Manager window.

5. Configure controller-specific options. By creating a controller-specific option, you can associate a controller configuration entry with a specific controller.

   Note: If you set an option as **Global Scope**, it applies to every controller in this group and does not need to be added again.

   a. Click **Scope —> Active Leases**. The Active Leases window opens, as shown in Figure 14.
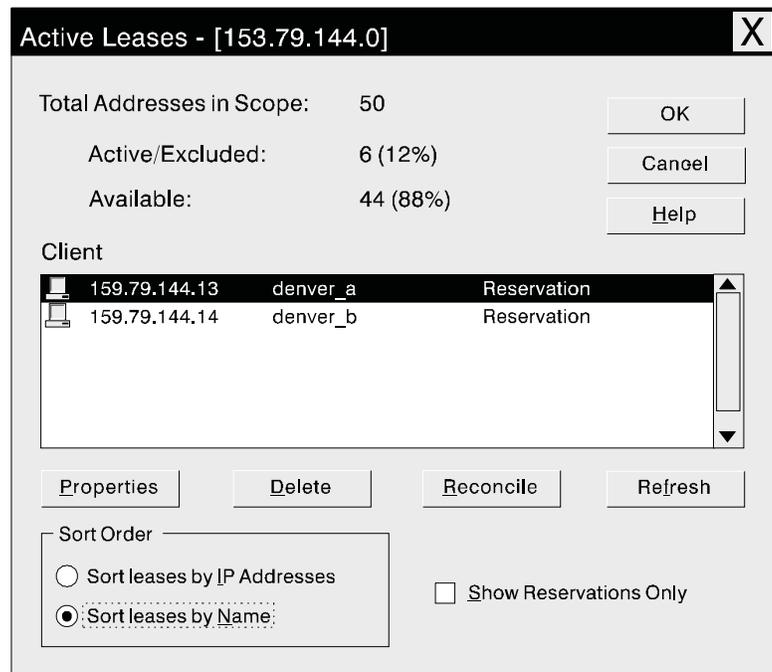
SJ000862

Figure 14. Active Leases window

   b. Select a controller in the list.

   c. Click **Properties**. The Add Option Type window opens, as shown in Figure 15 on page 31. The unique identifier is the hardware Ethernet

address from step 4c.
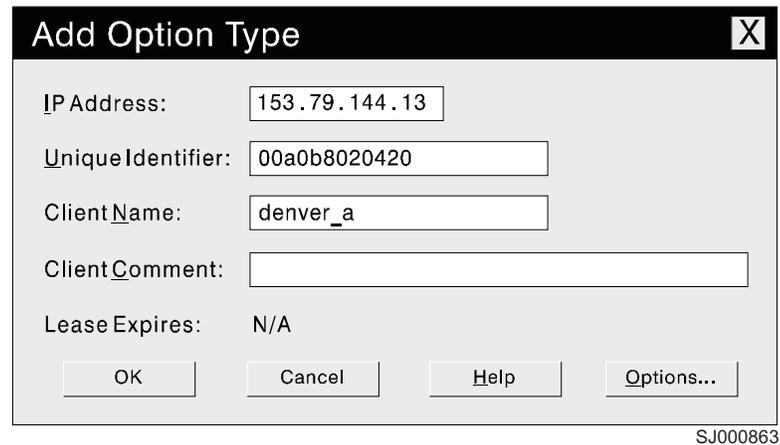
Figure 15. Add Option Type window

    d. Click **Options**. The DHCP Options: Reservations window opens.

    e. Select an option from the Unused Options list, and click **Add** to move it to the Active Options list.

    f. Click **Value** to assign a value to the active option.

    g. Type the information for the value of the option. For example, type the host name for the controller from your Storage Subsystem and Controller information record in the **String** field. Click **Edit** if the value that you need to add is an IP address for a router.

    h. Repeat step 5e through step 5g until you add all the specific options for this controller.

    i. Click **OK**. This returns you to the Add Option Type window.

    j. Click **OK**. This returns you to the Active Leases window.

    k. Repeat steps 5b on page 30 through step 5j until you finish adding controller-specific options for every controller.

    l. Click **OK** on the Active Leases window. This returns you to the DHCP Manager window.

6. Do the following to add a network management custom option:

    a. From the DHCP Manager window, select a scope; then, select **DHCP Options: Defaults**. The DHCP Option: Defaults window opens.

    b. In the **Name** field, type `Network Management Station`.

    c. In the **Data Type** field, select **IP Address**; then, select the **Array** check box.

    d. In the **Identifier** field, type `165`.

    e. In the **Description** field, type a description of the SNMP servers to which the controllers will send alerts.

    f. Click **OK**.

7. Continue with "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37.

Setting up a Windows 2000 DHCP server

You must use a version of DHCP that supports BOOTP static addressing. To use a DHCP server, you must have a DHCP Manager installed. If a DHCP Manager is

installed on the system, go to "Setting up a DHCP server". If a DHCP Manager is not installed, use the following procedure to install one.

Installing the DHCP Manager

To install the DHCP Manager, do the following:

1. Click **Start —> Administrative Tools —> Configure Your Server**. The Configure Your Server window opens.
2. In the left panel, double-click **Networking**; then, click **DHCP**.
3. In the right panel, click **Start**. The Windows Components Wizard starts.
4. In the **Components** field, select **Networking Services**; then, click **Details**.

   Note: Do not select the check box; you do not want to install all of the Networking Services subcomponents.
   The Networking Services window opens.

5. In the **Subcomponents of Networking Services** field, select **Dynamic Host Configuration Protocol (DHCP)**.
6. Click **OK**; the Windows Components Wizard window opens.
7. Click **Next** to start the installation process.
8. If prompted, type the full path to the Windows 2000 distribution files and click **Continue**.
9. When the installation has successfully completed, the Configure Your Server Window opens.
10. Click **Next**.
11. Click **Open the DHCP Manager**. The DHCP window opens.
12. Continue with step 2 of "Setting up a DHCP server".

Note: After installing the DHCP Manager, you can refer to its online help for additional information.

Setting up a DHCP server

Use the following procedure to create a scope and to set up a DHCP server. A scope defines a group of controllers by their IP addresses. You must create and configure a scope so that dynamic IP addresses can be assigned to controllers on your network. Before you begin, read through the procedure to determine what information is required; then, request the information from your network administrator. During this procedure you will need to refer to the Storage Subsystem and Controller information record.

1. Click **Start —> Programs —> Administrative Tools —> DHCP**. The DHCP window opens.
2. In the Console tree, right-click the server that you want to configure; then click **New Scope**. The New Scope Wizard starts.
3. Follow the on-screen instructions to define the scope of IP addresses for TCP/IP clients. You will define the following:
   a. The scope name and description.

b. The IP address range for the controllers that you are configuring and the subnet mask. See Figure 16.

SJ000868

Figure 16. New Scope Wizard: IP Address Range window

c. Any IP addresses that you want to exclude from the IP address range.

d. The IP address lease duration.

e. Common DHCP options:
- The IP address for a router
- The domain name and DNS servers

4. When you have defined the scope, click **Yes, I want to activate this scope now**. The wizard ends, and the DHCP window opens.

