IBM® FAStT Storage Manager Version 7.10 for Novell NetWare and Red Hat Linux

Installation and Support Guide

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Note:

Before using this information and the product it supports, be sure to read the general information in Appendix C, “Notices,” on page 77.

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About this book

This book provides information about setting up, installing, configuring, and working with IBM® Fibre Array Storage Technology (FAStT) Storage Manager Version 7.10 in Novell NetWare and Red Hat Linux operating-system environments. This *Installation and Support Guide* is for system administrators. Use this guide 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 storage-management software.
- Upgrade controller firmware, if necessary.
- Identify storage-management features that are unique to your specific installation.

How this book is organized

Chapter 1, “Introduction,” on page 1 provides an overview of IBM FAStT Storage Manager Version 7.10 and describes storage-subsystem management methods, configuration types, types of installations, and installation requirements.

Chapter 2, “Preparing for installation,” on page 17 discusses preparing for a network installation including setting up a Microsoft® DHCP server, UNIX® BOOTP server, or a NetWare server, and describes other setup tasks.

Chapter 3, “Installing software in standard and cluster configurations (Novell NetWare),” on page 33 gives the procedure for installing the software in a standard and noncluster server environments.

Chapter 4, “Completing the installation (Novell NetWare),” on page 39 discusses starting the Enterprise Management window, applying NVSRAM configuration scripts, adding devices, and subsystem management tasks.

Chapter 5, “Novell NetWare operating system support,” on page 49 discusses Novell NetWare operating system limitations.

Chapter 6, “Installing software in a standard configuration (Red Hat Linux),” on page 55 gives the procedure for installing the software in a standard (noncluster) environment.

Chapter 7, “Completing the software installation (Red Hat Linux),” on page 59 discusses starting the Enterprise Management window, applying NVSRAM configuration scripts, adding devices, and subsystem management tasks.

Chapter 8, “Red Hat Linux operating-system support,” on page 67 discusses Red Hat Linux operating system limitations.

Appendix A, “Storage subsystem/controller information record,” on page 71 provides a data sheet template that you can use to create a controller information record.

Appendix B, “Getting information, help, and service,” on page 73 provides information about how to obtain help, service, or technical assistance.

Appendix C, “Notices,” on page 77 provides product notices and trademark information.

Notices used in this book

This book contains notices to highlight information as follows:

- **Notes**

  These notices provide important tips, guidance, or advice.

- **Important**

  These notices provide information 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.

Related publications

The following publications are available in Adobe Acrobat Portable Document Format (PDF) on the IBM FAStT Storage Manager CD and http://www.ibm.com/pc/support/ IBM Web page.

- *IBM FAStT Storage Manager Version 7.10 for Novell NetWare and Red Hat Linux Installation and Support Guide (this book)*
- *IBM FAStT Storage Manager Version 7.10 for Microsoft® Windows NT® and Windows® 2000 Installation and Support Guide*
- *IBM FAStT Host Adapter Installation and User's Guide*
- *IBM FAStT200 and FAStT200 HA Storage Servers Installation and User's Guide*[1]
- *IBM Netfinity FAStT500 RAID Controller Enclosure Unit Installation Guide*
- *IBM Netfinity FAStT500 RAID Controller Enclosure Unit User's Reference*
- *IBM FAStT Storage Manager Concepts Guide*
- *IBM FAStT MSJ User's Guide*
- *IBM Netfinity Fibre Channel RAID Controller Unit User's Handbook*

1. Printed publications that are shipped with the IBM FAStT200 and FAStT200 High Availability (HA) Storage Servers.

Chapter 1. Introduction

This installation and support guide provides information on preparing, installing, configuring, and starting the IBM FAStT Storage Manager Version 7.10 in the Novell NetWare and Red Hat Linux operating-system environments. Before you begin the installation of this product, consult the following documentation:

- README.TXT file - Read this text file first. The README file is located in the root directory of the installation CD, or refer to the http://www.ibm.com/pc/support IBM Web page for the latest installation and user information about the storage-management software and hardware components.
- *IBM FAStT Storage Manager Concepts Guide* - Use this reference document to become familiar with terminology and features of the IBM FAStT Storage Manager Version 7.10 software. This book is located on the installation CD, or from the http://www.ibm.com/pc/support IBM Web page.

When you finish the entire installation process, refer to the following online Help systems, which contain information common to all operating system environments. For installation information specific to Novell NetWare or Red Hat Linux, refer to this book.

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

IBM FAStT Storage Manager Version 7.10 for Novell NetWare and Red Hat Linux are Java™-based tools that simplify the management of the IBM Fibre Array Storage Technology (FAStT)200 and FAStT200 HA Storage Servers, Netfinity FAStT500 RAID Controller Enclosure Unit, and Netfinity Fibre Channel RAID Controller Unit. Previous versions of IBM FAStT Storage Manager Version 7.10 were known as Netfinity Fibre Channel Storage Manager 7.

The FAStT Storage Manager Version 7.10 software presents an interface for storage management that is based on information that is supplied by the storage subsystem controllers. You can install the storage-management software on a management station, which is the system that is responsible for managing all, or a portion of, a network. The management station communicates with network management agents that reside in the managed node by means of a network management protocol, such as Simple Network Management Protocol (SNMP). When you manage a storage subsystem that uses the client software that is installed on a management station, commands are sent to the storage subsystem controllers. The controller firmware contains the necessary information to carry out the storage-management commands. The controller is responsible for validating and running the commands and providing status and configuration information back to the client software.

Throughout this book, the terms storage-management software and Storage Manager 7.10 refer to the IBM FAStT Storage Manager Version 7.10 for Novell NetWare and Red Hat Linux software. Individual components of the storage-management software are identified by name.

Terms to know

If you are upgrading from a previous version of the IBM FAStT Storage Manager software, you might find that some of the terms you are familiar with have changed. It is important that you familiarize yourself with the new terminology. Table 1 provides a list of machine type and supported storage-management software. Table 2 provides a list of some of the old and new terms. For more information, refer to the *IBM FAStT Storage Manager Concepts Guide*.

Table 1. Machine type and supported storage-management software.

Product name	Machine type	Model	Product release and firmware version	Supported storage-management software version
IBM FAStT200	3542	1RU	4.x	7.02, 7.10
IBM FAStT200 HA	3542	2RU	4.x	7.02, 7.10
Netfinity Fibre Channel RAID Controller Unit	3526	1RU	3.x, 4.x	6.22, 7.0, 7.01, 7.02, 7.10
Netfinity FAStT500 RAID Controller Enclosure Unit	3552	1RU	4.x	7.0, 7.01, 7.02, 7.10

Note: Product firmware must be at version 04.xx to be compatible with Storage Manager Version 7.10.

Table 2. Old and new terminology.

Term used in previous versions	New term
RAID module	Storage subsystem
Drive group	Array
Logical unit number (LUN)[1]	Logical drive

[1] In Storage Manager 7.10, the term *logical unit number (LUN)* refers to a logical address that is used by the host to access a particular 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. This system does not need to be attached to the storage subsystem through the Fibre Channel I/O path.

Host and host computer

The terms *host* and *host computer* are used interchangeably throughout this book. Both terms refer to 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.

Note: A system can be both a management station and a host computer at the same time.

Software packages

Storage Manager 7.10 contains the following software packages for a Novell NetWare environment:

- Storage Manager 7 client software (SM7client)
- Storage Manager 7 agent (SM7agent)
- Storage Manager 7 Utility package (SM7util)
- IBM Storage Area Network (IBMSAN) driver
- IBM Host Adapter (HA) device driver (QL2x00)[1]
- IBM FAStT Management Suite Java (FAStT MSJagent)[2]

Storage Manager 7.10 contains the following software packages for a Red Hat Linux environment:

- Storage Manager 7 client software (SM7client)
- IBM FAStT Management Suite Java (FAStT MSJ)[3]
- IBM Host Adapter (HA) device driver (QLa2x00)[4]

Storage Manager 7 client software package

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

- **Enterprise Management**. You can use the Enterprise Management component for adding, removing, and monitoring storage subsystems within the management domain.
- **Subsystem Management**. You can use the Subsystem Management component for managing the components of an individual storage subsystem.

Storage Manager 7 agent software package

The Storage Manager 7.10 agent (SM7agent) package contains the host-agent software. You can use the host-agent software to manage storage subsystems through the host Fibre Channel connection. The host-agent software takes requests from a management station that is connected to the host through a network connection and passes the requests to the storage subsystem controllers through the Fibre Channel I/O path. For more information about managing storage subsystems through the host agent, see “Host-agent (in-band) management method” on page 4.

Storage Manager 7 Utility software package

Use the Storage Manager 7 Utility (SM7util) software package to register and map new logical drives to the operating system. The Storage Manager 7 Utility is installed on all host computers running a Novell NetWare operating system. The host computers are attached to the storage subsystem through the Fibre Channel

1. The IBM HA driver is not included on the IBM FAStT Storage Manager installation CD. Refer to the *IBM FAStT Host Adapter Installation and User's Guide* or refer to the http://www.ibm.com/pc/support/ IBM Web page.
2. Refer to the *IBM FAStT MSJ User's Guide* for installation instructions.
3. This software package can be installed on a management station and a host. Refer to the *IBM FAStT MSJ User's Guide* for installation instructions.
4. The IBM HA driver is not included on the IBM FAStT Storage Manager installation CD. Refer to the *IBM FAStT Host Adapter Installation and User's Guide* or refer to the IBM Web page at http://www.ibm.com/pc/support/.

connection. The Storage Manager 7 Utility software package contains the following two components:

- **Hot Add utility.** The Hot Add utility enables you to register newly created logical drives with the operating system. For information on using the Hot Add utility, see “Using the Hot Add utility” on page 51 in a Novell NetWare environment.
- **SM7devices utility.** You can use the SM7devices utility to associate storage subsystem logical drives with operating system device names. For more information about using SM7devices, see “Using the Storage Manager 7 devices utility” on page 52 for a Novell NetWare environment.

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. In case of a failure along the I/O path, the driver will send the I/O requests through the alternate path and Auto-Volume Transfer (AVT) will move the logical drive within the FAStT Storage Server.

IBM FAStT Host Adapter (HA) device driver

The IBM FAStT Host Adapter device drivers, (QL2x00 for NetWare and QLa2X00 for Red Hat Linux) will enable 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). Refer to the *IBM FAStT Host Adapter Installation and User’s Guide* and the http://www.ibm.com/pc/support IBM Web page for the current README file and latest multipath I/O device drivers.

IBM FAStT Management Suite Java

The IBM FAStT Management Suite Java (FAStT MSJ) is part of the IBM FAStT Storage Manager software package. It provides multipath I/O device drivers for Linux. Based on a driver which resides on top of the hardware driver, the IBM FAStT Management Suite Java can be configured with a preferred and an alternate path for every logical drive. In case of a failure along the I/O path, the driver will send the I/O requests through the alternate path and Auto-Volume Transfer (AVT) will move the logical drive within the FAStT Storage Server. The IBM FAStT Management Suite Java agent (FAStT MSJagent) is installed on the NetWare system, which then can be configured from a management station running the IBM FAStT Management Suite Java.

Refer to the *IBM FAStT MSJ User’s Guide* for the diagnostics installation procedure for Linux and NetWare.

Storage subsystem management methods

The storage-management software provides two methods for managing storage subsystems: the host-agent (in-band) management method and the direct (out-of-band) management method. Depending on your specific storage subsystem configurations, you can use either or both methods.

Host-agent (in-band) management method

When you use the host-agent (in-band) management method, you manage the storage subsystems through the Fibre Channel I/O path to the host. The management

information can be processed in the host or passed to the management station through the network connection. See Figure 1 on page 6.

Note: The host-agent (in-band) management method is not applicable if you are using a Linux platform.

Managing storage subsystems using the host-agent management method has the following advantages:

- You do not have to run Ethernet cables to the controllers.
- You do not need a Dynamic Host Configuration Protocol (DHCP) BOOTP server to connect the storage subsystems to the network.
- You do not need to perform the controller network configuration tasks that are described in Chapter 2, “Preparing for installation,” on page 17.
- When adding devices, you only have to specify a host name or IP address only for the host instead of for the individual controllers in a storage subsystem. Storage subsystems that are attached to the host are automatically discovered.

Managing storage subsystems using the host-agent management method has the following disadvantages:

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

Important: The access volume uses one of the logical unit numbers (LUNs). The Novell NetWare operating system will allow a maximum number of LUNs, depending on which Support Pack is installed and which host adapter you are using. If your host already has the maximum number of LUNs configured, either use the direct management method or give up a LUN for use as the access volume. For information on your specific configuration, see “Operating system requirements” on page 16. Contact an IBM technical-support representative for additional assistance.

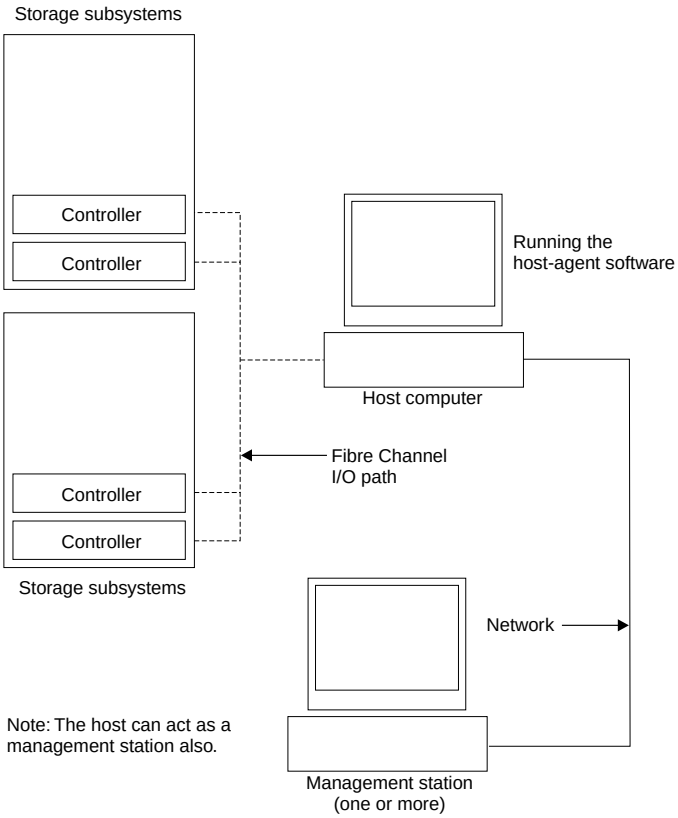

Figure 1. Host-agent (in-band) managed storage subsystems

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 the Ethernet connection to each controller. To manage the storage subsystem through the Ethernet connections, you must define the IP address and host name for each controller and attach a cable to the Ethernet connectors on each of the storage subsystem controllers. See Figure 2 on page 7.

Note: The direct (out-of-band) management method is applicable if you are running Novell NetWare or Red Hat Linux operating systems.

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

- The Ethernet connections to the controllers enable a management station running SM7client to manage storage subsystems that are connected to a host running Novell NetWare, Linux, or other operating systems that are supported by Storage Manager 7.10.
- You do not need to use an access volume to communicate with the controllers as you do if you are running the host-agent software. You can configure the maximum number of LUNs that are supported by the operating system and the host adapter that you are using.