5. In the Console tree, open the scope folder.

6. Right-click **Reservations**; then, select **New Reservations**. The New Reservations window opens.

7. To define the IP address reservation, type the following information:

a. Reservation name

b. IP address

c. Ethernet hardware MAC address

d. Description

8. In the **Supported Type** field, select **Both (DHCP and BOOTP)**.

9. Click **Add**.

10. Repeat steps 5 through 9 for each controller in the network.

11. Restart the DHCP server and then restart the storage subsystem so that all of the modifications are applied.

12. Go to "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table" on page 37.

Setting up a NetWare DHCP server

A NetWare DHCP server automatically assigns IP addresses and other configuration information to clients on request or when the clients are restarted.

To set up a NetWare DHCP server, you must complete the following tasks:

1. Install DNS/DHCP Services, either during or after installing NetWare 6.0.
2. Install the DNS/DHCP Management Console.
3. Create the DHCP server object.
4. Create the subnet address.
5. Create the subnet address range.
6. Create the IP address object.
7. Start the DHCP server.

Installing NetWare 6.0 with DNS/DHCP Services

This section contains instructions for adding Novell DNS/DHCP services during or after you install NetWare.

Adding Novell DNS/DHCP Services during the NetWare 6.0 installation: Do the following to add Novell DNS/DHCP Services during the Netware installation:

1. From the Installation Options window, select **Custom**.
2. From the Components window, select the **Novell DNS/DHCP Services** check box.
3. Follow the on-screen instructions to complete the NetWare installation.

Adding Novell DNS/DHCP Services after the NetWare 6.0 installation: Do the following to add Novell DNS/DHCP Services after the Netware installation:

1. Insert the NetWare 6.0 Installation CD into the CD-ROM drive; then, mount the CD as a volume.
2. Load NWCONFIG and select **Product Options**.
3. Select **Install a Product not Listed**.
4. Press F3 and specify the volume name of the CD. The X Server-Graphical Console window opens.
5. In the **Additional Products and Services** dialog box, select the **Novell DNS/DHCP Services** check box.
6. Follow the on-screen instructions to complete installation.

   Note: Installing the DNS/DHCP Service extends the Novell Directory Services (NDS) schema and creates the following NDS objects:
   - DNSDHCP-GROUP Group object
   - DNS/DHCP Locator object
   - RootServerInfo Zone object

Installing the DNS/DHCP Management Console

Do the following to install the DNS/DHCP Management Console and NetWare Administrator snap-in files on the client workstation that you will use to administer DNS and DHCP:

1. If you have not already done so, install the latest version of Novell Client 32 on your workstation.
2. From the workstation, run the SYS:PUBLIC\DNSDHCP\SETUP.EXE program.
3. Install the DNS/DHCP Management Console on the local hard disk drive.

4. Install the NetWare Administrator snap-in files in the SYS:PUBLIC\WIN32 directory.

5. Restart the workstation.

6. To start the DNS/DHCP Management Console, double-click the shortcut icon on the desktop, type the NDS tree name, and click **Launch**.

Note: You can install the DNS/DHCP Management Console on a workstation, or you can access it from the Tools menu of the NetWare Administrator utility.

Creating the DHCP server object

Use the DHCP Management Console to create a DHCP server object. You can create a DHCP server object under any of the following objects:

* Organization (O)
* Organization Unit (OU)
* Country (C)
* Locality (L)

Do the following to create a DHCP server object:

1. From the DHCP Management Console, click the **DHCP Service** tab.

2. In the left panel, select **Our Network**.

3. Click **Create**. The Create New DHCP Object window opens.

4. Select **DHCP Server**; then, click **OK**. The Create DHCP Server window opens.

5. Select a server; then, click **Create**. This creates the DHCP server object in NDS, called *DHCP_servername*.

6. In the DHCP Management Console, locate the icon for the DHCP server object at the bottom of the **DHCP Service** tab. The server object is displayed with a red line through it. The red line indicates that DHCP server has not started.

7. Continue with "Creating a subnet object".

Creating a subnet object

Do the following to create a DHCP subnet object for each of the subnets for which you want to assign addresses:

1. From the DNS/DHCP Management Console, click the **DHCP Service** tab.

2. Select **Our Network** or the **DHCP Server Object**.

3. Click **Create**. The Create New DHCP Object window opens.

4. Select **Subnet**; then, click **OK**. The Create Subnet window opens.

5. For each subnet, type the following information:
   * Subnet name
   * NDS context
   * Subnet address
   * Subnet mask
   * Default DHCP server

6. Click **Create**. The DHCP subnet object is created and displayed in the DNS/DHCP Management Console.

Creating subnet address ranges

Do the following to create a subnet address range object:

1. From the DNS/DHCP Management Console, click the **DHCP Service** tab.

2. Select the subnet object under which you want to create the subnet address range object; then, click **Create**. The Create New DHCP Record window opens.

3. Select **Subnet Address Range**; then, click **OK**. The Create New Subnet Address Range window opens.
4. Type the following information for the subnet address range:
   - Subnet address range name
   - Starting address
   - Ending address
5. Click **Create**.
6. Select the **Define Additional Properties** check box; then, set the Range Type to **Dynamic BOOTP and DHCP**.

Creating IP address objects

Use the DNS/DHCP Management Console to create IP address objects. IP address objects are used for the following purposes:
- To exclude an IP address from assignment
- To assign an IP address manually to a specific host
- To record dynamic IP address leases

Do the following to create an IP address object:
1. From the DNS/DHCP Management Console, click the **DHCP Service** tab.
2. Select the subnet object of the target IP address; then, click **Create**.
3. Select **IP Address**; then, click **OK**. The Create IP Address window opens.
4. In the **IP Address** field, type the IP address for the first controller.
5. In the **Assignment** field, select **Manual**.
6. In the **Client Identifier** field, specify the MAC address.
7. In the **MAC Address** field, type the hardware Ethernet MAC address for the controller.
8. Select the **Define Additional Properties** check box.
9. In the **Hostname field**, type the eight-character name for the controller.
10. In the Usage field, select **Permanent**.
11. Repeat step 3 through step 10 for each controller.

Starting the DHCP server

To start the DHCP server, type the following at the DHCP server console:

```
LOAD DHCPSRVR
```

The DHCP server can now respond to client requests and assign IP addresses.

Notes:
1. To load the DHCP server automatically each time the server starts, place the DHCPSRVR command in the SYS:\SYSTEM\AUTOEXEC.NCF directory.
2. For additional information about how to set up, configure, or use Novell DNS/DHCP Services, see the NetWare 6.0 documentation, located on the Novell documentation CD or go to the Novell Web site at:

   www.novell.com/documentation

Setting up a UNIX BOOTP server

To use a UNIX BOOTP server, you must set up a BOOTP table. Table 17 on page 37 shows the information that is required for the BOOTP table.

Table 17. Required entries for setting up the UNIX BOOTP server

Entry	Description	Sample format in BOOTP server
Subnet mask	Mask that is used to route packets to defined subnets.	dot notation (sm=255.255.255.0)
Router	IP address of the host computer that routes packets to networks.	dot notation (gw=192.168.1.1)
Host name for the controller	Host name that is associated with the controller. See the Storage Subsystem and Controller information record for this information.	host name (Denver_a)
IP address	IP address of the controller See the Storage Subsystem and Controller information record for this information.	dot notation (ip=192.168.128.101)
Ethernet address	The Ethernet address of the controller hardware. See the Storage Subsystem and Controller information record for this information.	hexadecimal notation (ha=00a0b8020420)

To set up a UNIX BOOTP server, do the following:

1. Use a text editor to edit the bootptab file in the /etc directory.

   The following is an example of the BOOTP table used to configure the Network A server (shown in Figure 7 on page 22):

```
s4.default:\ (common settings)
ht=ether:\
sm=255.255.248.0:\
gw=192.168.1.1:\
hn:
denver_a:\
tc=s4.default:\ (common settings)
ip=192.168.128.101:\
ha=00a0b8020420:
denver_b:\
tc=s4.default:\
ip=192.168.128.102:\
ha=00a0b80000d8:
```

   where the `s4.default:\` entry denotes settings that are common to all controllers, and the `tc=s4.default:\` entry associates this common setting group to a specific controller.

2. If the storage subsystem is running, shut down and then restart the subsystem. This ensures that the parameters in the BOOTP table take effect.

3. Continue with "Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table".

Step 6: Verifying the TCP/IP protocol and setting up the host or DNS table

Use the following procedure to verify that the TCP/IP protocol software is installed on the management station and to set up the host or DNS table. Make sure that the host names for the controller match the IP addresses for the controllers.

1. Click **Start —> Settings —> Control Panel —> Network —> Protocols** to verify that the TCP/IP software is installed and configured properly.

Note: If the TCP/IP software is not installed properly, install it from the installation CD. Click **Start —> Settings —> Control Panel —> Network —> Protocols —> Add —> Have Disk**.

2. Update either the host table or the DNS table to specify a host name to associate with an IP address. If you do not have a DNS table, edit the two host tables that are found in the sys:etc\hosts directories. (Your directory will be different if the operating system is not installed on the root).

   To set up the host tables for the controllers, open the hosts file that is located in the \etc\ directory. Use a text editor to update the host file to create the following IP address and controller name entries. For example:

   Mappings of host names and host aliases to IP addresses

   `127.0.0.1   loopback lb local host loopback address`

   Examples from a fictitious network:

```
129.47.4.2 ta tahiti ta.some.com loghost
129.47.6.40 osd-frog
129.47.6.144 sj-in5 in5
197.67.172.71 sj-in1 in1
```

3. To manage storage subsystems through a firewall, configure the firewall to open port 2463 to TCP data.

Chapter 3. Installing the storage management software

This chapter describes how to install the storage management software in standard (noncluster) and cluster server configurations in the NetWare 6.0 operating system environment.

If you have existing storage systems, make sure that you have read "Storage subsystem management methods" on page 6 and "Installation environments" on page 11.

To ensure proper installation, make sure you have completed all preparation tasks described in Chapter 2, "Planning and preparing for installation", on page 21.

Important: Always check for a readme file on any installation media. A readme file might contain important information that was not available when the *Installation and Support Guide* was prepared.

Installation Overview

The Storage Manager 8.3 software components must be installed on both management stations and host computers.

Management station: A management station is a system that is used to manage the storage subsystem. It can be attached to the storage subsystem in the following ways:

- Through a TCP/IP Ethernet connection to the controllers in the storage subsystem.
- Through a TCP/IP network connection to a host computer with host-agent software installed on it, which in turn is directly attached to the storage subsystem through the Fibre Channel input/output (I/O) path.

You must install the following Storage Manager 8.3 components:

- Storage Manager 8.3 Client
- Client from IBM FAStT MSJ

Host computer: A host computer (or host) is a system that is directly attached to the storage subsystem through a fibre-channel I/O path.

Important: Be sure that you install the host bus adapter before you install the storage management software.

To install the storage management software in a NetWare 6.0 operating system environment, you *must* install the software on each host computer in the following order:

1. Storage Manager 8.3 Client.
2. Storage Manager 8.3 Agent.
3. Storage Manager 8.3 Utility.
4. IBM Storage Area Network (SAN) driver.
5. IBM Host Adapter (HA) device driver.
6. Netware Agent component of IBM FAStT Management Suite Java (FAStT MSJ).

To begin the installation:

- If NetWare 6.0 is installed, begin the installation with "Storage Manager 8.3 Client".

Storage Manager 8.3 Client

This section provides instructions for installing Storage Manager 8.3 Client on management stations and host computers.

Before you install the software, make sure that:
- The management station or host computer has at least 60 MB of available disk space.
- All programs are closed.
- The host bus adapter is installed.

Important: When you install Storage Manager 8.3 Client on a stand-alone host and manage storage subsystems through the fibre-channel I/O path rather than through the network, you must install the TCP/IP software on the host and assign an IP address to the host.

Installing Storage Manager 8.3 Client

To install Storage Manager 8.3 Client software package, do the following:

1. Insert the IBM FAStT Storage Manager installation CD into the CD-ROM drive and type:

   load cdrom

2. Mount the volume.
3. Click **Novell —> Install**.
4. Click **Add**, and follow the instructions on the screen.
5. Click the **Directory Tree** button.

   The Directory Tree window opens.

6. Select the CD-ROM volume.
7. Select the \Netware\SMclient folder.
8. Select the program.ni file, and then click **OK**.
9. Click **OK**.

   After the files are copied, the License Agreement window opens.

10. Click **Accept** to continue.

    The Copying Files message window opens.

11. When the installation is complete, click **Finish**.

Verifying the Storage Manager 8.3 Client installation

To verify that the Storage Manager 8.3 Client software is installed correctly, do the following:

1. Click **Novell —> Programs**.
2. Verify that the IBM FAStT Fibre Channel Storage Manager Client displays in the list of programs.

   If the program is not listed, repeat "Installing Storage Manager 8.3 Client". If the IBM FAStT Storage Manager Client still does not display, a failure has occurred. Contact your IBM technical support representative.

3. If you are installing Storage Manager 8.3 Client on a host computer, go to "Storage Manager 8.3 Agent". Otherwise, go to Chapter 4, "Completing the installation", on page 45.

Storage Manager 8.3 Agent

The Storage Manager 8.3 Agent software *must* be installed if you want to manage the storage subsystem using the host-agent management method.

Before you install the software, ensure that the following conditions are met:
- The host computer is configured with Novell NetWare 6.0 and Service Pack 2.
- You have Administrator privileges on the host computer.
- The host computer has at least 20 MB of available disk space.

Installing Storage Manager 8.3 Agent

To install the Storage Manager 8.3 Agent, do the following:
1. Close all other programs.
2. Insert the IBM FAStT Storage Manager installation CD into the CD-ROM drive and type:

   ```
   load cdrom
   ```

3. Mount the CD volume.
4. Click **Novell —> Install**.
5. Click **Add**, and follow the instructions on the screen.
6. Click the **Directory Tree** button.

   The Directory Tree window opens.
7. Select the CD-ROM volume.
8. Select the \Netware\SMagent directory.
9. Select the product.ini file, and then click **OK**.
10. Click **OK**.

    After the files are copied, the License Agreement window opens.
11. Click **Accept** to continue.