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

- It requires two Ethernet cables to connect both storage subsystem controllers to 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 Table 10 on page 19.

Figure 2 shows a system in which storage subsystems are managed directly.

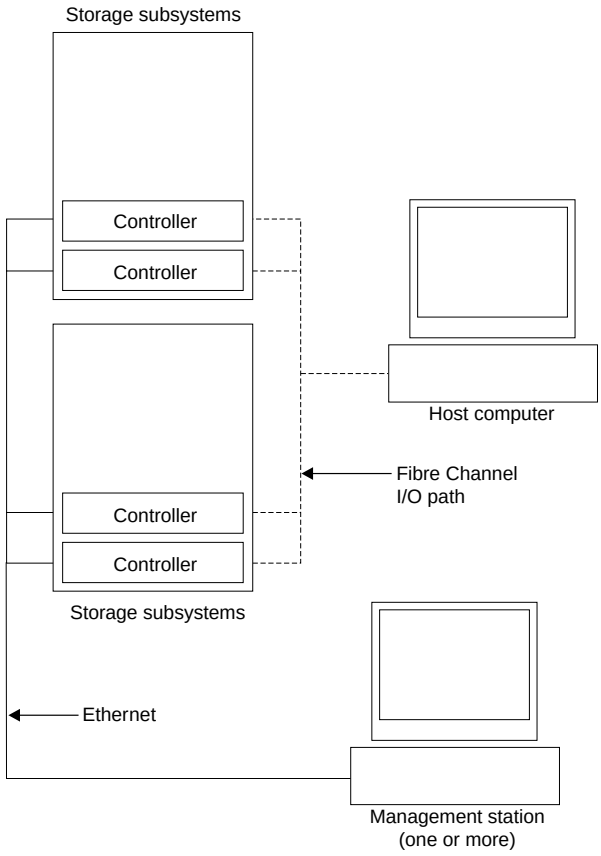

Figure 2. Direct (out-of-band) managed storage subsystems

Installation types

To install Storage Manager 7.10, choose the installation type in the following list that represents the setup of your enterprise.

- **New storage subsystem environment.** You do not have existing storage subsystems. In this case, you are installing new storage subsystems with machine type 3526, 3542, or 3552 controllers using firmware version 04.01.xx and intend to manage these new storage subsystems using Storage Manager 7.10. To proceed with this installation, go to “Configuration types” on page 9.
- **Existing storage subsystem environment.** You have existing storage subsystems. Table 3 on page 8 explains your options for managing these existing storage subsystems.

Table 3. Configurations for existing storage subsystems.

Existing storage subsystems with:	Options
Machine type 3526 controllers running firmware version 3.x	**Option 1 —**Upgrade the controller firmware to version 04.01.xx and manage the storage subsystems with Storage Manager 7.10. Refer to the http://www.ibm.com/pc/support IBM Web page for the Migrate utility in the README file; then, go to “Configuration types” on page 9. **Option 2 —**Install new storage subsystems and attach them to the same host as the existing storage subsystems. These existing and new storage subsystems are referred to as coexisting storage subsystems. See “Managing new and existing storage subsystems attached to the same host” for more information. **Option 3 —**Continue to use version 6.22 of the storage-management software to manage these storage subsystems, if they are attached to separate hosts from those that are attached to storage subsystems managed with Storage Manager 7.10.

Managing new and existing storage subsystems attached to the same host

When installing Storage Manager 7.10, you must determine how you will use any existing storage subsystems. Existing storage subsystems are coexisting storage subsystems when they are attached to the same host as storage subsystems managed with Storage Manager 7.10, and when the conditions in Table 4 are met.

Table 4. Coexisting storage subsystems requirements.

Existing storage subsystems	New or upgraded storage subsystems
• Use 3.01.x firmware • Are managed with version 6.22 of the storage-management software **Note:** Firmware and software levels are the minimum levels required for machine type 3526 controllers to coexist with new or upgraded storage subsystems.	• Use 04.01.xx firmware • Are managed with Storage Manager 7.10

Figure 3 on page 9 shows an example of an environment that includes coexisting storage subsystems.

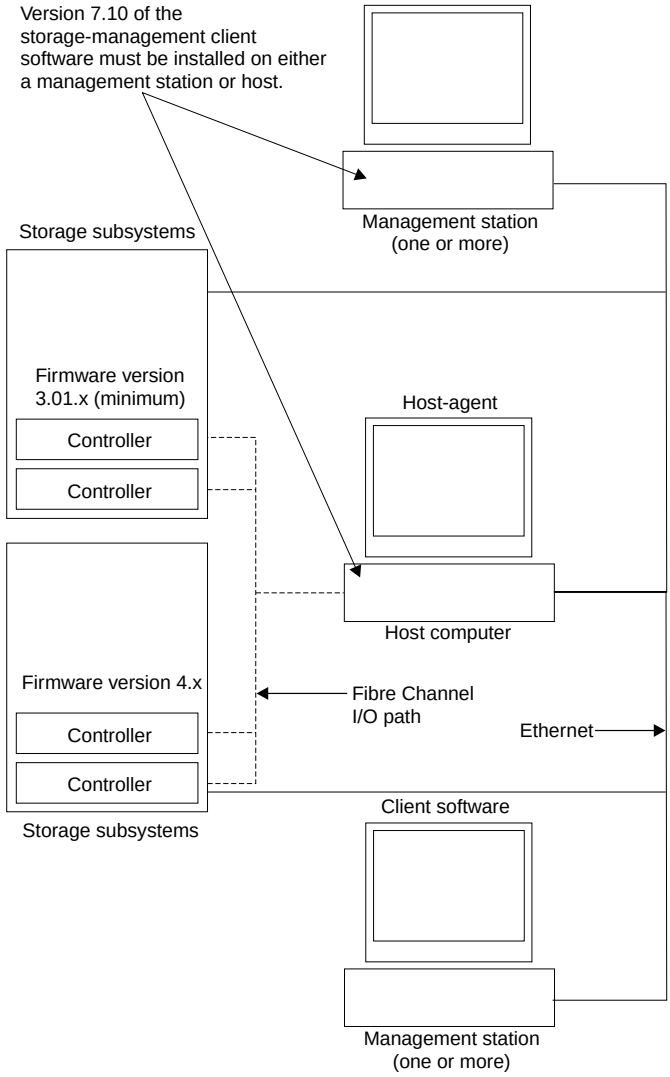

Figure 3. Sample coexistence installation

Configuration types

You can install Storage Manager 7.10 in one of two configurations:

- Standard (noncluster) configuration. See “Standard (noncluster) configuration”.
- Cluster server configuration. See “Cluster server configuration” on page 11.

Standard (noncluster) configuration

Table 5 on page 10 describes where the storage-management software components are installed in a standard (noncluster) configuration. Figure 4 on page 11 shows a sample standard (noncluster) configuration.

Table 5. Where to install software components in a standard (noncluster) configuration.

Software component	Where installed	Notes
Storage Manager 7.10 client (SM7client)	Install the client package on either of the following: • Linux and NetWare Management station (for direct or host-agent management) • Linux and NetWare Host computer (for direct or host-agent management) **Note:** NetWare supports host-agent and direct management. Linux supports direct management only.	• **Management stations** If you install the SM7client software on one or more management stations, you can choose to manage storage subsystems directly through Ethernet connections to the controllers, over the network to the host computer through the host agent, or a combination of both methods. • **Host computer in a direct-managed controller configuration** If you choose to manage storage subsystems directly through Ethernet connections to the controllers over the network, you install the SM7client software on the host computer, the host computer does not need to be connected to a network as long as the host-agent software is installed. The host computer must have the TCP/IP software installed and you must assign a static IP address to the host. • **Host computer in a host-agent managed controller configuration** If you install the SM7client software in an alternative, non-network controller configuration, you can manage the storage subsystems that are connected to the host computer through the Fibre Channel I/O path. **Note:** You must assign an IP address for host agent and direct management.
Storage Manager 7.10 Agent (SM7agent)	NetWare host	Install the SM7agent software to manage storage subsystems with the host computer running NetWare through the Fibre Channel connections.
Storage Manager 7.10 Utility (SM7util)	NetWare host	The Storage Manager 7 Utility software contains two important components, the Hot Add and Storage Manager 7 devices utility.
IBM FAStT Management Suite Java (FAStT MSJ)	Linux host and management station NetWare management station	The IBM FAStT Management Suite Java is a required component for managing the multipath driver. Refer to the *IBM FAStT MSJ User's Guide* for more information.
IBM FAStT Host Adapter (HA) device driver	Linux host NetWare host	Refer to the *IBM FAStT Host Adapter Installation and User's Guide*.
IBMSAN driver	NetWare host	Provides automatic Fibre Channel multipath capability to storage subsystems for NetWare.

Table 5. Where to install software components in a standard (noncluster) configuration.

Software component	Where installed	Notes
IBM FAStT Management Suite Java agent (QLRemote)	Linux host NetWare host	Provides the interface between the FAStT MSJ application and host operating system. Refer to the *IBM FAStT MSJ User's Guide* for more information.

The following figure shows an example of a standard (noncluster) configuration.

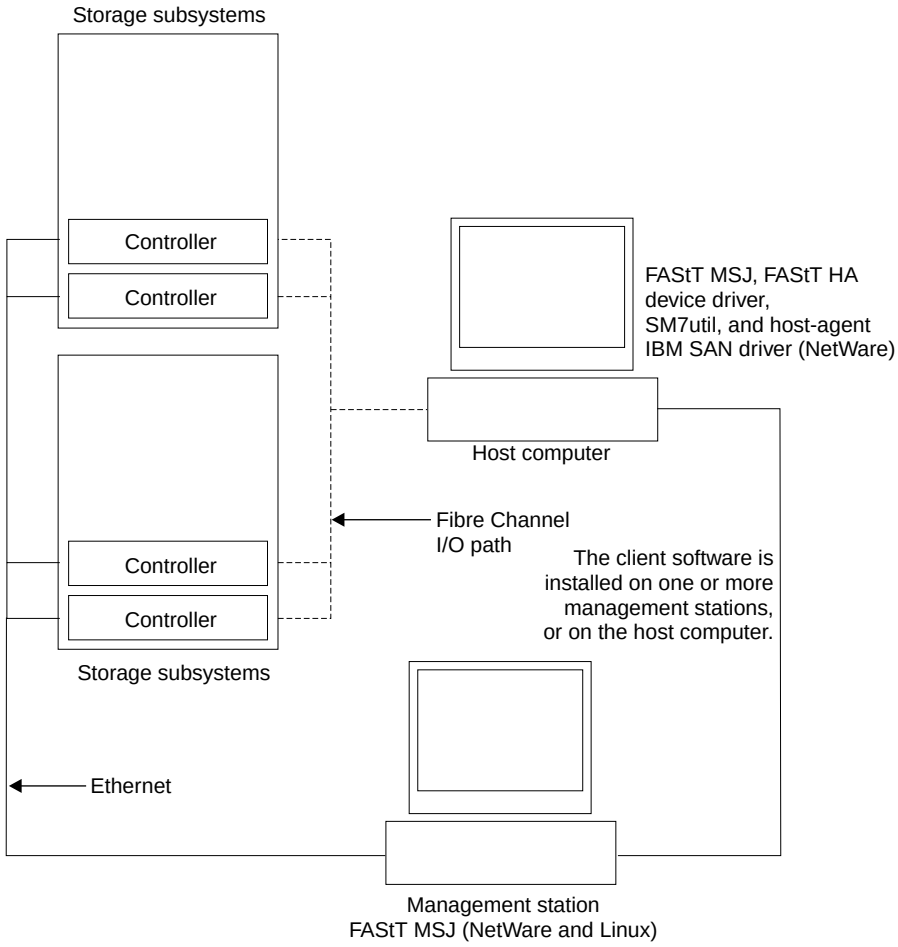

Figure 4. Sample standard (noncluster) configuration

Cluster server configuration

The following table describes the storage-management software components that are installed in a cluster server environment if you are running a Novell NetWare operating system. See Figure 5 on page 13 for a sample cluster configuration.

Important: Be sure to install all storage-management software components on each server in your cluster.

Table 6. Where to install software components in a cluster configuration (Novell NetWare).

Software component	Where installed	Notes
Storage Manager 7.10 client (SM7client)	Install the SM7client package on either of the following: • Management station (for direct or host-agent management) • Nodes 01 and 02 (for direct or host-agent management)	• **Management stations** When you install the SM7client software on one or more management stations, you can choose to manage storage subsystems directly through Ethernet connections to the controllers, over the network to the host computer through the host agent, or a combination of both management methods. • **Nodes 01 and 02** When you install the SM7client on the cluster servers (nodes 01 and 02), the server does not need to be connected to a network as long as the host-agent software is installed. However, the host computer must have the TCP/IP software installed, and you must assign a static IP address to the cluster server.
Storage Manager 7.10 agent (SM7agent)	Nodes 01 and 02	Install the SM7agent software to manage storage subsystems with the host computer through the Fibre Channel connections.
Storage Manager 7.10 Utility (SM7util)	Nodes 01 and 02	The Storage Manager 7 Utility software package contains important utilities that are necessary for operating the storage-management software.

Figure 5 shows an example of a cluster server configuration.

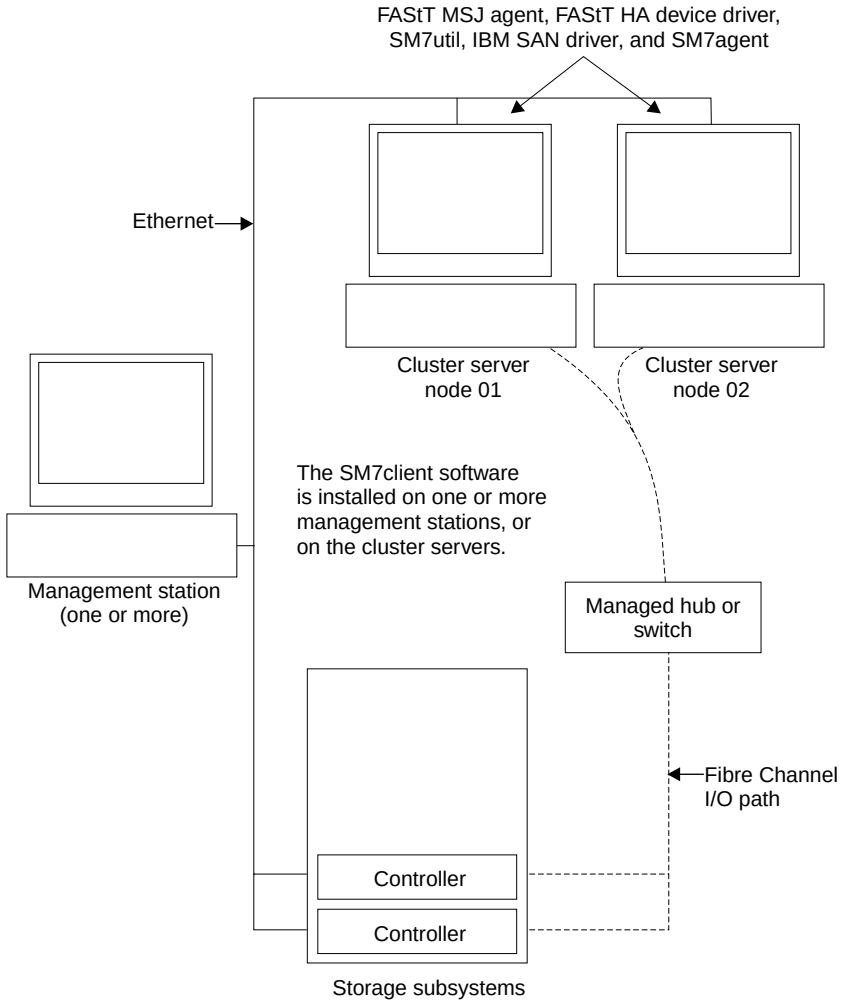

Figure 5. Sample NetWare cluster server configuration

System requirements

This section provides detailed information about the hardware, software, and operating system requirements for Storage Manager 7.10.