    The files are copied.
12. When the installation is complete, click **Finish**.

    Note: To enable SMagent at server startup, an autoexec.ncf entry can now be made.

Verifying the Storage Manager 8.3 Agent installation

To verify that the Storage Manager 8.3 Agent software was installed correctly, do the following:
1. Toggle to the Server Console window and at the command prompt, type:

   ```
   SMagent
   ```

   The agent starts and displays the following message when UTM LUNs are being scanned:

   ```
   Activating
   ```

2. Continue with "Storage Manager 8.3 Utility" on page 42.

Storage Manager 8.3 Utility

This section provides instructions for installing Storage Manager 8.3 Utility software on host computers. This component contains utilities that will register and map new logical drives to the operating systems.

Important: Make sure that you have installed the IBM FAStT MSJ QLRemote agent on the same host where you are installing the Storage Manager 8.3 Utility software. For more information, see "Installing IBM FAStT Management Suite Java" on page 43.

Installing Storage Manager 8.3 Utility

To install the Storage Manager 8.3 Utility software on each attached Windows host computer, do the following:

1. Close all programs.
2. Insert the IBM FAStT Storage Manager installation CD into the CD-ROM drive and type:

   `load cdrom`

3. Mount the CD volume.
4. Click **Novell —> Install**.
5. Click **Add**, and follow the instructions on the screen.
6. Click the **Directory Tree** button.

   The Directory Tree window opens.
7. Select the CD-ROM drive.
8. Click the \NetWare\SMutil folder, and then, click **Open**.
9. Select the product.ni file, and then, click **Open**.

   The Welcome window opens.
10. Click **Next** to begin the installation.

    After installing the Storage Manager 8.3 Utility software, the Operation Complete window opens. If the system detects the installation of another version of Storage Manager 8.3 Utility, a window opens indicating that the installation will be updated and your personal configuration files will be saved. Click **Yes** to continue.
11. Click **Finish**.
12. Go to "Verifying the Storage Manager 8.3 Utility installation".

Verifying the Storage Manager 8.3 Utility installation

To verify that Storage Manager 8.3 Utility is installed correctly, do the following:

1. Go to the following directory:

   sys:system

   where *installation_directory* is the directory where you installed the Storage Manager 8.3 Utility.
2. Verify that the directory contains the following files:
   * hot_add.ncf
   * SMdevices.ncf

   If it does not, reinstall the Storage Manager 8.3 Utility using the procedure in "Installing Storage Manager 8.3 Utility".

3.   Continue with "Installing the IBMSAN driver".

Installing the IBMSAN driver

The IBM Storage Area Network (SAN) driver is used in a Novell NetWare environment to provide multipath I/O support to the storage server. The IBMSAN driver is a custom driver module that is installed with the IBM FAStT Host Adapter driver. In case of a failure along the I/O path, the driver sends the I/O requests through the alternate path and Auto-Volume Transfer (AVT) moves the logical drive within the FAStT Storage Server.

For the current readme file, SAN driver, and installation instructions, go to the IBM Web page located at:

www.ibm.com/pc/support

Continue with "Installing the IBM Host Adapter device driver (QL2x00)".

Installing the IBM Host Adapter device driver (QL2x00)

The IBM Host Adapter device driver enables the operating system to communicate with the host adapter. The IBM FAStT Host Adapter, IBM FAStT FC-2 Host Bus Adapter, and IBM TotalStorage FAStT FC2-133 Host Bus Adapter are high-performance, direct memory access (DMA), bus-master, host adapters that are designed for high-end systems. These host bus adapters support all fibre-channel peripheral devices that support private loop direct attach (PLDA) and fabric loop attach (FLA). For more information, see the *IBM FAStT Host Adapter Installation and User's Guide*, *IBM FAStT FC-2 Host Bus Adapter Installation and User's Guide*, or the *IBM TotalStorage FAStT FC2-133 Host Bus Adapter Installation and User's Guide*.

For the current readme file and latest multipath I/O device driver, go to the IBM Web page located at:

www.ibm.com/pc/support

Continue with "Installing IBM FAStT Management Suite Java".

Installing IBM FAStT Management Suite Java

For information about installing and using this software, see the *IBM FAStT MSJ User's Guide* or online Help.

Chapter 4. Completing the installation

This chapter contains procedures for using Enterprise Management and Subsystem Management to complete the following installation tasks:

1. Performing an initial automatic discovery of storage subsystems
2. Adding devices
3. Setting up alert notifications
4. Naming the storage subsystems
5. Downloading firmware and NVSRAM
6. Creating arrays and logical drives
7. Defining the default host type
8. Configuring heterogeneous hosts
9. Performing other storage subsystem tasks

The Enterprise Management window opens when you start FAStT Storage Manager. Use the Enterprise Management window to do the following:

- Add and discover the storage subsystems.
- View all storage subsystems in your management domain.
- Perform batch storage subsystem management tasks by using the Script Editor.

Performing an initial automatic discovery of storage subsystems

To perform an initial automatic discovery of storage subsystems, do the following:

1. If you are using the SMagent, start the SMagent at the Server Console window. At the Server Console, type:

   ```
   smagent
   ```

2. From the Xserver Graphical Console, click **Novell —> Programs**.
3. Click **IBM FAStT Storage Manager**.

The client software starts, displaying the Enterprise Management window. See Figure 17.
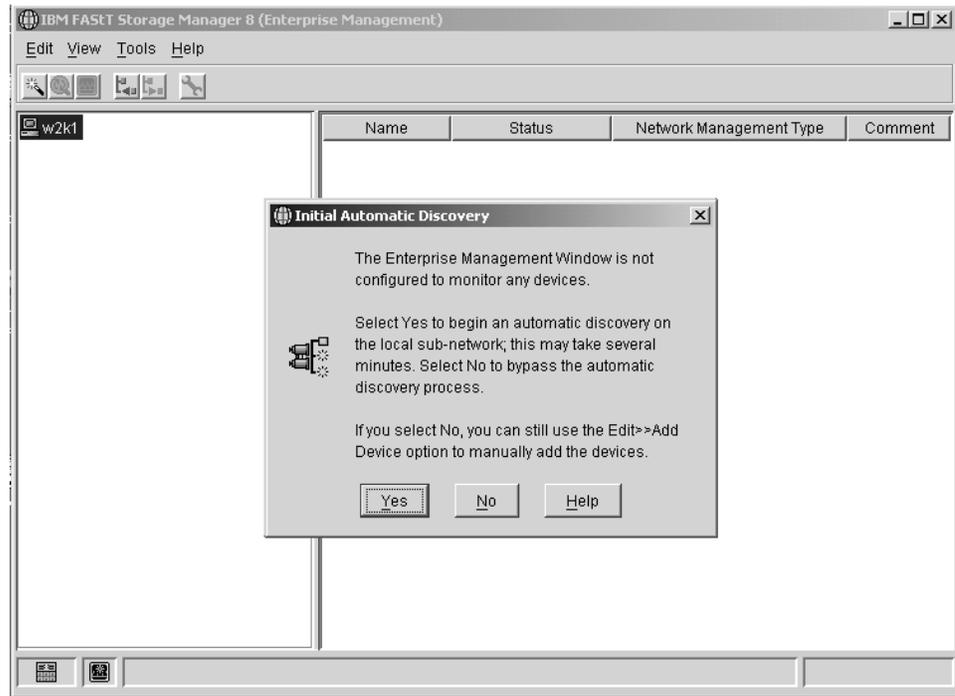
Figure 17. Enterprise Management window: Initial automatic discovery options

> **Note:** The Enterprise Management window might take several minutes to open. No wait cursor (such as a hourglass) is displayed.

4. Click **Yes** to begin an initial automatic discovery of hosts and storage subsystems that are attached to the local subnetwork.

After the initial automatic discovery is complete, the Enterprise Management window displays all hosts and storage subsystems that are attached to the local subnetwork. See Figure 18 on page 47.

Note: The Enterprise Management window might take up to a minute to refresh after an initial automatic discovery.
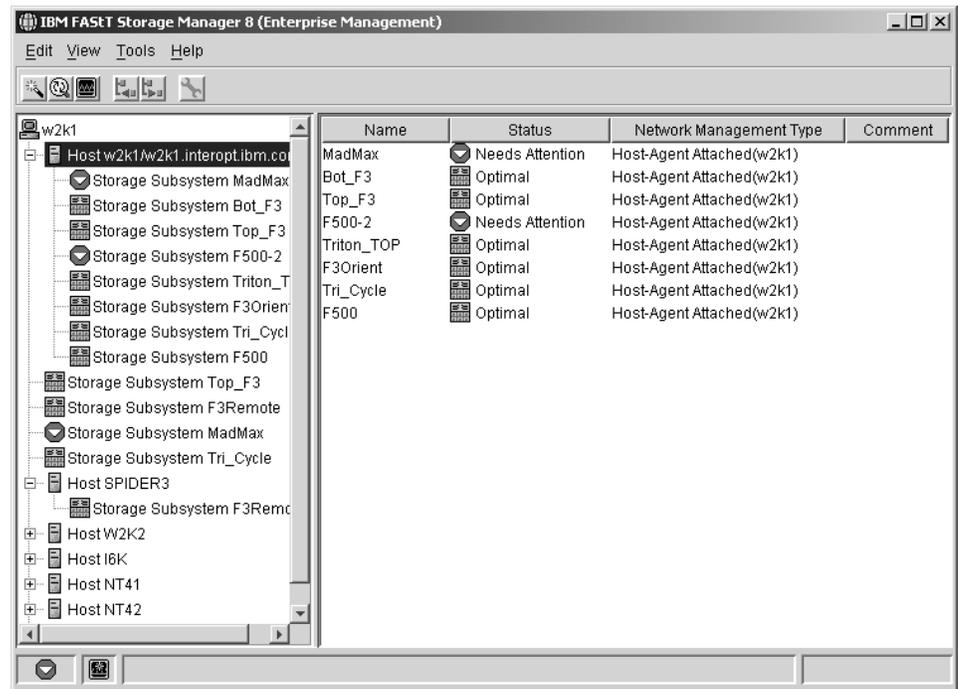
SJ000873

Figure 18. Enterprise Management window

5. Verify that each host and storage subsystem is displayed in the Enterprise Manager window.

   If a host or storage subsystem is not displayed, do the following:

   a. Check the hardware and connections for possible problems (refer to the hardware documentation for specific procedures).

   b. Refer to the Enterprise Management online help for additional information about discovering storage subsystems.

   c. Verify that all hosts and storage subsystems are on the local subnetwork. If they are not, use the Add Device option.

   Note: In certain situations, a storage subsystem might be duplicated in the device tree after an automatic discovery. You can remove a duplicate storage management icon from the device tree by using the Remove Device option in the Enterprise Management window.

6. Verify that the status of each storage subsystem is Optimal. If a device shows a status of Unresponsive, use the software to remove the device from the management domain and then add it again. Refer to the Enterprise Management window online help for instructions on how to remove and add devices.

7. Continue with "Adding devices" on page 48.

Adding devices

You can manually add more hosts or storage subsystems. You can use this option to selectively manage a group of storage subsystems from a Storage Manager 8.3 client. You can also use this option to add additional devices to be managed that were not identified during the Storage Manager 8.3 client initial discovery. For more information about this option, refer to the Enterprise Management window online help.

Important:

- When you add new storage subsystems to existing storage subsystems in a SAN that are managed through the host-agent software, you must stop and restart the host-agent service. When the host-agent service restarts, the new storage subsystem is detected. For more information, see "Stopping and starting the host-agent software" on page 55. Then, go to the Enterprise Management window and click **Tools —> Rescan** to add the new storage subsystems to the management domain.
- When you add new storage subsystems to existing storage subsystems that are managed using the direct-management method, be sure to specify the IP addresses for both controllers.

Continue with "Setting up alert notifications".

Setting up alert notifications

After you add devices to the management domain, you can set up alert notifications to report critical events on the storage subsystems. The following alert notification options are available:

- Notification to a designated network management station (NMS) using SNMP traps.
- Notification to designated e-mail addresses.
- Notification to designated alphanumeric pagers (requires additional software to convert e-mail messages)

Note: You can only monitor storage subsystems within the management domain. If you do not install Event Monitor service, the Enterprise Management window must remain open. If you close the window, you will not receive alert notifications from the managed storage subsystems. Refer to the Enterprise Management window online help for additional information.

To set up alert notification to an NMS using SNMP traps, do the following:

1. Insert the IBM FAStT Storage Manager Version 8.3 CD into the CD-ROM drive on an NMS. You need to set up the designated management station only once.
2. Copy the SM820.MIB file from the SM8mib directory to the NMS.
3. Follow the steps required by your NMS to compile the management information base (MIB) file. For details, contact your network administrator or see the documentation specific to the storage management product that you are using.
4. Continue with "Naming storage subsystems".

Naming storage subsystems

To name your storage subsystem, do the following:

1. In the Enterprise Management window, select a storage subsystem.

2. Click **Tools —> Manage Device**. The Subsystem Management window opens, as shown in Figure 19.
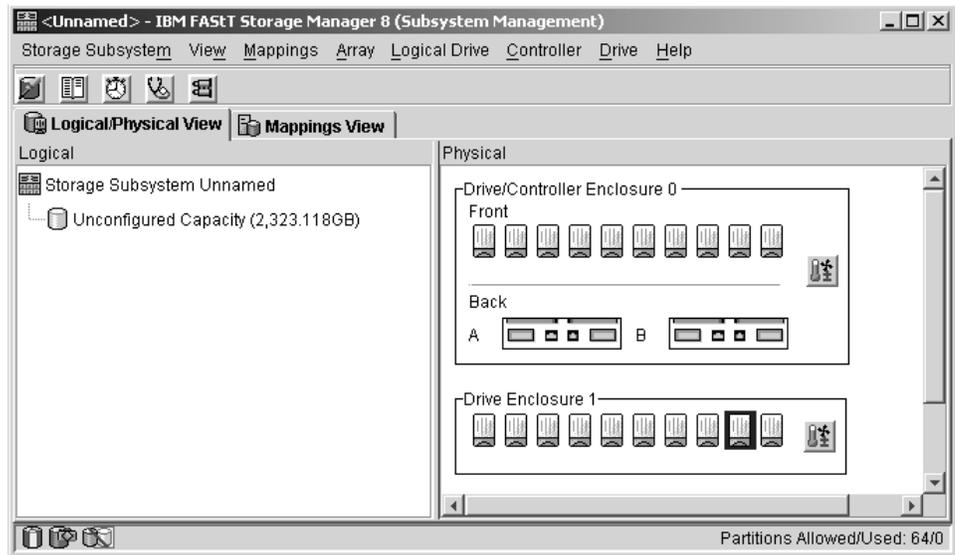
SJ000874

Figure 19. Subsystem Management window

3. Click **Storage Subsystem —> Rename**. The Rename Storage Subsystem window opens.

4. Type the name of the storage subsystem from the Storage Subsystem and Controller information record; then, click **OK**.