Hardware requirements

Table 7 on page 14 lists the hardware that is required for installing Storage Manager 7.10 in Novell NetWare and Red Hat Linux environments. For the latest information about host adapters and host adapter device drivers, see the README file on the IBM FAStT Storage Manager Version 7.10 installation CD or on the http://www.ibm.com/pc/support IBM web page.

Table 7. Storage Manager 7.10 hardware requirements for Novell NetWare and Red Hat Linux environments.

Hardware component	Requirements
A BOOTP server (only for directly managed storage subsystems)	• UNIX® BOOTP server • Novell DNS/DHCP services for NetWare 5 or later • Microsoft BOOTP-compatible DHCP2 server for Windows NT® Server 4.0 with Service Pack 5 or later
Storage subsystems (one or more)	Storage subsystems with controllers running firmware version 04.01.xx. **Note:** Before you begin, make sure that you read "Storage subsystem management methods" on page 4 for information on 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 IBM FAStT Host Adapter (part number: 00N6881) has been tested with the storage-management software. For information on specific host adapter requirements: • Refer to the README file in the \redhat71\Host_Adapter or NetWare51\Host_Adapter directory on the installation CD. Refer to the README for your specific operating system. • Read the documentation that comes with your host adapter. • Refer to the http://www.ibm.com/pc/support IBM Web page
Fibre Channel fabric switches (if needed for the desired configuration)	The following Fibre Channel fabric switches were tested with the storage-management software: • IBM 8-port Fibre Channel switch (machine type 2109-S08) • IBM 16-port Fibre Channel switch (machine type 2109-S16) For specific Fibre Channel switch setup requirements: • Read the documentation that comes with your switch. • Refer to the http://www.ibm.com/products IBM Web page
Fibre Channel managed hub (if needed for the desired configuration)	The IBM Fibre Channel managed hub (machine type: 3534) has been tested with the storage-management software. For specific Fibre Channel managed hub setup requirements: • Read the documentation that comes with your managed hub. • Refer to the http://www.ibm.com/products IBM Web page

Table 7. Storage Manager 7.10 hardware requirements for Novell NetWare and Red Hat Linux environments.

Hardware component	Requirements
Management station (for client software)	Your management station computer will require: • Intel® Pentium® or Pentium-equivalent microprocessor (133 MHz or faster) • CD-ROM drive • Mouse or similar pointing device • A minimum of 180 MB system memory for Linux and a minimum of 60 MB for NetWare • 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 • 60 MB of free hard disk space • Ethernet network interface card **Note:** 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:** The required basic system memory is based on your configuration.

Firmware requirements

Storage Manager 7.10 operates only with controller machine types 3526, 3542, or 3552, and firmware version 04.00.xx through 04.01.xx. If you want to manage controllers with Storage Manager 7.10, you must upgrade the firmware to version 04.00 through 4.01, refer to the http://www.ibm.com/pc/support IBM Web page for migration instructions. You must use version 6.22 of the storage-management software to manage storage subsystems with controllers using firmware version 3.x.

Software requirements

Table 8 lists the disk space and administrator privilege required for installing version 7.10 of the storage-management software in Novell NetWare and Red Hat Linux environments.

Table 8. Installation requirements by software package.

Package	Disk space requirement (Novell NetWare)	Disk space requirement (Red Hat Linux)
Client (SM7client)	35 MB	40 MB on /opt 80 MB on /tmp
IBMSAN driver	1 MB	Not required
Host agent (SM7agent)	1 MB	Not required

Table 8. Installation requirements by software package.

Package	Disk space requirement (Novell NetWare)	Disk space requirement (Red Hat Linux)
IBM FAStT Management Suite Java (FAStT MSJ)	35 MB	35 MB
Storage Manager 7 Utility (SM7util)	25 MB	Not required
IBM HA device driver	1 MB	1 MB

Operating system requirements

For Windows management stations, install one of the following operating systems:

- Windows NT Server 4.0 with Service Pack 5 or later
- Windows NT Workstation 4.0 with Service Pack 5 or later
- Windows NT 4.0 Enterprise Edition with Service Pack 5 or later
- Windows 2000 Server
- Windows 2000 Professional
- Windows 2000 Advanced Server

Install the Novell NetWare version 5.1 operating system with Support Pack 2 or later on one of the hosts.

If you are running Red Hat version 7.1, kernel 2.4.x, install Linux on the management station and hosts.

There are limits on how many logical unit numbers (LUNs) you can use to access the logical drives on a single storage subsystem. Supported logical drive limits for Microsoft Windows, Novell NetWare, and Red Hat Linux version 7.1 are 128 maximum with 32 LUNs per storage partition.

Chapter 2. Preparing for installation

This chapter provides information to help you plan and prepare for installing the storage-management software in NetWare and Linux operating-system environments.

Refer to Table 9 for the software component installation based on the operating system of the attached management station, host computer, or cluster server.

Table 9. Software component installation in Novell Netware and Red Hat Linux environments.

Operating system	Required software installation sequence	Where to install
Novell NetWare	Storage Manager 7 client (SM7client)	One or more: • Management stations • Attached host computers • Cluster servers (cluster configuration)
	1. Storage Manager 7 agent package (SM7agent) 2. IBM FAStT Management Suite Java (FAStT MSJagent) 3. Storage Manager 7 Utility (SM7util) 4. IBM Storage Area Network driver (SAN) 5. IBM Host Adapter (HA) device driver (QL2x00)	Each attached host computer
	IBM FAStT Management Suite Java (FAStT MSJ)	Management station (Administrative client) Refer to *IBM FAStT MSJ User's Guide* for installation instructions.
Linux	Storage Manager 7 client (SM7client)	One or more: • Management stations • Attached host computers • Cluster servers (cluster configuration)
	1. IBM FAStT Management Suite Java and agent 2. IBM Host Adapter (HA) device driver (QLa2x00)	Each attached host computer Refer to *IBM FAStT MSJ User's Guide* for installation instructions.

Deciding how to manage storage subsystems

If you have not already done so, refer to "Storage subsystem management methods" on page 4 for information about the following two methods for managing storage subsystems:

- Use the direct (out-of-band) management method to manage the storage subsystems through an Ethernet connection to each controller on the storage subsystem.

- Use the host-agent (in-band) management method to manage the storage subsystems through host-agent software installed on the host computer that is connected to the storage subsystem.

In a Linux environment, you can use only the direct (out-of-band) management method. You can use either or both methods in a NetWare environment. 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.

Reviewing a sample network

The example in Figure 6 shows a direct-managed storage subsystem network setup. Network A contains the following components:

- DHCP BOOTP server
- Network Management Station (NMS) for Simple Network Management Protocol (SNMP) traps
- Host that is connected to a storage subsystem through a Fibre Channel I/O path
- Management station connected by Ethernet cable to the storage subsystem controllers

Figure 6 shows an example of a host-agent managed storage subsystem network setup. Network B contains the following components:

- Host that is connected to a storage subsystem through a Fibre Channel I/O path
- Management station connected by Ethernet cable to the host

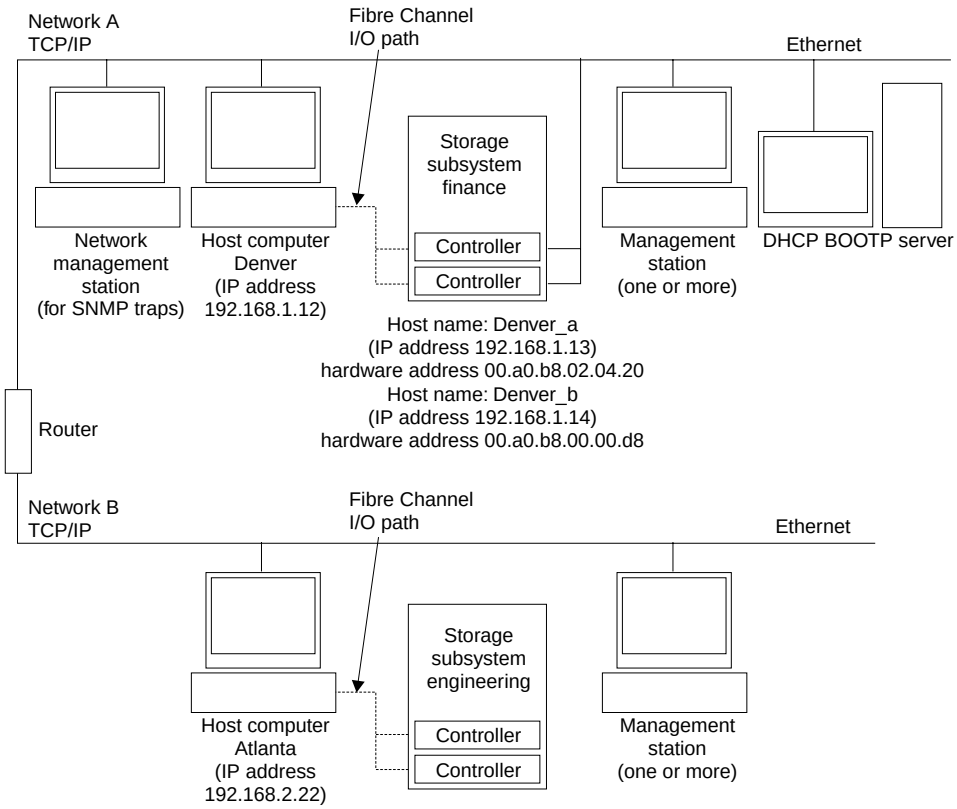

Figure 6. Sample network using direct and host-agent managed storage subsystems

Continue with “Preparing for a network installation”.

Preparing for a network installation

Before you install the storage-management software, make sure that the network components are set up and operating properly, and that you have all the host and controller information needed for the software to operate correctly. To prepare for a network installation, perform the tasks summarized in Table 10. Be sure to refer to the appropriate procedures. Use Table 17 on page 71 to record storage subsystem and controller information. An example of a completed information record is shown in Table 11 on page 20.

Table 10. Network preparation task summary.

Task to perform	Management method	Result	For instructions, refer to
Step 1 - Install all hardware components (host computers, storage subsystems, cables, and so on) that you want to connect to the network.	Direct and host agent	To ensure that the network hardware is present.	The installation guide specific to the hardware components.
Step 2 - Establish and record a naming convention for the storage subsystems connected to the network.	Direct and host agent	To add the storage subsystems to the management domain after installing the software.	“Deciding how to name the storage subsystems” on page 21.
Step 3 - Determine the hardware Ethernet address for each controller in all storage subsystems connected to the network.	Direct	To set up the DHCP BOOTP server to provide network configuration information to the controllers.	“Identifying the hardware Ethernet MAC address for each controller” on page 21.
Step 4 - Obtain IP addresses and host computer names from the network administrator.	Direct and host agent	For host-agent management, you need the IP addresses and host names of the host on which the host-agent software will run. For direct management, you need the IP addresses of each controller in the storage subsystems to configure the DHCP BOOTP server. The DHCP BOOTP server can then provide network configuration information to the controllers. Also, you use the IP addresses of the controllers to set up the host or DNS table.	“Obtaining IP addresses for hosts and controllers” on page 23.

Table 10. Network preparation task summary.

Task to perform	Management method	Result	For instructions, refer to
Step 5 - Set up the DHCP BOOTP server to provide network configuration information for a specific controller.	Direct	To provide network configuration information to the controllers using the DHCP BOOTP server.	"Setting up the DHCP BOOTP server" on page 23.
Step 6 - Verify that the TCP/IP software is installed, and set up the host or DNS table.	Direct	Installing the client software on a management station ensures that the management station is configured to reach the controllers over the network.	"Verifying the TCP/IP protocol and setting up the host or DNS table" on page 30.
Step 7 - Power on the devices connected to the network.	Direct and host agent	To ensure that all devices and links are operational.	The installation guide specific to the hardware components.

Table 11 shows a sample information record for a direct-managed storage subsystem and a host-agent managed storage subsystem.

Table 11. Sample 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 = 192.168.1.13	IP address = 192.168.1.14	
		Host = Denver_a	Host = Denver_b	
Engineering	Host agent			IP address = 192.168.2.22
				Host = Atlanta

For information about the entries in Table 11, see the following:

- "Deciding how to name the storage subsystems" on page 21.
- "Deciding how to manage storage subsystems" on page 17.
- "Identifying the hardware Ethernet MAC address for each controller" on page 21.
- "Obtaining IP addresses for hosts and controllers" on page 23.

Table 17 on page 71 provides a data sheet on which you can 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 recorded in Table 17 on page 71 to set up the DHCP BOOTP table for the network server and the host or DNS (Domain Name System) table.

Deciding how to name the storage subsystems

As you set up your network, determine the naming convention for the storage subsystems. After 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.