5. Repeat for each unnamed storage subsystem. For more information, refer to the topic on renaming storage subsystems in the Subsystem Management window online help.

6. Continue with "Downloading firmware and NVSRAM".

Downloading firmware and NVSRAM

This section provides instructions for downloading firmware and NVSRAM. You must download firmware version 5.3x.xx.xx before you download NVSRAM.

Downloading firmware

To download firmware version 5.3x.xx, do the following:

1. From the Enterprise Management window, select a storage subsystem.

2. Click **Tools —> Manage Device**. The Subsystem Management window opens.

3. Click **Storage Subsystem —> Download —> Firmware**. Follow the on-screen instructions.

4. Continue with "Downloading NVSRAM".

Downloading NVSRAM

To download NVSRAM, do the following:

1. From the Enterprise Management window, select a storage subsystem.

2. Click **Tools —> Manage Device**. The Subsystem Management window opens.

3. Click **Storage Subsystem —> Download —> NVSRAM**. Follow the on-screen instructions.

4. Continue with "Creating arrays and logical drives".

Creating arrays and logical drives

A *logical drive* is the basic structure that you create to store data on the storage subsystem. The operating system recognizes a logical drive as a single drive. Choose a RAID level to meet application needs for data availability and maximize fibre-channel I/O performance.

To create arrays and logical drives, do the following:

1. From the Enterprise Management window, select a storage subsystem.
2. Click **Tools —> Manage Device**. The Subsystem Management window opens.
3. Click the **Logical/Physical View** tab.
4. Click **Logical Drive —> Create**. The Logical Drive Create wizard starts. Follow the on-screen instructions to create arrays and logical drives.
5. Continue with "Defining the default host type".

Note: (For cluster configurations) If you add or delete logical drives, you must make them known to both node A and node B.

Defining the default host type

Before using the logical drives in a host computer, you must specify the host type. The host type determines how the storage subsystem controllers work with each particular operating system on the hosts to which it is connected. If all of the host computers that are connected to the same storage subsystem have the same operating system installed and you do not want to define partitioning, you can define a default host type.

To define a default host type, do the following:

1. Click **Storage subsystem —> Change —> Default host-type**. The Default Host-type window opens.
2. From the pull-down menu, select the host type.
3. Click **OK**.

If you have hosts with different operating systems or if you want to define partitions for the hosts, continue with "Configuring heterogeneous hosts".

Configuring heterogeneous hosts

The heterogeneous hosts feature enables hosts that run different operating systems to access a single storage subsystem. Previous releases of IBM FAStT Storage Manager (versions 7.02 or earlier) required that hosts run the same operating system in order to access a single storage subsystem.

Host computers can run completely different operating systems (for example, Solaris and Windows NT) or variants of the same operating system (for example, Windows NT operating in a cluster environment or Windows NT running in a noncluster 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) to the needs of the host.

Important: To use the heterogeneous host feature, the following conditions must be met:

- Storage partitioning is enabled.
- During host-port definition, you must set each host type to the appropriate operating system so that the firmware on each controller can respond correctly to the host.

To start the heterogeneous host configuration, do the following:

1. From the Subsystem Management window, click **Configure —> Storage Partition**.
2. Follow the on-screen instructions.
3. Continue with "Performing other storage subsystem management tasks".

Note: Partitioning is a premium feature. If you disable partitioning, you *must* contact your IBM technical support representative to obtain a key to reenable partitioning.

Performing other storage subsystem management tasks

Other storage subsystem management tasks you can perform include the following:
- Locate a storage subsystem.
- View a storage subsystem profile.
- Enter or change a storage subsystem password.
- Create and manage logical drives and subsystems.
- Use the Performance Monitor.
- Create storage partitions (if applicable).

Note: To create storage partitions, you must obtain the worldwide name (WWN) or port name of each host adapter in every host that is connected to the storage subsystem.

For more information about these and other storage subsystem management tasks, refer to the appropriate topics in the Subsystem Management online help.

After installing IBM FAStT Storage Manager Version 8.3, consider installing the FAStT Management Suite Java (FAStT-MSJ) diagnostic program. You can use this program to verify the status of the fibre-channel connections before using the storage subsystem. The program and the *IBM FAStT MSJ User's Guide* are located on theIBM FAStT Storage Manager Version 8.3 CD.

Chapter 5. Using the storage management software

This chapter provides information about how to add, or delete logical drives, use the Hot Add and SMdevices utilities, start and stop the host-agent software, and how to uninstall Storage Manager components.

Adding or deleting logical drives

Use the following instructions to add or delete logical drives in a standard (noncluster) configuration.

Adding logical drives

When you add (create) new logical drives with the storage management software, you must add the new logical drives to Novell NetWare. See Novell NetWare documentation for details about adding a drive. Novell NetWare recognizes each logical drive (not array) as a single drive.

After adding logical drives, run the Hot Add and SMdevices utilities that are provided with the storage management software. The Hot Add utility adds newly created logical drives to the operating system, and the SMdevices utility identifies logical drives by their associated operating system device names. For information about using these utilities, see "Using the Hot Add utility" on page 54 and "Using the SMdevices utility" on page 54.

Deleting logical drives

Important: If you have data or logical drives that you want to keep, do not click **Configure —> Reset Configure**. This resets the controller unit and deletes *all* logical drives that were previously configured.

Before deleting logical drives with the storage-management software or using **Configure —> Reset Configuration**, stop all input and output activity to the affected storage subsystem. Then dismount any NetWare volumes that are associated with the logical drives.

Creating a FlashCopy logical drive

A FlashCopy logical drive is a logical point-in-time image of a logical drive, called a *base logical drive*. A FlashCopy logical drive has the following features:
- It is created quickly and requires less disk space than an actual logical drive.
- It can be assigned a host address, so that you can perform backups by using the FlashCopy logical drive while the base logical drive is online and accessible.
- You can use the FlashCopy logical drive to perform application testing or both scenario development and analysis. This does not affect the actual production environment.
- The maximum number of FlashCopy logical drives allowed is one half of the total logical drives that are supported by your controller model.

For additional information about the FlashCopy feature and how to manage FlashCopy logical drives, see the Storage Manager Subsystem Management online help.

Note: FlashCopy is a premium feature. Contact your IBM reseller or IBM marketing representative for more information.

To create a FlashCopy logical drive, do the following:

1. To ensure that you have the accurate point-in-time image of the base logical drive, stop applications and flush cache I/O to the base logical drive.

2. Open the Subsystem Management window. From the Logical view, right-click the base logical drive.

3. Select **Create FlashCopy Logical Drive**. The Create FlashCopy Logical Drive wizard starts.

4. Follow the on-screen instructions.

5. See the Subsystem Management online help for instructions on how to add the FlashCopy logical drive to the host.

Using the Remote Mirror Option

The Remote Mirror Option is a premium feature. The Remote Mirror Option is used for online, real-time replication of data between storage subsystems over a remote distance. In the event of a disaster or unrecoverable error at one storage subsystem, the Remote Mirror Option enables you to promote a second storage subsystem to take over responsibility for normal I/O operations. For more information about this feature, see the *IBM FAStT Remote Mirror Option Installation and User's Guide*, or contact your IBM reseller or marketing representative.

Using the Hot Add utility

The Hot Add utility enables you to add new logical drives without restarting the system. The utility registers the new logical drives with the operating system so that you can use nwconfig to create partitions, add device names, and so on. The Hot Add utility is part of the Storage Manager 8.3 Utility package.

When you finish creating logical drives on a particular storage subsystem, go to the host that is attached to that storage subsystem, and perform the following steps to use the Hot Add utility:

1. From the Server Console, type:

   ```
   hot_add
   ```

2. Press Enter.

   The new logical drives are available through the Disk Administrator.

Using the SMdevices utility

The Storage Manager 8.3 Utility software package includes a utility called SMdevices. You can use this utility to view the storage subsystem logical drive that is associated with a particular operating system device name. This is helpful when you want to create drives, volumes, or a combination of both for the logical drive using the nwconfig program.

When you finish creating the logical drives on a particular storage subsystem, go to the host that is attached to that storage subsystem, and perform the following steps to use SMdevices:

1. From the Server Console type:

   ```
   SMdevices
   ```

2. Press Enter.

   The software displays device identification information. For example, you might see:

```
V596-A3-D0:0[Storage Subsystem MARKETING, Logical Drive DEBIT,
LUN 0, WWN <600a0b800007545c0000008d3a308b6e>]
V596-A3-D0:1 [Storage Subsystem MARKETING, Logical Drive DEBIT, LUN 1,
WWN <600a0b80000756ec000000a93a307d2a>]
V596-A3-D0:1F [Storage Subsystem MARKETING, Logical Drive Access volume,
LUN 31, WWN <600a0b800007545c0000009000000000>]
Where V596-A3-D0:0;
```

The numbers at the beginning of each line comprise the device name. The device name identifies the adapter or device as follows:

- **Vendor number** [V596]. A unique number specific to the device vendor.
- **Adapter number** [A3]. The instance number of an adapter registered with NWPA. In the example, A3 identifies the first instance of an adapter installed in the server.
- **Device number** [D0]. The number of the disk or other device.
- **Logical unit number** [0,1,1F]. The LUN identifies individual devices when more than one device is attached to one bus.

    Storage Subsystem x. The storage subsystem name

    Logical Drive x. The logical drive name

    LUN x. The logical unit number associated with the logical drive

    WWN x. The worldwide name for the logical drive

Stopping and starting the host-agent software

Use the procedures in the following sections to stop and start the host-agent software that is installed on the host or cluster node.

Note: If an access logical drive is not detected after a restart, the host-agent software automatically stops running. Restart the host or cluster node so that new host-agent-managed storage subsystems are discovered.

Stopping the host-agent software

You must stop the host-agent software if you want to add storage subsystems. When you restart the service, the host-agent software discovers the new storage subsystems and adds them to the management domain.

To stop the host-agent software, do the following:

1. From the system console, press Ctrl+Esc, and then select **System Console**.
2. At the prompt, type:

    java -show

    Look for the following line:

    "devmgr.versioned.agent.AgentServer.............QQQ"

    Where *QQQ* is the process ID.
3. At the prompt type the following:

    java -killQQQ

    Where *QQQ* is the process ID from the Java **-show** command.
4. Press Enter.

Starting the host agent manually

The host-agent software must be started manually when the system is started or if it is stopped to add storage subsystems.

Use the following procedure to start the host agent manually:

1. From the system console, press Ctrl+Esc, and then select **System Console**.
2. At the prompt, type:

   `smagent`

3. Press Enter.

   The agent will start and display the following message when UTM LUNs are scanned:

   `Activating`

4. Return to ConsoleOne. Press Ctrl+Esc, and then select **Xserver —> Graphical Console**.

Uninstalling storage management software components

Use the following procedure to uninstall one or more of the components of Storage Manager 8.3. If you are uninstalling components that were released with an earlier version of the storage management software, use the procedure that came with the version of the storage management software that you are currently running.

1. From the Xserver Graphical Console, click **Novell —> Install**.

   The Add/Remove Programs Properties window opens.

   Note: The Storage Manager components should be uninstalled in the following order:
   a. Storage Manager 8.3 Agent
   b. Storage Manager 8.3 Utility
   c. Storage Manager 8.3 Client

2. Select the component that you want to uninstall from the list of programs (for example, IBM FAStT Storage Manager 8.3 Client).
3. Click **Add/Remove**.

   The Confirm File Deletion window opens.

4. Click **Yes** to start the uninstallation process.
5. When the uninstallation is completed, click **OK**.

Appendix A. Novell NetWare operating system limitations

Important: Always check for a readme file on any installation media. This readme file might contain important information that was not available when this *Installation and Support Guide* was prepared.

Table 18 lists the limitations that apply when you use the IBM FAStT Storage Manager Version 8.3 with Novell NetWare.

Table 18. Novell NetWare limitations and workarounds

Limitation	Workaround
If the SMagent is running on the NetWare server and a fiber-optic cable is pulled or a path failure occurs, the NetWare server might abend.	Stop the SMagent and manage the FAStT using the direct (out-of-band) method of management. See "Stopping the host-agent software" on page 55 and use the procedure for uninstalling the SMagent software.
Clicking a vertical scroll arrow (either up or down) causes the scroll box to move all the way to the opposite end of the scroll bar.	This is a known defect in the Java Runtime Environment. Click the scroll box and slide it until you reach the desired position in the Help window.
Logical drive migration (removing a set of drives that are configured with logical drives from one storage subsystem for insertion into another storage subsystem) is not supported because it could cause loss of configuration.	Call for service.
When you manage storage subsystems through the host-agent software and use the storage management software to download controller firmware, the download process can take up to 10 minutes to complete.	None.
The controller firmware does not recognize or communicate with a single controller until slot A is populated. This limitation does not apply to storage subsystems that were originally configured with two controllers.	When you configure a new storage subsystem with a single controller, you must place the controller in slot A.
Public loop configurations (managed hubs that are attached to switches) are not supported.	None.
Multipath failover will work only if the storage controllers are in active/active mode.	When you configure the storage subsystem, change both controllers to active status.
When you remove a fan or power supply field replaceable unit (FRU) from a storage subsystem while the system is running, the storage management software does not report an error message, and the component is not reported as missing. **Note:** Fan and power supply FRU failures are reported.	Replace the missing fan or power supply FRUs immediately to ensure redundancy. Make sure that the fan or power supply FRU is properly seated in the controller unit.
Your windows and online Help will display a brownish hash pattern when you run in 256 color mode.	Run the Storage Manager 8.3 application in a higher display mode