The following list provides tips for naming storage subsystems:

- There is a 30-character limit. All leading and trailing spaces are deleted from the name.
- Use a unique, meaningful naming convention that is easy to understand and remember.
- Avoid arbitrary names or names that would quickly lose their meanings in the future.
- 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
  ```

After you decide on a naming scheme, record the storage subsystem names in the information record (Table 17 on page 71).

If you are directly managing your storage subsystem, go to “Identifying the hardware Ethernet MAC address for each controller”. If you are going to manage your storage subsystem through the host agent, go to “Obtaining IP addresses for hosts and controllers” on page 23.

Identifying the hardware Ethernet MAC address for each controller

Use the following procedure if you plan to directly manage storage subsystems through Ethernet connections to each controller. If you plan to manage storage subsystems using the host-agent software, skip this procedure and go to “Obtaining IP addresses for hosts and controllers” on page 23.

For machine type 3542, the media-access control (MAC) address is at the back of the unit under the controller Gigabit Interface Converter (GBIC) slots (see Figure 7).

Record each Ethernet address in the information record (Table 17 on page 71); then go to “Obtaining IP addresses for hosts and controllers” on page 23.

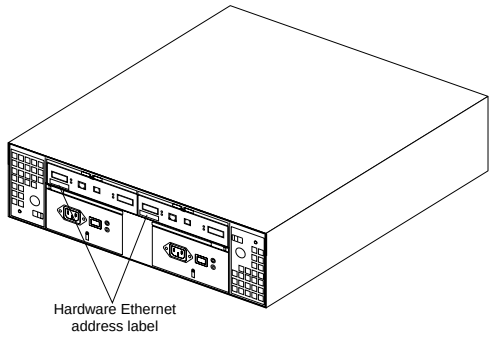

Figure 7. Location of the hardware Ethernet address labels (machine type 3542)

For machine types 3526 and 3552, use the following instructions:

1. Remove the front bezel from the controller unit (machine types 3526 and 3552), as shown in Figure 8. Carefully pull the bottom of the bezel out **1** to release the pins; then slide the bezel down **2** .

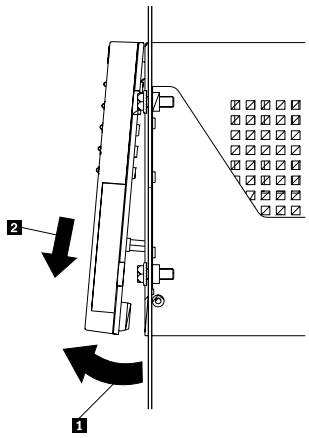

Figure 8. Removing the controller-unit bezel (machine types 3526 and 3552)

2. Unlock and open the levers on the RAID controllers (models 3526 and 3552).

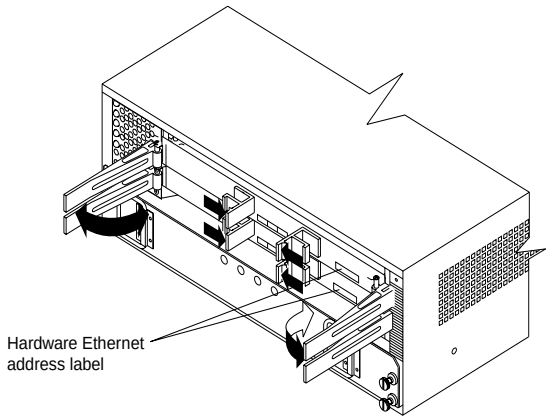

Figure 9. Location of the hardware Ethernet address labels (machine types 3526 and 3552)

3. On the front of each controller, look for a label with the controller hardware Ethernet address, as shown in Figure 9.

   The number will be in the form xx.xx.xx.xx.xx.xx (for example, 00.a0.b8.00.00.d8).

4. Record each Ethernet address in the information record (Table 17 on page 71).
5. Lock the RAID controllers by simultaneously pushing the levers until they are latched in.
6. To replace the bezel on machine types 3526 and 3552, 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 on page 23.

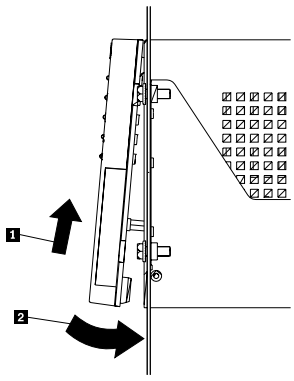

Figure 10. Replacing the controller-unit bezel (models 3526 and 3552)

7. Continue with “Obtaining IP addresses for hosts and controllers”.

Obtaining IP addresses for hosts and controllers

If you intend to manage some storage systems directly and others with the host-agent software or if you intend to manage subsystems directly, assign (or obtain from your network administrator) a unique IP address and the associated host name for each controller in every storage subsystem on the network. Record the IP address and host name for each controller in the information record (Table 17 on page 71). Then, go to “Setting up the DHCP BOOTP server”.

If you intend to manage storage subsystems with the host agent, contact your network administrator to obtain the IP address and host name for each host on which you plan to install the host-agent software for managing storage subsystems. Record the IP address and host name for the host in the information record (Table 17 on page 71). Then, go to “Verifying the TCP/IP protocol and setting up the host or DNS table” on page 30.

Setting up the DHCP BOOTP server

If you plan to directly manage storage subsystems through the Ethernet connection to each controller, select the procedure you plan to use for setting up the DHCP BOOTP server:

- When using NetWare DHCP as a BOOTP-compatible server, go to “Using NetWare DHCP as a BOOTP-compatible server”.
- When using Microsoft BOOTP-compatible DHCP, go to “Using Microsoft Windows 2000 DHCP as a BOOTP-compatible server” on page 27.
- When using UNIX BOOTP, go to “Using a UNIX BOOTP server” on page 29.

If you plan to manage storage subsystems using the host-agent software, go to “Verifying the TCP/IP protocol and setting up the host or DNS table” on page 30.

Using NetWare DHCP as a BOOTP-compatible server

The Dynamic Host Configuration Protocol (DHCP) enables TCP/IP-based client workstations to receive local and network configuration information automatically

when the TCP/IP transport is loaded. When a DHCP client workstation starts, it broadcasts a DHCP request for its IP address and network configuration. When the DHCP server receives the message, it checks its database and replies by sending a DHCP reply message that includes all TCP/IP configuration information required by the specific client that sent the request.

This section provides procedures for setting up the NetWare DHCP service. Prior to the installation of the DNS DHCP service, you must complete the following tasks:

- Extend the NDS schema and create the default DNS DHCP objects.
- Install the Novell Client on the computer that is going to run the DNS DHCP Management Console.
- Install the DNS DHCP Management Console and NetWare Administrator snap-in files.

To use a DHCP server, you must have a DHCP Manager installed.

Before you begin

Complete the following steps before setting up DHCP:

1. Install NetWare version 5.1 on the selected server or servers.
2. Install the Novell Client software delivered with NetWare version 5.1 on client computers that you will use to administer DNS and DHCP.
3. Install the DNS/DHCP Management Console on client computers that you will use to administer DNS and DHCP.

Installing DHCP services during the NetWare 5.1 installation

Use the following procedure to install DHCP services:

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 version 5.1 installation.
4. Continue with “Launching the DHCP Management Console”.

Launching the DHCP Management Console

To launch the DNS/DHCP Management Console, double-click its icon. You can install the DNS/DHCP Management Console on a client workstation, or you can access it from the Tools menu of the NetWare Administrator utility.

After the DNS/DHCP Management Console is installed, you are prompted to enter the DNS Tree Name where you want to set up DHCP. Continue with “Creating a DHCP server object” on page 25.

Creating a DHCP server object

Use the DHCP Management Console to create and set up a DHCP server object. A DHCP server object is created or located under any of the following objects:

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

Complete the following steps to create and set up a DHCP server object:

1. Click the DHCP Service tab on the DHCP Management Console.

   The Our Network object is the only object displayed on the DHCP Management Console left pane.

2. Click **Create** on the tool bar.

   The Create New DHCP Object window opens, enabling you to create a DHCP server object, a subnet object, or a subnet pool object.

3. Select DHCP Server and click **OK**.

   The Create DHCP Server window opens, prompting you to select a server object.

4. Use the browse button to select a server, then click **Create**.

   This creates the DHCP server object in NDS, called DHCP_servername.

   In the DHCP Management Console, locate the icon for the DHCP server at the bottom of the DHCP Service tab. The server object will display with a red line through it. The red line indicates that DHCP server NetWare Loadable Module (NLM) and related NLMs have not been installed.

5. Continue with “Creating a subnet object”.

Creating a subnet object

Use the DNS/DHCP Management Console to create and set up a DHCP subnet object for each of the subnets to which you will assign addresses.

Complete the following steps to create and set up a subnet object:

1. Click the DHCP Service tab on the DNS/DHCP Management Console.

   The Our Network object is the only object displayed on the DNS/DHCP Management Console left pane.

2. Click **Create** on the tool bar.

   The Create New DHCP Object window opens enabling you to create a DHCP server, a subnet, or a subnet pool object.

3. Select **Subnet** and click **OK**.

   The Create Subnet window opens. For each subnet you create, enter the following information in the fields provided: subnet name, NDS context, subnet address, and subnet mask. If you have set up a default DHCP server, the server name is displayed and can be changed.

   Click the Define Additional Properties check box to provide more detailed configuration, including DHCP options specific to each subnet.

4. Enter the required information, then click **Create**.

   The DHCP subnet object is created and displayed in the left pane of the DNS/DHCP Management Console.

5. Continue with “Creating subnet address ranges” on page 26.

Creating subnet address ranges

Use the DNS/DHCP Management Console to create and set up subnet address range objects for each pool of addresses you want to be dynamically assigned by DHCP.

To create and set up a subnet address range object, complete the following steps:

1. Click the DHCP Service tab on the DNS/DHCP Management Console.
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** and click **OK**.

   The Create New Subnet Address Range window opens.
4. Enter a name for the subnet address range, specify the range's starting and ending address, then click **Create**.

   If you click the Define Additional Properties check box, the range's detailed information window is displayed, enabling you to provide more detailed configuration information.
5. Continue with “Creating IP address objects”.

Creating IP address objects

Use the DNS/DHCP Management Console to create and set up IP address objects to be assigned to specific devices or to be excluded from dynamic assignment. Create an IP address object for each such device or address. Assigning a specific address to a client requires you to specify the client's media-access control (MAC) address or Client ID.

If you have set up subnets and subnet address ranges, you are not required to set up individual IP addresses, unless you want to perform manual address assignment or exclude addresses from assignment.

To create and set up an IP address object, complete the following steps:

1. Click the DHCP Service tab on the DNS/DHCP Management Console.
2. Select the subnet object of the target IP address, then click **Create** on the tool bar.

   The Create New DHCP Object window opens.
3. Select **IP Address** and click **OK**.

   The Create IP Address window opens.
4. Enter the IP address to be assigned or excluded, select the assignment type, then click **Create**.

   If you choose Manual Assignment Type, you must provide information for either the Client Identifier or the MAC Address fields. You can also specify the MAC Type by clicking in the field; the default is FF Any.
5. Continue with “Starting the DHCP server” on page 27.

Starting the DHCP server

After you create and set up a DHCP server and configure the NDSTM objects required for DHCP, type the following command at the DHCP server console:

```
LOAD DHCPSRVR
```

After you install DHCPSRVR.NLM, the DHCP server can respond to client requests and assign IP addresses.

Note: For additional information about setting up, configuring, or using Novell DNS/DHCP Services, refer to the NetWare 5.1 documentation, located on the Novell Documentation CD or at http://www.novell.com/documentation.

Using Microsoft Windows 2000 DHCP as a BOOTP-compatible server

You must use a version of Dynamic Host Configuration Protocol (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, go to "Installation instructions".

Installation instructions

Complete the following steps to install the DHCP Manager:

1. Click **Start** → **Settings** → **Control Panel** → **Add/Remove Programs**.

   The Add/Remove window opens.

2. Click the **Add/Remove Component** button.

   The Component window opens.

3. Scroll to, highlight, and click **Networking Services**.
4. Click the **Details** button.
5. Under Subcomponents of Networking Services, select the **Dynamic Host Configuration Protocol** check box, and click **OK**.
6. If prompted, type the full path to the Windows distribution files and click **Continue**.

   The required files are copied to your hard disk. The server software can be used after you restart the system.

7. Continue with "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 the 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. Refer to the information that you provided in Table 17 on page 71. Before you begin, read through the instructions to determine what information is required, and then, request the information from your network administrator.

Note: The following steps and window example assume that you are configuring a Windows DHCP server using its DHCP Manager.

1. Click **Start** → **Programs** → **Administrative Tools** → **DHCP**.

   The DHCP Manager window opens.

2. Highlight the server you want to configure.

The Create Scope window opens. Use the following instructions:

a. Type a scope name and description.

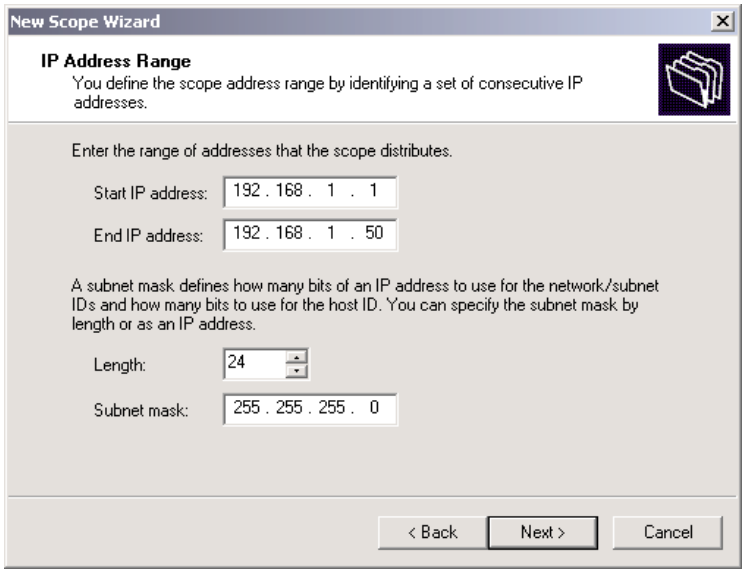

Figure 11. Create scope - (Local) window

b. Type the starting and ending IP addresses of the controllers that you are configuring on the network.

   For example, if you are configuring 50 controllers on a 192.168.1.0 subnet, set the starting address to 192.168.1.1, and set the ending address to 192.168.1.50.

   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 addresses.

c. Type the subnet mask (obtained from your network administrator).

d. Using the Add Exclusions window, enter IP addresses that need to be excluded from the beginning and ending addresses that you just entered in step 2b, and then click **Add**.

e. Set the Lease Duration (obtained from your network administrator).

f. To configure the DHCP options, do the following:

   Note: Be sure that you configure the DHCP options now. If you want to configure the options later, go to the DHCP window, and open the directory structure for the scope that you created in step 2 on page 27. Right-click **Scope Options** → **Configure Options** and follow the instructions.

   1) Add an IP address for a router.

   2) Add the domain name and DNS servers.

   3) Enter the server name and IP address in the WINS Servers window.

   4) When the scope has successfully completed, click **Yes** to activate it.

      You return to the DHCP Manager window.

3. Open the directory structure below the scope you created.

   a. Right-click **Reservation**, click **New Reservation**, and follow the instructions.

Important: At the bottom of the New Reservations window, make a selection under Supported Type.

The New Reservation window opens.

b. Enter a Reservation name, IP address, MAC address, and description.

c. In the support type box, select both options (**DHCP** and **BOOTP**).

d. Click **Add**.

e. Repeat step 3b through step 3d until you have added the reservations for all of the controllers.

f. When you enter the information for all of the controllers, click **Close.**

4. After you finish setting up the DHCP server, you must restart the DHCP server and then restart the storage subsystem before any modifications in the DHCP will take effect.
5. Go to “Verifying the TCP/IP protocol and setting up the host or DNS table” on page 30.

Using a UNIX BOOTP server

Table 12 and Table 17 on page 71 provide information for setting up the BOOTP table and making the required entries to support the controllers in the storage subsystems. Use a text editor to edit the bootptab file in the /etc directory.

Table 12. 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 (refer to Table 17 on page 71).	host name (Denver_a)
IP address	IP address of the controller (refer to Table 17 on page 71).	dot notation (ip=192.168.1.13)
Ethernet address	The Ethernet address of the controller hardware (refer to Table 17 on page 71).	hexadecimal notation (ha=00a0b8020420)

Note: The RMS and NMS entries used in previous versions of the storage management software are not required when using Storage Manager 7.10 with controllers running firmware version 4.x.

Example for editing a UNIX BOOTP table

The following example of a BOOTP table assumes that you are configuring a UNIX BOOTP server, such as a server on Network A, of Figure 6 on page 18. The s4.default:\ entry denotes settings that are common to all controllers. The tc=s4.default:\ entry associates this common setting group to a specific controller.

```
s4.default:\ (common settings)
ht=ether:\
sm=255.255.248.0:\
gw=153.79.144.2:\
hn:
denver_a:\
tc=s4.default:\ (refers to common settings)
ip=153.79.144.13:\
ha=00a0b8020420:
denver_b:\
tc=s4.default:\
ip=153.79.144.14:\
ha=00a0b80000d8"
```

When you finish setting up the BOOTP table you must restart the storage subsystems for the parameters in the BOOTP table to take effect then, continue with “Verifying the TCP/IP protocol and setting up the host or DNS table”

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

Make sure that the host names for the controller correspond to the appropriate IP addresses for the controllers. 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 (Domain Name System) table.

Note: You can use the Windows Internet Naming Service (WINS) rather than DNS.

For Novell NetWare:

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

   Note: If the TC/PIP software is not installed properly, install it from the appropriate installation CD. Click **Start** → **Settings** → **Control Panel** → **Network** → **Protocols** → **Add** → **Have Disk**.

2. Update either the host table or DNS table to specify a host name to associate with an IP address. If you do not have a DNS (or WINS), edit the two host tables found in the following directories (your directory will be different if the operating system is not installed on the root).

   For NetWare:

   c:\NetWare\system32\drivers\etc\hosts

   c:\NetWare\system32\drivers\etc\imhosts

   For Linux:

   c:\Linux\system32\drivers\etc\hosts

   c:\Linux\system32\drivers\etc\imhosts

   Important: Opening ports to your network poses potential security risks.

   To set up the host tables for the controllers connected to Network A (Figure 6 on page 18). Open the hosts file that is located in the \etc\ directory (refer to the example below) and use a text editor to update the hosts file to create the following IP address and controller name entries. See the following hosts file example:

```
Copyright (c) 1993-2001 Microsoft Corp.

This is a sample HOSTS file used by Microsoft TC/PIP for Windows.
```

```
This file contains the mappings of IP addresses to host names. Each entry should be
kept on an individual line. The IP address should be placed in the first column
followed by the corresponding host name. The IP address and the host name should be
separated by at least one space.

Additionally, comments (such as these) might be inserted on individual lines or
following the machine name denoted by a '#' symbol.

For example:

102.54.94.97              rhino.acme.com            # source server
38.25.63.10               x.acme.com                # x client host