Table 18. Novell NetWare limitations and workarounds (continued)

Limitation	Workaround
When performing a redundancy check (parity scan) from the storage management application, machine type 3542 can take several minutes longer than machine type 3526 and 3552 controller platforms.	None.
When attempting to manage a storage subsystem where the RAID controller unit does not have access to logical drives, Storage Manager prompts you for a password. This occurs even if no password has been set up. The automatic discovery locates and identifies each storage subsystem as two separate storage subsystems.	Ensure that at least one IBM FAStT EXP700 expansion unit with at least one logical drive is properly attached to the IBM FAStT700 RAID controller unit in each storage subsystem being managed. The RAID controller unit should not be powered on until the expansion units are attached and powered on. Power off the RAID controller unit, properly attach all expansion units with the drives installed to the RAID controller unit, and power them on; then, power on the RAID controller unit. At this point the storage subsystems can be rediscovered and managed using the FAStT Storage Manager software.
You might not see the maximum number of drives during Automatic Configuration if you are using drives of different capacities.	Use Manual Configuration to select individual drives and select the maximum number of drives allowed.
When you connect an IBM TotalStorage FAStT EXP700 Storage Expansion Unit to a FAStT200, the drive speed must be set to 1 GB per second.	None.

Appendix B. Storage Subsystem and Controller information record

Table 19 provides a blank information record that you use to record storage subsystem names, management types, hardware Ethernet addresses, and IP addresses. Make a copy of this table and complete the information for your storage subsystems and controllers. Use the information to set up the BOOTP table for the network server and the host or Domain Name System (DNS) table. The information will also be helpful if you add storage subsystems after your initial installation. The column headings show a page reference for detailed instructions about obtaining the information. For a sample information record, see Table 15 on page 24.

Table 19. Storage Subsystem and Controller information record

Storage subsystem name (see page 23)	Management type	Controllers-Ethernet and IP addresses, and host name (see pages 23 and 26)		Host-IP address and host name

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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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Glossary

This glossary provides definitions for the terminology used for the IBM TotalStorage FAStT. This glossary also provides definitions for the terminology used for the IBM TotalStorage FAStT Storage Manager.

This glossary defines technical terms and abbreviations used in this document. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms* located at www.ibm.com/networking/nsg/nsgmain.htm

This glossary also includes terms and definitions from:

- *Information Technology Vocabulary* by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- *IBM Glossary of Computing Terms*. New York: McGraw-Hill, 1994.

The following cross-reference conventions are used in this glossary:

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

See also
       Refers you to a related term.

This glossary includes terms for the IBM FAStT Storage Manager Version 8.30 for UNIX and AIX environments.

This glossary also includes terms and definitions from: *IBM Glossary of Computing Terms*, available online at the following Web site:

www.ibm.com/ibm/terminology/

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

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

See also
       Refers you to a related 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/auto disk transfer (AVT/ADT). A function that provides automatic failover in case of controller failure on a storage subsystem.

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

AWT. See *Abstract Windowing Toolkit*.

BOOTP. See *bootstrap protocol*.

bootstrap protocol (BOOTP). A Transmission Control Protocol/Internet Protocol (TCP/IP) protocol that is used by a diskless workstation or network computer to obtain its IP address and other network information such as server address and default gateway.

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. See *disk array controller*.

dar. See *disk array router*.

disk array controller (dac). A disk array controller device that represents the two controllers of an array. See also *disk array controller*.

disk array router (dar). A disk array router that represents an entire array, including current and deferred paths to all logical unit numbers (LUNs) (hdisks on AIX). See also *disk array controller*.

field replaceable unit (FRU). 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*.

graphical user interface (GUI). A type of computer interface that presents a visual metaphor of a real-world scene, often of a desktop, by combining high-resolution graphics, pointing devices, menu bars and other menus, overlapping windows, icons, and the object-action relationship.

GUI. See *graphical user interface.*

hdisk. An AIX term representing a logical unit number (LUN) on an 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 simultaneously.)

host computer. See *host*.

Internet Protocol (IP). A protocol that routes data through a network or interconnected networks. Internet Protocol (IP) acts as an intermediary between the higher protocol layers and the physical network.

IP. See *Internet Protocol*.

Java Runtime Environment (JRE). A subset of the Java Development Kit (JDK) for end users and developers who want to redistribute the Java Runtime Environment (JRE). The JRE consists of the Java virtual machine, the Java Core Classes, and supporting files.

JRE. See *Java Runtime Environment*.

LAN. See *local area network*.

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

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

LUN. See *logical unit number*.

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

man pages. In UNIX-based operating systems, online documentation for operating-system commands, subroutines, system calls, file formats, special files, stand-alone utilities, and miscellaneous facilities. Invoked by the **man** command.

MIB. See *management information base*.

network management station (NMS). In the Simple Network Management Protocol (SNMP), a station that executes management application programs that monitor and control network elements.

NMS. See *network management station*.

nonvolatile storage (NVS). A storage device whose contents are not lost when power is cut off.

NVS. See *nonvolatile storage*.

NVSRAM. Nonvolatile storage random access memory. See *nonvolatile storage*.

Object Data Manager (ODM). An AIX proprietary storage mechanism for ASCII stanza files that are edited as part of configuring a drive into the kernel.

ODM. See *Object Data Manager*.

PDF. See *portable document format*.

portable document format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact; can be distributed globally by e-mail, the Web, intranets, or CD-ROM; and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

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

PTF. See *program temporary fix*.

RDAC. See *redundant dual active controller*.

redundant dual active controller (RDAC). A controller, used with AIX and Solaris hosts, that provides a multipath driver for a storage subsystem. An RDAC is also known as redundant disk array controller.

router. A computer that determines the path of network traffic flow. The path selection is made from several paths based on information obtained from specific protocols, algorithms that attempt to identify the shortest or best path, and other criteria such as metrics or protocol-specific destination addresses.

SAN. See *storage area network*.

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

Simple Network Management Protocol (SNMP). 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 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, as opposed to SNMPv2, a revision of SNMP. See also *Simple Network Management Protocol.*

storage area network (SAN). A dedicated storage network tailored to a specific environment, combining servers, storage products, networking products, software, and services.

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

subnet. An interconnected but independent segment of a network that is identified by its Internet Protocol (IP) address.

TCP. See *Transmission Control Protocol.*

TCP/IP. See *Transmission Control Protocol/Internet Protocol.*

Transmission Control Protocol (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 packed-switched communication networks and in interconnected systems of such networks. It uses the Internet Protocol (IP) as the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communication protocols that provide peer-to-peer connectivity functions for both local and wide-area networks.

trap. In the Simple Network Management Protocol (SNMP), a message sent by a managed node (agent function) to a management station to report an exception condition.

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

WWN. See *worldwide name.*

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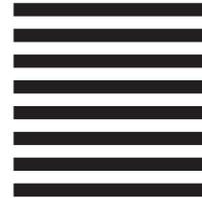
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