127.0.0.1                 local host
192.168.1.13              denver_a
192.168.1.14              denver_b
```

3. To manage storage subsystems through a firewall, configure the firewall to open port 2463 to TCP data. Otherwise, go to “Determining your storage-management software installation process”.

Determining your storage-management software installation process

The installation process you follow depends on your operating system and how you plan to configure the system. If you plan to install the software in a standard (non-cluster) configuration do one of the following:

- Go to Chapter 3, “Installing software in standard and cluster configurations (Novell NetWare),” on page 33.
- Go to Chapter 6, “Installing software in a standard configuration (Red Hat Linux),” on page 55.

If you plan to install the software in a cluster server configuration go to Chapter 3, “Installing software in standard and cluster configurations (Novell NetWare),” on page 33.

Chapter 3. Installing software in standard and cluster configurations (Novell NetWare)

This chapter describes how to install the storage-management software in standard and cluster configurations.

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 written.

There are two configurations in which you can install the storage-management software:

- You do *not* have existing storage subsystems. In this situation, you are installing new storage subsystems with machine type 3526, 3542, or 3552 controllers using firmware version 04.01.xx and will manage these new storage subsystems using Storage Manager 7.10. If this is your situation, go to “Installation process” on page 34.
- You have existing storage subsystems with machine type 3526, 3542, or 3552 controllers. In this situation, you can do one of the following:
  - — Upgrade the controller firmware on the existing storage subsystems to version 04.01.xx and manage them with Storage Manager 7.10.
  - — Continue to manage the existing storage subsystems with version 6.22 of the storage-management software and manage new storage subsystems with Storage Manager 7.10. To determine if you have coexisting storage subsystems, see “Installation types” on page 7.

Use Table 13 to determine your installation process.

Table 13. Determining your installation process in standard and cluster configurations.

Current environment	Planned environment	Action
Existing storage subsystems with controllers using firmware version 3.x	Upgrade to firmware version 04.01.xx.	Refer to the README file located in the \Netware51\ directory on the installation CD for more information.
No existing storage subsystems	New storage subsystems with controllers that use version 04.01.xx firmware managed with Storage Manager 7.10.	Go to “Installation process” on page 34.
Existing storage subsystems with controllers that have firmware versions 4.00.00 through 4.00.01	Upgrade storage subsystems with controllers that use version 04.01.xx firmware managed with Storage Manager 7.10.	1. Go to “Installation process” on page 34. 2. Update the NVSRAM and firmware to version 04.01.xx using the storage-management software online help.
	Continue to use your existing versions 4.00.00 through 4.00.01 controller firmware managed with Storage Manager 7.10. Refer to the README file for more information.	Go to “Installation process” on page 34.

Installation process

The following installation process applies to:

- New installations
- Additions to existing storage subsystems

Begin the installation of the storage-management software with “Installing the Storage Manager 7 client package”. Continue the process until you have completed “Installing IBM FAStT Management Suite Java” on page 38.

Figure 12 shows a flowchart of the installation process.

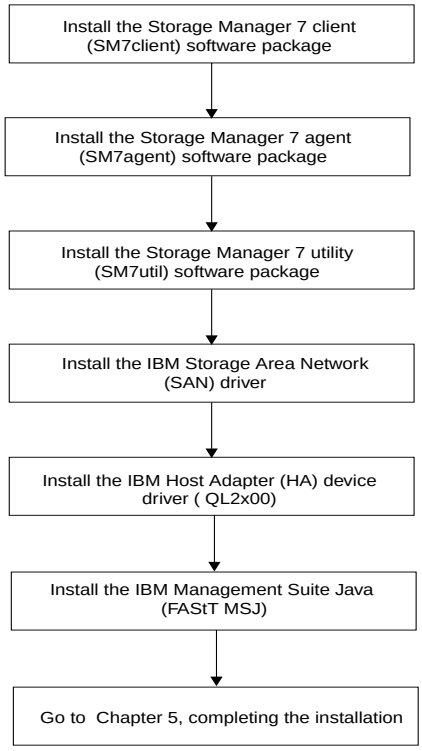

Figure 12. Installation process

Installing the Storage Manager 7 client package

Use the following instructions to install the SM7client on a management station that is configured with Novell NetWare 5.1 with Service Pack 2.

To install the SM7client on a management station that is configured with one of the following operating systems, refer to this installation guide or the *IBM FAStT Storage Manager Version 7.10 for Microsoft Windows NT and Windows 2000 Installation and Support Guide* for installation instructions.

- Windows NT Server 4.0 with Service Pack 5 or later
- Windows NT 4.0 Enterprise Edition with Service Pack 5 or later
- Windows NT Workstation 4.0 with Service Pack 5 or later
- Windows 2000 Advanced Server
- Windows 2000 Professional

- Windows Advanced Server

Notes:

- If you are configuring only a network management station, you need to install only the SM7client.
- If you want to install SM7client 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 a static IP address to the host.

Installation instructions for Storage Manager 7 client

Before you install the SM7client software, make sure that:

- The management station has at least 60 MB of available disk space.
- The monitor properties are set to a minimum screen resolution of 800 x 600 pixels and a palette of 256 colors or more.
- You close all other programs.

Perform the following steps if you are installing the SM7client package on a management station running NetWare 5.1 operating system software:

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 \Netware51\SM7client directory.
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**.

Use the following procedure to verify that the installation was successful:

1. Click **Novell** → **Programs**.
2. Verify that the IBM FAStT Fibre Channel Storage Manager client appears in the list of programs.
3. Continue with “Installing the Storage Manager 7 agent software package” on page 36.

Installing the Storage Manager 7 agent software package

Use the following procedure to install the host-agent software package on each host computer that is connected to one or more storage subsystems. The host-agent software is necessary for host-agent management of the storage subsystems.

Important: You must install the host-agent software package even if you do not intend to manage storage subsystems through the host-agent software. The host agent package contains utilities that are required to manage storage subsystems.

Note: You must install the host agent package even if you are installing SM7client only on a management station.

Before you install the software, make sure that:

- The host computer is configured with Novell NetWare 5.1 and Service Pack 2.
- The host computer has at least 20 MB of available disk space.
- The monitor properties are set to a minimum screen resolution of 640 x 480 pixels and a palette of 256 colors or more.
- You close all other programs.

If you are using the host-agent management method for the storage subsystem, set the maximum LUN value to 32 for the host bus adapter. By default, the Universal Transport Module (UTM) LUNs are set to 31 and must be reported to the operating system so that the SM7agent can identify and link to the UTM. For more information, refer to the README in the Netware51/host_adapter directory of the IBM FAStT Storage Manager installation CD.

Installation instructions

Perform the following steps to install the host agent package:

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

   ```
   load cdrom
   ```

2. Mount the CD 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 \Netware51\SM7agent directory.
8. Select the product.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 files are copied.
11. When the installation is complete, click **Finish**.

    Note: To enable SM7agent at server startup, an autoexec.ncf entry can now be made.

Use the following procedure to load SM7agent and verify that the installation was successful:

1. Toggle to the Server Console window and at the command prompt, type:

   ```
   Load SM7agent
   ```

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

   ```
   Activating
   ```

2. Continue with “Installing the Storage Manager 7 Utility software”.

Installing the Storage Manager 7 Utility software

This section provides instructions for installing the Storage Manager 7 Utility software on attached hosts that are running NetWare. The Storage Manager 7 Utility software contains utilities that will register and map new logical drives to the operating systems. The Storage Manager 7 Utility software must be installed on host computers that are attached to the storage subsystem through a Fibre Channel connection.

Important: Make sure you have installed the FAStT MSJ software on the same host where you are installing the Storage Manager 7 Utility software. For more information, refer to “Installing IBM FAStT Management Suite Java” on page 38.

Installation instructions

Use the following procedure to install the Storage Manager 7 Utility software on each attached Windows host computer.

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

   ```
   load cdrom
   ```

2. Mount the CD 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 drive.
7. Select the \NetWare51\SM7util folder, and then, click **Open**.
8. Select the setup.exe file, and then, click **Open**.

   The Welcome window opens.

9. Click **Next** to begin the installation.

   After installing the Storage Manager 7 Utility software, the Operation Complete window opens. If the system detects the installation of another version of Storage Manager 7 Utility, a window opens indicating that the installation will be updated and your personal configuration files will be saved. Click **Yes** to continue.

10. Click **Finish**.
11. Go to “Installing the IBMSAN driver” on page 38.

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 controller. The IBMSAN driver is a custom driver module (CDM) that is installed with the IBM FAStT Host Adapter driver. In case of a failure along the I/O path, the driver will send the I/O requests through the alternate path and Auto-Volume Transfer (AVT) will move the logical drive within the FAStT Storage Server. Refer to the http://www.ibm.com/pc/support IBM Web page for the current README file, SAN driver, and installation instructions.

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 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). Refer to the *IBM FAStT Host Adapter Installation and User’s Guide* and the http://www.ibm.com/pc/support IBM Web page for the current README file and latest multipath I/O device driver.

Continue with “Installing IBM FAStT Management Suite Java”.

Installing IBM FAStT Management Suite Java

The IBM FAStT Management Suite Java (FAStT MSJ) software includes the FAStT MSJ agent and FAStT MSJ application. The FAStT MSJ is for only diagnostics.

Note: For additional information, refer to the *IBM FAStT MSJ User’s Guide* or online Help.

Perform the following steps to install IBM FAStT Management Suite Java:

1. Insert the IBM FAStT Storage Manager installation CD into the CD-ROM Drive.
2. Map a drive to the SYS volume of the NetWare server.
3. Select the NetWare51 directory.
4. Click **install.exe**.

   The Introduction window opens.
5. Click **Next**.

   The Important Information window opens. Read the FAStT MSJ application notes.
6. Click **Next**.

   The Choose Install Folder window opens.
7. Restart your NetWare server to start the FAStT MSJ agent.

For additional information, refer to the *IBM FAStT MSJ User’s Guide* or online Help.

Chapter 4. Completing the installation (Novell NetWare)

This chapter contains procedures for starting Enterprise Management and Subsystem Management and for completing the installation tasks.

Starting the Enterprise Management window

The Enterprise Management window is the first window that opens when you start the software. Use the Enterprise Management window to:

- Add and discover the storage subsystems that you want to manage.
- Provide a comprehensive view of all storage subsystems in your management domain.
- Perform batch storage-subsystem management tasks using the Script Editor.

Use the following procedure to start the Enterprise Management window:

1. If you are using the SM7agent, start the SM7agent at the Server Console window.

   At the Server Console, type:

   ```
   Load SM7agent
   ```

2. From the Xserver Graphical Console, click **Novell** → **Programs**.
3. Click **IBM FAStT Storage Manager 7**.

   The client software starts, and the Enterprise Management window and the Initial Automatic Discovery dialog box opens, as shown in Figure 13.

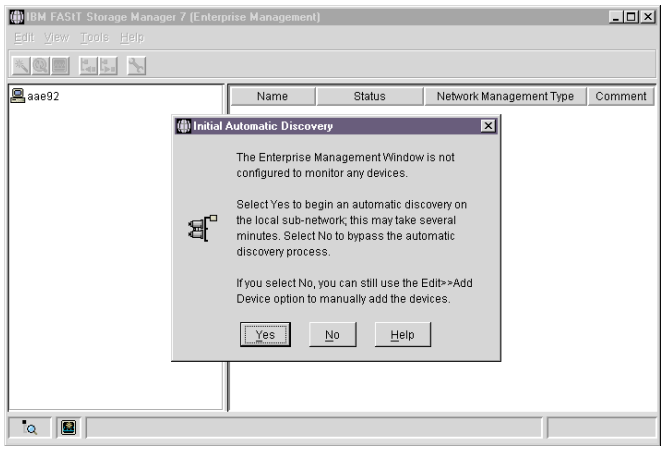

Figure 13. Confirm Initial Automatic Discovery dialog box

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

If you do not want to perform the initial automatic discovery, click **No**. You can use the **Edit** → **Add Device** menu option to add hosts and storage subsystems. For more information, see “Adding devices” on page 40.

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

The software sends a broadcast message across the local subnetwork where the management station is installed. It discovers host-agent managed storage subsystems when the hosts that provide network management connections to the storage subsystems respond to the broadcast. The software discovers storage subsystems (that are using the direct management method) when the controllers in those storage subsystems respond to the broadcast message.

Adding devices

You can add more hosts or storage subsystems outside the local subnetwork. For more information about this option, refer to the Enterprise Management window online Help.

Important: If you are managing storage subsystems through the host-agent software and you physically add new storage subsystems, you must stop and restart the host-agent service so that it can recognize the new storage subsystems. Then, go to the Enterprise Management window and click **Tools** → **Rescan** to add the new storage subsystems to the management domain.

Continue with "Setting up alert notifications".

Setting up alert notifications

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

- Notification to a designated network management station (NMS) using Simple Network Management Protocol (SNMP) traps (see "Setting up the NMS for SNMP notification" for more information)
- Notification to designated e-mail addresses
- Notification to designated alphanumeric pagers (when a vendor software package is used to convert e-mail messages)

Note: If you do not install Event Monitor, you must monitor storage subsystems within the management domain. The Enterprise Management window must remain open (you can minimize the window). If you close the window, you will not receive alert notifications. Refer to the Enterprise Management window Help for information on alert notification options.

Setting up the NMS for SNMP notification

If you choose to set up alert notification using SNMP traps, you must first copy a management information base (MIB) file to the designated network management station. Use this procedure to set up the MIB file on the network management station.

Important: You need to designate your NMS only once.

1. From the \SM7mib directory on the IBM FAStT Storage Manager Installation CD, copy the Arrayman.mib file to the network management station.
2. Follow the steps that are required by your specific network management station to compile the MIB file.

   Note: For details on the required steps, see your network administrator or the documentation that is specific to the NMS product that you are using.

Configuring alert destinations

Configure SNMP trap destinations and e-mail destinations for alert notifications using Enterprise Management. Refer to the Enterprise Management online Help for specific procedures.

Starting Subsystem Management

The Subsystem Management window enables you to manage selected subsystems.

Use the following procedure to open a Subsystem Management window for a selected storage subsystem:

1. In the Enterprise Management window, select a storage subsystem.
2. Click **Tools** → **Manage Device**.

   The software displays the Subsystem Management window for the selected storage subsystem, as shown in Figure 14 and Figure 15 on page 42.

   Note: Using the open Subsystem Management window, you can manage only the selected storage subsystem. However, you can open multiple subsystem-management windows to manage other storage subsystems.

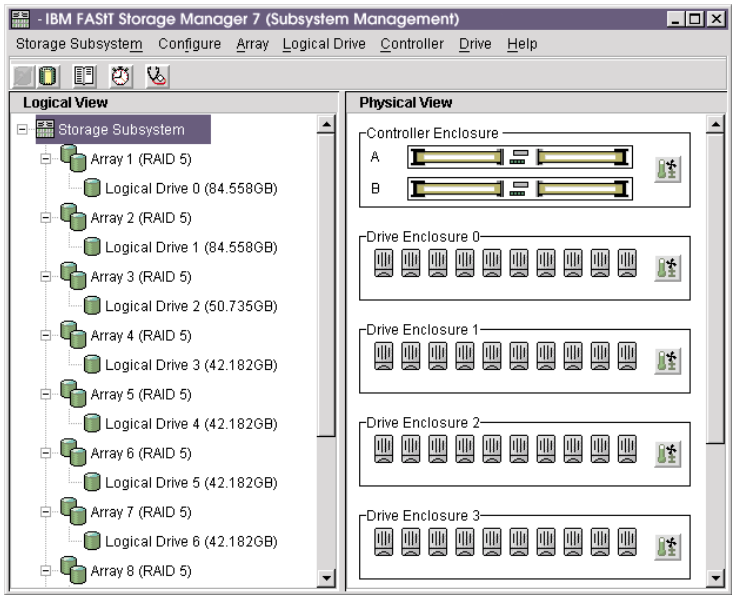

Figure 14. Subsystem Management window (models 3526 and 3552)

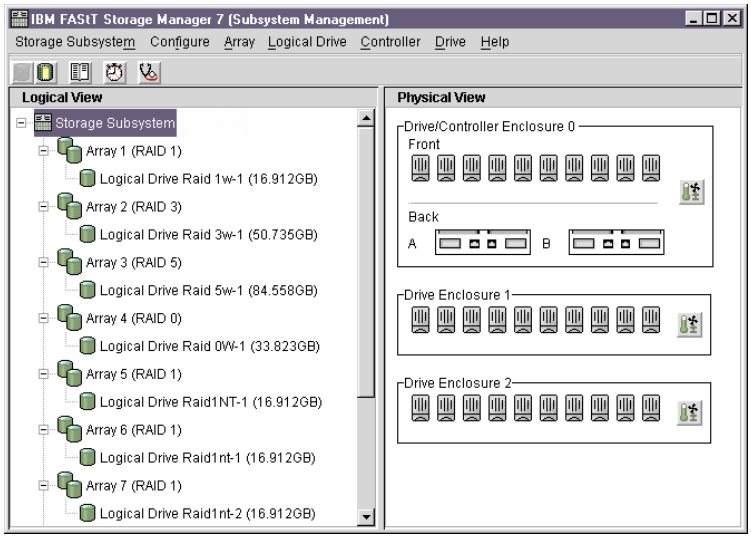

Figure 15. Subsystem Management window (model 3542)

Renaming storage subsystems

When starting Storage Manager 7.10 for the first time, the storage subsystems are unnamed. You must use the Subsystem Management window to rename each storage subsystem to the name that you want. Refer to the names that you entered in the information record using Table 17 on page 71. Then, refer to the renaming storage subsystems topic in the Subsystem Management online Help, which provides detailed instructions for renaming storage subsystems.

Downloading firmware and NVSRAM

Important: You must download firmware version 04.01.xx before you download NVSRAM.

To download firmware version 04.01.xx, do the following:

1. Open the Subsystem Management window.
2. Click **Storage Subsystem** → **Download** → **Firmware**.

   Follow the online instructions.

To download NVSRAM, do the following:

1. Open the Subsystem Management window.
2. Click **Storage Subsystem** → **Download** → **NVSRAM**.

   Follow the online instructions.
3. Continue with “Creating arrays and logical drives”.

Creating arrays and logical drives

To create an array or logical drive, perform the following procedure:

1. Create all of your planned arrays and logical drives on this storage subsystem by clicking the **Configure** → **Create Array/Logical Drive**.

2. Repeat the arrays/logical drive configuration for each storage subsystem connected to your cluster.

   Note: If you make any other logical drive additions or deletions, you must make them known to node 02 in a cluster configuration.

3. Continue with “Changing host type”.

Changing host type

If you have partitioning enabled, do the following to check or change your host type:

1. From the Subsystem Management window left pane, select your host.
2. From the Subsystem Management window, select **Configure** → **View Logical LUN Mapping**.
3. From the Subsystem Management window left pane, select the host port you want to configure, and from the tool bar, click **Configure** → **Topology** → **Change Host Type**.

If you do not have partitioning enabled, do the following to check or change your host type:

Note: Partitioning is a premium feature. If you disable partitioning, you will have to contact your IBM technical-support representative to obtain a key to enable partitioning.

1. From the Subsystem Management window, select your host in the left pane.
2. Click **Configure** → **Change Host Type**.
3. Continue with “Heterogeneous hosts overview”.

Heterogeneous hosts overview

The heterogeneous hosts feature enables hosts running different operating systems to access a single storage subsystem. Previous releases of IBM FAStT Storage Manager did not have this featrure.

Host computers accessing a single storage subsystem can now run completely different operating systems (for example, NetWare and Linux). When a host type is specified in the Define New Host Port window, the heterogeneous hosts feature enables the controllers in the storage subsystem to tailor their behavior (such as LUN reporting and error conditions) to the needs of the host operating system of the host sending the information.

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

In a heterogeneous environment, you must set each host type to the appropriate operating system during host-port definition so that the firmware on each controller can respond correctly for the operating system for that host.

To start the heterogeneous host configuration, do the following:

1. From the Subsystem Management window, click **Configure** → **Storage Partition**.
2. Refer to the Subsystem Management window online help.
3. Continue with “Stopping and starting the host agent” on page 44.

Stopping and starting the host agent

Perform the procedures in the following sections to stop and start the host-agent software that is installed on the host computer.

Note: If an access volume is not detected, the host-agent software will automatically stop running. If you download an NVSRAM file that enables an access volume or changes the LUN that is used for the access volume, you must stop and restart the host-agent software or restart the host computer to enable the discovery of host-agent managed storage subsystems.

Stopping the host agent

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

Use the following procedure to stop the host-agent software:

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

   ```
   unload sm7agent
   ```

3. Press Enter.
4. Return to ConsoleOne. Press Ctrl+Esc, and then select **Xserver** –– **Graphical Console**.

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:

   ```
   sm7agent
   ```

3. Press Enter.

   The window will go blank when the define (NLM) space has been created.
4. Return to ConsoleOne. Press Ctrl+Esc, and then select **Xserver** –– **Graphical Console**.

Starting the host agent automatically

To configure the host-agent software automatically at startup, use the following procedure:

1. Open the autoexec.ncf file in a file editing program.
2. Locate the section that describes loading the Java Runtime Environment. Type the following line after the string:

   ```
   sys:system/sm7agent
   ```

3. Save and close the edited autoexec.ncf file.

Note: It can take up to a minute for the Enterprise Management window to refresh after an initial automatic discovery.

If you need to stop the automatic discovery operation, close the Enterprise Management window.

When the initial automatic discovery is complete, the system displays all hosts and storage subsystems that are attached to the local subnetwork, as shown in Figure 16.

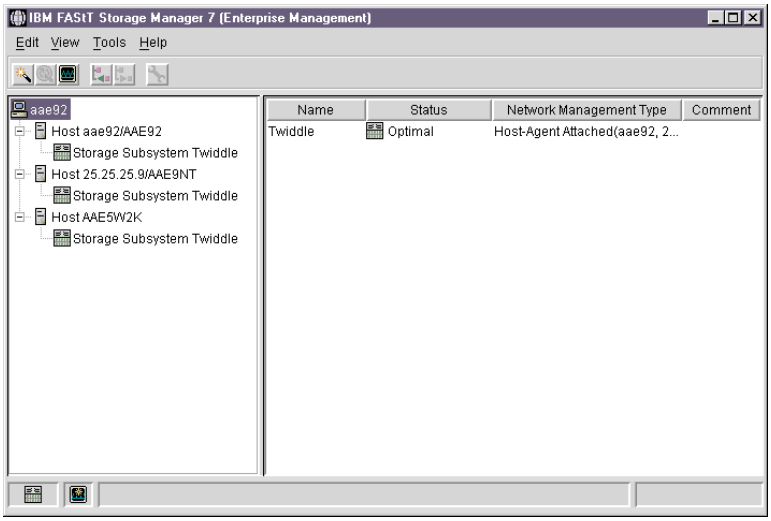

Figure 16. Enterprise Management window

The system does not display all hosts and storage subsystems:

- Check the hardware and connections for possible problems (refer to the hardware documentation for specific procedures).
- Refer to the discovering storage subsystems Enterprise Management Help topic.
- Make sure that the device is on the local subnetwork. If it is not, you must use the Add Device option.

Note: If any 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 online Help for instructions on removing and adding devices.

A storage subsystem might be duplicated in the device tree after an automatic discovery. In this case, you can remove the duplicate storage-management icon from the device tree using the Remove Device option in the Enterprise Management window.

Continue with “Monitoring storage subsystems”.

Monitoring storage subsystems

To monitor the condition of storage subsystems in your management domain, you must start Enterprise Management. For more information about monitoring storage subsystems, refer to the Enterprise Management online Help.

Performing other storage-subsystem management tasks

You can perform the following storage-subsystem management tasks:

- Download controller firmware
- Download controller NVSRAM
- Locate a storage subsystem

- View a storage subsystem profile
- Type or change a storage subsystem password
- Create and manage logical drives and arrays
- Use the Performance Monitor
- Create storage partitions (if applicable)

Note: To create storage partitions, you must obtain the worldwide name or port name of each host adapter in each 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.

Continue with “Applying NVSRAM configuration scripts”.

Applying NVSRAM configuration scripts

When you manage with Storage Manager 7.10, you might need to run the NVSRAM configuration scripts on each storage subsystem to modify configuration settings that are stored in NVSRAM. Use the following procedure to modify the scripts:

1. Insert the IBM FAStT Storage Manager Installation CD into the CD-ROM drive.
2. From the Xserver Graphical Console, type:

   ```
   load cdrom
   ```
3. Mount the CD volume.
4. From the Xserver Graphical Console, click **Novell** → **IBM FAStT Storage Manager 7**.
5. From the Initial Automatic Discovery dialog box, click **Yes**.

   If you click **No**, you can still add devices manually using the **Edit** → **Add Device** option.

   Storage subsystems at firmware level 4.x are automatically discovered.
6. In the right pane of the IBM FAStT Storage Manager 7 (Enterprise Management) window, right-click a storage subsystem, and click **Execute Script** from the menu.

   The Script Editor window opens.
7. From the Script Editor window menu, click **File** → **Load Script**.

   If you are prompted to save changes to newscript.scr, click **No**.
8. From the Load Script window, select the <CD-ROM volume> \Netware51\scripts\Netware5.scr file and select **Open**.
9. From the Script Editor window menu, click **Tools** → **Verify and Execute**.

   The message `Script execution complete` is displayed in the lower pane of the Script Editor window.
10. From the Script Editor window, click **File** → **Load Script**.

    If you are prompted to save changes to newscript.scr, click **No**.
11. From the Load Script window, select the <CD-ROM volume> \Netware51\scripts\NW_mpio.scr file and then, select **Open**.
12. From the Script Editor window, select **Tools** → **Verify** → **Execute**.

    The message `Script execution complete` is displayed in the lower pane of the Script Editor window.
13. Restart the controller.

Chapter 5. Novell NetWare operating-system support

This chapter contains information about operating the storage-management software with Novell NetWare.

Novell NetWare 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 14 explains the limitations that apply when you use the FAStT Storage Manager Version 7.10 with Novell NetWare.

Table 14. Novell NetWare limitations and workarounds.

Limitation	Workaround
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 only work 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 customer replaceable unit (CRU) 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 CRU failures are reported.	Replace the missing fan or power-supply CRUs immediately to ensure redundancy. Make sure that the fan or power-supply CRU is properly seated in the controller unit.

Table 14. Novell NetWare limitations and workarounds.

Limitation	Workaround
Automatic redistribution of LUNs/arrays is not supported. If a controller fails over the storage subsystems to the alternate controller and the failed controller is replaced and brought back online, then the storage subsystems do not automatically transfer to the preferred controller.	This must be done manually by redistributing storage arrays.
Your windows and online Help will display a brownish hash pattern when you run in 256 color mode.	Run the SM7 application in a higher display mode
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 will prompt you for a password. This will occur even if no password has been setup. The automatic discovery will locate and identify each storage subsystem as two separate storage subsystems.	Ensure that at least one IBM FAStT EXP500 Expansion Unit with at least one logical drive is properly attached to the IBM FAStT500 RAID Controller Unit in each storage subsystem being managed. Since the RAID controller unit should not be powered on until the expansion units are attached and powered on, this should be done by powering off the RAID controller unit, properly attaching all expansion units, with the drives installed, to the RAID controller unit and powering them on, and then powering the RAID controller unit back on. At this point the storage subsystems can be re-discovered 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.

Number of supported logical drives

The supported logical drive limits are as follows:

- When using Novell Storage Management Services (SMS) you can configure up to 128 LUNs, or the maximum for the host adapter model in your system.
- Host adapters support a specific number of logical drives. Refer to the host-adapter documentation for specific information.
- The host-agent management method uses a special logical drive, called an access volume, to communicate with the controllers on the storage subsystem. The access volume uses one of the allowable logical drives. Therefore, managing storage subsystems with the host-agent software limits you to one fewer LUN than the maximum number that is supported by Novell NetWare and the host adapter.

Creating logical drives

A logical drive is a logical object that is the basic structure that you create to store data on the storage subsystem. A logical drive is configured for an array with a specific RAID level to meet application needs for data availability and Fibre Channel I/O performance. A logical drive is recognized by the operating system as one drive.

You can add or delete logical drives in a standard configuration.

When you create new logical drives with the storage-management software, you must add the new logical drives to Novell NetWare. Refer to the Novell NetWare documentation for details about adding a drive. Remember that each logical drive (not array) is recognized by Novell NetWare as one drive. After creating logical drives, run the Hot Add and SM7devices utilities that are provided with the storage-management software. The Hot Add utility adds newly created logical drives to the operating system, and the SM7devices utility identifies logical drives by their associated operating system device names. For information about using these utilities, see “Using the Hot Add utility” and “Using the Storage Manager 7 devices utility” on page 52.

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.

Using the Hot Add utility

The Storage Manager 7 utility software package includes the Hot Add utility that you can use to add new logical drives dynamically without restarting the system. This utility registers the new logical drives with the operating system so that you can use Disk Administrator to create partitions, add device names, and so on. The Hot Add utility is part of the SM7util package.

After 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 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 Storage Manager 7 devices utility

The Storage Manager 7 utility software package includes the utility called Storage Manager 7 devices (SM7devices) that you can use to view the storage subsystem logical drive that is associated with a particular operating system device name. This capability is helpful when you want to create drives, volumes, or a combination of both for the logical drive using the nwconfig program.

After 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 SM7devices:

1. From the Server Console type:

   ```
   SM7devices
   ```

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

Uninstalling storage-management software components

Use the following procedure to uninstall one or more of the components of Storage Manager 7.10.

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

   The Add/Remove Programs Properties window opens.

2. From the list of programs, select the component that you want to uninstall.

   For example, select **IBM FAStT Storage Manager 7**.

3. Click **Add/Remove**.
   The Confirm File Deletion window opens.
4. Click **Yes** to start the uninstall process.
5. When the uninstall is completed, click **OK**.

Chapter 6. Installing software in a standard configuration (Red Hat Linux)

This chapter describes how to install the storage-management software in a standard (noncluster) configuration in a Red Hat Linux operating-system environment.

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 written.

To ensure proper installation, make sure you have read the entire contents of Chapter 1, “Introduction,” on page 1, including all supporting documentation. In addition, you must complete all preparation tasks described in Chapter 2, “Preparing for installation,” on page 17.

Pre-installation process

There are two configurations in which you can install the storage-management software:

- You do *not* have existing storage subsystems. In this situation, you are installing new storage subsystems with machine type 3526, 3542, or 3552 controllers using firmware version 04.01.*xx* and will manage these new storage subsystems using Storage Manager 7.10. For this configuration, go to “New-installation process” on page 56.
- You have existing storage subsystems with machine type 3526, 3542, or 3552 controllers. In this situation, you can do one of the following:
  - — Upgrade the controller firmware on the existing storage subsystems to version 04.01.*xx* and manage them with Storage Manager 7.10.
  - — If you have firmware version 3.01.x, continue to manage the existing storage subsystems with version 6.22 of the storage-management software and manage with new storage subsystems with Storage Manager 7.10.
  - — Manage the storage subsystem with the Storage Manager 7.10 at controller firmware version 4.00.x.

Use Table 15 to determine an installation process.

Table 15. Determining your installation process in a standard configuration.

Current environment	Planned environment	Action
No existing storage subsystems	New storage subsystems with controllers that use version 4.00.02 firmware managed with Storage Manager 7.10.	Go to “New-installation process” on page 56.
	Manage existing storage subsystems attached to separate host computers (not in a coexistence environment).	Continue to use existing storage-management software to manage existing storage subsystems. **Note:** You cannot manage storage subsystems running version 3.x firmware with Storage Manager 7.10.

Table 15. Determining your installation process in a standard configuration.

Current environment	Planned environment	Action
Existing storage subsystems with controllers that have firmware versions 4.00.00 through 4.00.01 and storage-management software version 7.00 or 7.01 (machine types 3526 and 3552)	Upgrade storage subsystems with controllers that will use version 4.00.02 firmware managed with Storage Manager 7.10.	1. Uninstall storage-management software version 7.0 or 7.01 using the procedures in the *Installation Guide* for the previous version of the storage-management software. 2. Go to “New-installation process”. 3. Update the NVSRAM and firmware to version 4.00.02 using the storage-management software online help.
	Continue to use controller firmware versions 4.00.00 through 4.00.01. (Be sure to uninstall previous versions of the storage-management software before installing version 7.10.) You can manage these existing storage subsystems with Storage Manager 7.10, which includes components that are compatible with firmware versions 4.00.00 through 4.00.01. The functional differences between the existing controller firmware and controller firmware 4.00.02 is provided on the installation CD. Refer to the README file located in the \linux\ directory on the installation CD for more information.	1. Uninstall storage-management software version 7.0 or 7.01 using the procedures in the *Installation Guide* for the previous version of the storage-management software. 2. Go to “New-installation process”.

New-installation process

Begin the installation of the storage-management software with “Installing the Storage Manager 7 client package on a Linux platform” on page 57. Continue the process until you have completed “Installing the IBM Host Adapter (HA) device driver (QLa2x00)” on page 58.

Figure 17 on page 57 shows a flowchart of the installation process.

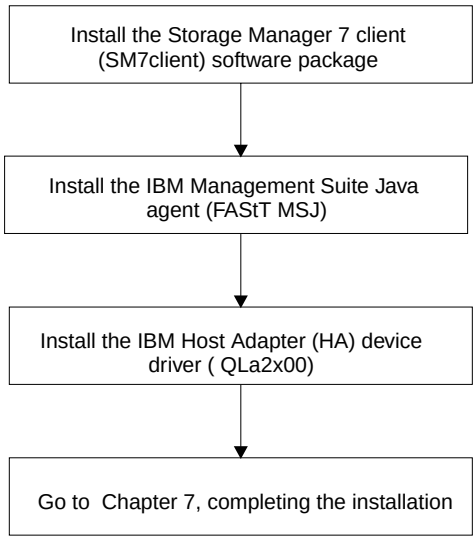

Figure 17. Installation process

Installing with existing storage subsystems

Begin this installation with “Installing the Storage Manager 7 client package on a Linux platform”. Continue the process until you have completed “Installing the IBM Host Adapter (HA) device driver (QLa2x00)” on page 58.

Installing the Storage Manager 7 client package on a Linux platform

Use the procedure in this section to install the client software on a Linux management station, host, or cluster server attached to the storage subsystem.

Installation instructions

Before you install the software, make sure that:

- The management station has at least 80 MB of available disk space on /tmp and 40 MB of available disk space on /opt.
- The display properties are set to a minimum screen resolution of 800 x 600 pixels and a palette of 256 colors or more.
- You close all other programs.

  Attention: To avoid system problems, do not install any of the storage-management components on a second Linux management station until instructed to do so in the installation procedures.

To install the SM7client package:

1. Insert the IBM FAStT Storage Manager version 7.10 installation CD into the CD-ROM drive.
2. Mount the CD-ROM by typing:

   ```
   mount /mnt/cdrom
   ```

   and press Enter.
3. Type:

   ```
   cd /mnt/cdrom
   ```

and press Enter.

4. Go to /Redhat71/SM7client folder.
5. Type:

   ```
   rpm -ivh SM7client-Linux-0710G506.rpm
   ```

   and press Enter.

Verifying the Storage Manager 7 client installation

Use the following procedure to verify that the installation was successful:

1. At the system prompt, type the following and press Enter:

   ```
   rpm -qi SM7client
   ```

   The verification process displays a message that describes the SM7client software, including version numbers, copyright license, installation time, and general software package description.

   If no failure is reported, go to step 2. If the verification reports a failure, repeat steps 1 through 5 of the installation procedure.
2. Continue the installation with “Installing IBM FAStT Management Suite Java”.

Installing IBM FAStT Management Suite Java

The IBM FAStT Management Suite Java (FAStT MSJ) software includes the FAStT GUI device driver that is required for failover support. You can use the GUI to configure LUNs, storage, and failover.

Note: For additional information, refer to the online Help.

Perform the following steps to install IBM FAStT Management Suite Java:

1. Insert the IBM FAStT Storage Manager installation CD into the CD-ROM Drive.
2. From the X-windows GUI, open a command window.
3. Select the \Redhat71 directory.
4. Run the installer for FAStT MSJ, At the prompt, type:

   ```
   sh FAStTMSJ_installation.bin
   ```

   The Introduction window opens.
5. Click **Next**.
6. Restart your Linux server.

For configuration information, refer to the *IBM FAStT MSJ User’s Guide*. Continue with “Installing the IBM Host Adapter (HA) device driver (QLa2x00)”.

Installing the IBM Host Adapter (HA) device driver (QLa2x00)

The IBM Host Adapter device driver enables the 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). Refer to the *IBM FAStT Host Adapter Installation and User’s Guide* and the http://www.ibm.com/pc/support IBM Web page for the current README file and latest multipath I/O device driver installation and configuration information.

Chapter 7. Completing the software installation (Red Hat Linux)

This chapter contains procedures for starting Enterprise Management and Subsystem Management and for completing the installation tasks.

Starting the Enterprise Management window

The Enterprise Management window is the first window that opens when you start the software. Use the Enterprise Management window to do the following:

- Add and discover the storage subsystems that you want to manage.
- Provide a comprehensive view of all storage subsystems in your management domain.
- Perform batch storage-subsystem management tasks using the Script Editor.

Use the following procedure to start the Enterprise Management window:

1. At the command prompt, Type:

   ```
   SM7client
   ```

   Note: If /opt/SM7client is not contained in the path environment, the full path name is required on the command line:

   ```
   /opt/SM7client/SM7client
   ```

   The client software starts and the Enterprise Management window and the Confirm Initial Automatic Discovery dialog box displays, as shown in Figure 18.

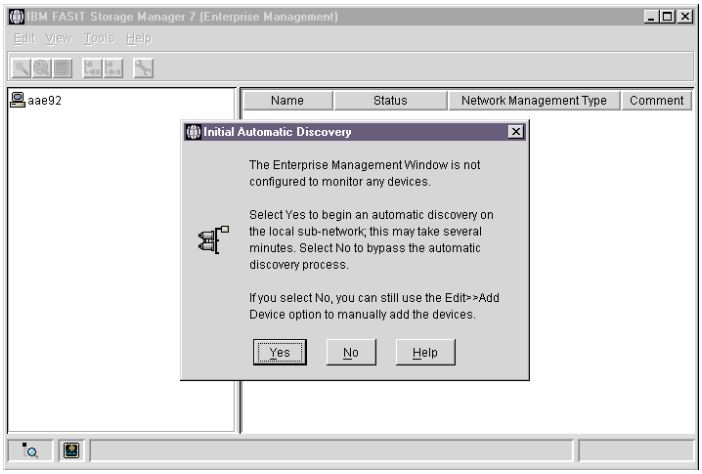

Figure 18. Confirm Initial Automatic Discovery dialog box

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

If you do not want to perform the initial automatic discovery, click **No**. You can use the **Edit** → **Add Device** menu option to add hosts and storage subsystems. For more information, see “Adding devices” on page 62.

2. Click **Yes** to begin an initial automatic discovery of hosts and storage subsystems that are attached to the local subnetwork where the management station is installed.

   The software sends a broadcast message across the local subnetwork where the management station is installed. It discovers host-agent managed storage subsystems when the hosts that provide network management connections to the storage subsystems respond to the broadcast. The software discovers directly managed storage subsystems when the controllers in those storage subsystems respond to the broadcast message.

Note: It can take up to a minute for the Enterprise Management window to refresh after an initial automatic discovery.

To stop the automatic discovery operation, close the Enterprise Management window.

When the initial automatic discovery is complete, all hosts and storage subsystems that are attached to the local subnetwork are displayed, as shown in Figure 19.

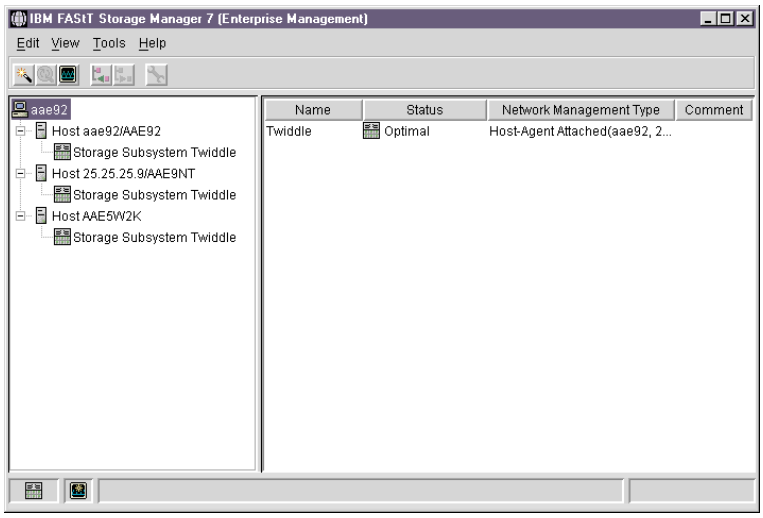

Figure 19. Enterprise Management window

If all hosts and storage subsystems are not displayed:

- Check the hardware and connections for possible problems (refer to the hardware documentation for specific procedures).
- Refer to the discovering storage subsystems Enterprise Management Help topic.
- Make sure that the missing device is on the local subnetwork. If it is not, you must use the Add Device option.

Note: If any 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 online Help for instructions on removing and adding devices.

A storage subsystem might be duplicated in the device tree after an automatic discovery. In this case, you can remove the duplicate storage management icon from the device tree using the Remove Device option in the Enterprise Management window.

Continue with “Renaming storage subsystems” on page 61.

Renaming storage subsystems

When starting Storage Manager 7.10 for the first time, the storage subsystems are unnamed. You must use the Subsystem Management window to rename each storage subsystem to the name that you want. Refer to the names that you entered in the information record using Table 17 on page 71. Then, refer to the renaming storage subsystems topic in the Subsystem Management online Help, which provides detailed instructions for renaming storage subsystems.

Downloading firmware and NVSRAM

Important: You must download firmware version 04.01.xx before you download NVSRAM.

To download firmware version 04.01.xx, do the following:

1. Open the Subsystem Management window.
2. Click **Storage Subsystem** → **Download** → **Firmware**.

   Follow the online instructions.

To download NVSRAM, do the following:

1. Open the Subsystem Management window.
2. Click **Storage Subsystem** → **Download** → **NVSRAM**.

   Follow the online instructions.
3. Continue with “Creating arrays and logical drives”.

Creating arrays and logical drives

To create an array or logical drive, perform the following procedure:

1. Create all of your planned arrays and logical drives on this storage subsystem by clicking the **Configure** → **Create Array/Logical Drive**.
2. Repeat the arrays/logical drive configuration for each storage subsystem connected to your cluster.

   Note: If you make any other logical drive additions or deletions, you must make them known to node 02 in a cluster configuration.
3. Continue with “Changing host type”.

Changing host type

The access logical drive must be deleted from the Linux storage partition in order for the multipath I/O driver to be configured properly. The LUNs must also be numbered consecutively starting with 0-31. If you have partitioning enabled, do the following to check or change your host type:

1. From the Subsystem Management window left pane, select your host.
2. From the Subsystem Management window, select **Configure** → **View Logical LUN Mapping**.
3. From the Subsystem Management window left pane, select the host port you want to configure, and from the tool bar, click **Configure** → **Topology** → **Change Host Type**.

If you do not have partitioning enabled, do the following to check or change your host type:

Note: Partitioning is a premium feature. If you disable partitioning, you will have to contact your IBM technical-support representative to obtain a key to enable partitioning.

1. From the Subsystem Management window, select your host in the left pane.
2. Click **Configure** → **Change Host Type**.
3. Continue with “Heterogeneous hosts overview”.

Heterogeneous hosts overview

The heterogeneous hosts feature enables hosts running different operating systems to access a single storage subsystem. Previous releases of IBM FAStT Storage Manager did not have this feature.

Host computers accessing a single storage subsystem can now run completely different operating systems (for example, NetWare and Linux). When a host type is specified in the Define New Host Port window, the heterogeneous hosts feature enables the controllers in the storage subsystem to tailor their behavior (such as LUN reporting and error conditions) to the needs of the host operating system of the host sending the information.

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

In a heterogeneous environment, you must set each host type to the appropriate operating system during host-port definition so that the firmware on each controller can respond correctly for the operating system for that host.

To start the heterogeneous host configuration, do the following:

1. From the Subsystem Management window, click **Configure** → **Storage Partition**.
2. Refer to the Subsystem Management window online help.
3. Continue with “Adding devices”.

Adding devices

You can add more hosts or storage subsystems outside the local subnetwork. For more information about this option, refer to the Enterprise Management window online Help.

To monitor the condition of storage subsystems in your management domain, you must start Enterprise Management. For more information about monitoring storage subsystems, refer to the Enterprise Management online Help.

Continue with “Setting up alert notifications”.

Setting up alert notifications

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

- Notification to a designated network management station (NMS) using Simple Network Management Protocol (SNMP) traps. (See “Setting up the NMS for SNMP notification” for more information.)
- Notification to designated e-mail addresses
- Notification to designated alphanumeric pagers (when a vendor software package is used to convert e-mail messages)

Note: The Enterprise Management Window must remain open to monitor the condition of storage subsystems that are included in your management domain. If you close this window, you will not receive alert notifications. Refer to the Enterprise Management online Help or Understanding Storage Manager Concepts Guide for Version 7.10 for more information on alert notification options.

Continue with “Setting up the NMS for SNMP notification”.

Setting up the NMS for SNMP notification

If you choose to set up alert notification using SNMP traps, you must first copy a management information base (MIB) file to the designated network management station. Use this procedure to set up the MIB file on the network management station.

Important: You need to designate NMS only once.

1. From the \SM7mib directory on the FAStT Storage Manager Installation CD, copy the Arrayman.mib file to the network management station.
2. Follow the steps that are required by your specific network management station to compile the MIB file.

   Note: For details on the required steps, see your network administrator or the documentation that is specific to the NMS product that you are using.
3. Continue with “Configuring alert destinations”.

Configuring alert destinations

Configure SNMP trap destinations and e-mail destinations for alert notifications using Enterprise Management. Refer to the Enterprise Management online Help for specific procedures.

Starting Subsystem Management

The Subsystem Management window enables you to manage selected subsystems.

Use the following procedure to open a subsystem management window for a selected storage subsystem:

1. In the Enterprise Management window, select a storage subsystem.
2. Click **Tools** → **Manage Device**.

   The software displays the Subsystem Management window for the selected storage subsystem, as shown in Figure 20 and Figure 21 on page 64.

   Note: Using the open Subsystem Management window, you can manage only the selected storage subsystem. However, you can open multiple subsystem-management windows to manage other storage subsystems.

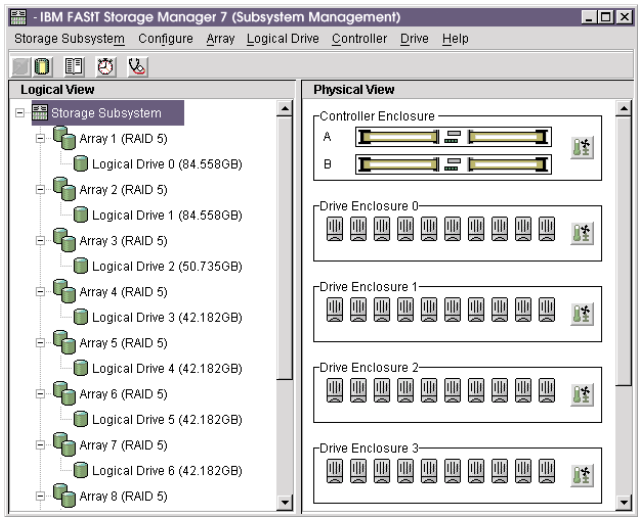

Figure 20. Subsystem Management window (machine types 3526 and 3552)

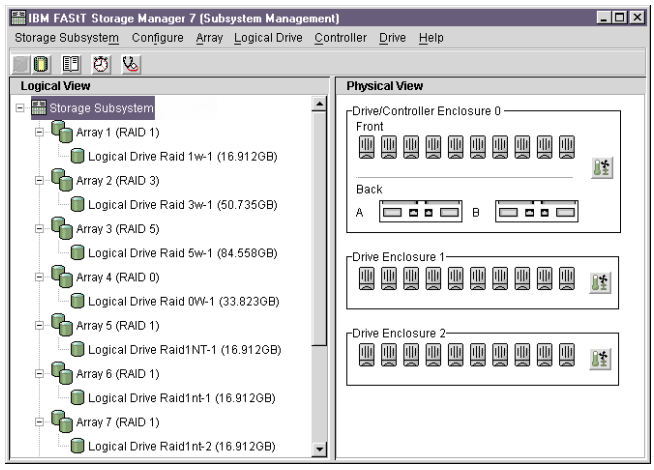

Figure 21. Subsystem Management window (machine type 3542)

Continue with “Performing other storage-subsystem management tasks”.

Performing other storage-subsystem management tasks

You can perform the following storage-subsystem management tasks:

- Download controller firmware
- Download controller NVSRAM
- Locate a storage subsystem
- View a storage subsystem profile
- Type or change a storage subsystem password
- Create and manage logical drives and arrays
- Use the Performance Monitor
- Create storage partitions (if applicable)

Note: To create storage partitions, you must obtain the worldwide name or port name of each host adapter in each 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.

Continue with “Applying NVSRAM configuration scripts”.

Applying NVSRAM configuration scripts

You might need to run scripts to modify configuration settings that are stored in NVSRAM on each storage subsystem managed with Storage Manager 7.10.

Use the following procedure to modify the configuration settings:

1. Insert the FAStT Storage Management Installation CD into the CD-ROM drive on the management station.
2. Go to the \SM7scripts directory and read the README file in that directory.
3. In the Enterprise Management window, select a storage subsystem; then click **Tools** → **Execute Script**.

Use the following procedure to run the scripts for your configuration:

1. To run a script file, click **File** → **Load Script**.

   The Load Script window opens.
2. Select the appropriate script from the SM7scripts directory on the installation CD.
3. Click Open to load the script.
4. Click **Tools** → **Execute**. Wait until the Script Execution Complete message is displayed.
5. Repeat the procedures in steps 2 through 4 for each storage subsystem that you are managing with the storage-management software.

   Note: For more information refer to the README file.

Chapter 8. Red Hat Linux operating-system support

This chapter contains information that is related to operating the storage-management software in a Red Hat Linux environment.

Number of supported logical drives

The supported logical drive limits are as follows:

- When using Linux Storage Management Services (SMS) you can configure up to 128 LUNs, or the maximum for the host adapter model.
- Host adapters support a specific number of logical drives. Refer to the host-adapter documentation for specific information.

Red Hat Linux 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 16 explains the limitations that apply when you use the FAStT Storage Manager Version 7.10 in a Red Hat Linux operating system environment.

Table 16. Red Hat Linux limitations and workarounds.

Limitation	Workaround
Vixel Rapport 2000 Fibre Channel hubs using controllers with firmware version 4.00.02 cause problems, including data corruption, system instability, and disrupted loop activity.	Do not use Vixel Rapport 2000 Fibre Channel hubs when your system is operating in a controller or an I/O path fault-tolerant environment.
The drive space capacity for a single logical drive group is limited. For example, if configuring seventy-three, 4 GB drives, the maximum number of drives that can be configured in a single logical drive group is 29.	None.
After removing all drives from a storage subsystem, you will be prompted for a password at software startup or when you perform protected operations, all passwords you enter will fail.	Password information is stored on a reserved sector of each storage subsystem logical drive. Each drive stores a mirrored copy of the password data. When the storage-management software does not detect password data when you attempt password-protected operations, add one of the drives to the storage subsystem and reattempt the operation.
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.
A standard non-network configuration is not supported when the Linux host does not have the TCP/IP software installed.	Install the TCP/IP software on the Linux host computer and assign the host a static IP address.
Multipath failover will work if the storage controllers are in only active/active mode.	When you configure the storage subsystem, change both controllers to active status.

Table 16. Red Hat Linux limitations and workarounds.

Limitation	Workaround
When you configure a new storage subsystem with a single controller, you must place the controller in slot A.	The controller firmware does not recognize or communicate with a single controller until slot A is populated. This restriction does not apply to storage subsystems that were originally configured with two controllers.
Automatic redistribution of LUNs/arrays is not supported. If a controller fails over the storage subsystems to the alternate controller and the failed controller is replaced and brought back online, then the storage subsystems do not automatically transfer to the preferred controller.	This must be done manually by redistributing storage arrays.
Your windows and online Help will display a brownish hash pattern when you run in 256 color mode.	Run the Storage Manager 7.10 application in a higher display mode.
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 7.10 will prompt you for a password. This will occur even if no password has been set up. The automatic discovery will locate and identify each storage subsystem as two separate storage subsystems.	Ensure that at least one IBM FAStT EXP500 Expansion Unit with at least one logical drive is properly attached to the IBM FAStT500 RAID Controller Unit in each storage subsystem being managed. Since the RAID controller unit should not be powered on until the expansion units are attached and powered on, this should be done by powering off the RAID controller unit, properly attaching all expansion units with the drives installed, to the RAID controller unit and powering them on, and then powering the RAID controller unit back on. At this point the storage subsystems can be re-discovered 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.

Creating logical drives

A *logical drive* is a logical object that is the basic structure that you create to store data on the storage subsystem. A logical drive is configured for an array with a specific RAID level to meet application needs for data availability and Fibre Channel I/O performance. A logical drive is recognized by the operating system as one drive.

Important: Before mounting a logical drive, make sure that you have the correct hardware path.

When you create new logical drives with the storage-management software, you must add the new logical drives to Linux. Refer to the Linux documentation for details about adding a drive. Remember that each logical drive (not array) is recognized by Linux as one drive.

Uninstalling storage-management software components

Use the following procedure if you need to uninstall the Storage Manager 7 client component of Storage Manager 7.10. You must have root or equivalent privileges to remove this component.

Note: The uninstall process will not remove the emwdata.bin or emwback.bin configuration files that are created by the SM7client. Reinstalling the SM7client will not overwrite these files.

Use the following procedure to uninstall the SM7client:

1. At the command prompt, type:

   ```
   rpm -e SM7client
   ```

2. Press Enter.

To uninstall the FAStT MSJ, refer to the *IBM FAStT MSJ User's Guide*.

Appendix A. Storage subsystem/controller information record

Table 17 provides a data sheet on which you can 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 that is recorded in Table 17 to set up the BOOTP table for the network server and the host or Domain Name System (DNS) table. The information in Table 17 will help 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, refer to “Reviewing a sample network” on page 18.

Table 17. Storage subsystem information record and controller information record.

Storage subsystem name (refer to page 21)	Management type (refer to page 17)	Controllers—Ethernet and IP addresses, and host name (refer to pages 21 and 23)		Host—IP address and host name (refer to page 23)

Appendix B. Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your computer, and whom to call for service should it be necessary.

Getting information

Information about your IBM server product and preinstalled software, if any, is available in the documentation that comes with your server. That documentation includes printed books, online books, README files, and help files. In addition, information about IBM products is available on the World Wide Web and through the IBM Automated Fax System.

Using the World Wide Web

On the World Wide Web, the IBM Web page has up-to-date information about IBM products and support. The address for the IBM Personal Computing home page is http://www.ibm.com/pc/.

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You also can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada, you can receive, by fax, marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs).

You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine. In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

Getting help and service

If you have a problem with your server product you will find a wide variety of sources available to help you.

Using the documentation and diagnostic programs

Many problems can be solved without outside assistance. If you experience a problem with your server product, the first place to start is the troubleshooting information in your IBM documentation. If you suspect a software problem, see the documentation,

including README files and online help, that comes with the operating system or application program.

Most IBM server products come with a set of diagnostic programs that you can use to help you identify hardware problems. See the troubleshooting information in your IBM documentation for instructions on 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. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions.

Calling for service

If you have tried to correct the problem yourself and still need help, during the warranty period, you can get help and information by telephone through the IBM HelpCenter®. The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make selected Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts. All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Configuration of BIOS as part of an installation or upgrade.
- Changes, modifications, or upgrades to device drivers.
- Installation and maintenance of network operating systems (NOS).
- Installation and maintenance of application programs.

Refer to your IBM hardware warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.

Note: Response time will vary depending on the number and complexity of incoming calls.

Please have the following information ready when you call:

- Machine type and model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Phone numbers are subject to change without notice. For the most up-to-date phone numbers, go to http://www.ibm.com/pc/support/ and click **Support Phone List**.

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Belgium - French	Belgique	02-210 9800
Canada	Toronto only	416-383-3344
Canada	Canada - all other	1-800-565-3344
Denmark	Danmark	45 20 82 00
Finland	Suomi	09-22 931 840
France	France	02 38 55 74 50
Germany	Deutschland	07032-1549 201
Ireland	Ireland	01-815 9202
Italy	Italia	02-482 9202
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-514 5770
Norway	Norge	23 05 32 40
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-477 4420
Switzerland	Schweiz/Suisse/Svizzera	0848-80 52 52
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries, contact your IBM reseller or IBM marketing representative.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country.

For more information about these services, contact your IBM marketing representative.

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