IBM Fibre Channel

Basic SAN Configuration Setup Guide

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> **Note:**
> Before using this information and the product it supports, be sure to read the general information in ″Notices″ on page 25.

Contents

Preface

The IBM® SAN Solutions Basic Configuration Setup Guide outlines the steps required to assemble a basic Storage Area Network (SAN) that encompasses IBM SAN Solutions hardware components. Several possible configurations are also described. In addition, this guide discusses how to add hardware components to expand the SAN configuration. This guide is not intended to describe all the configurations possible by using the building blocks listed in this chapter. The installation information presented in this book is intended to be used in conjunction with the detailed information found at the Web sites cited in the text.

Note: Many of the explanations of components and programs in this book are directly quoted from the original IBM documentation for the particular products. Because this guide is intended to serve as an outline for assembling a SAN configuration, be aware that the original information source will often contain more detail than this guide. Therefore, if you have questions about particular components or programs, refer to the documentation for the component or program.

Who should read this book

This guide is intended for trained service personnel who are familiar with IBM products and are proficient with Windows® 2000 operating system administration. The user should have a solid understanding of the IBM FAStT Storage Manager as well as the software tools used to configure and administer Fibre Channel switches, routers, host bus adapters, and other hardware devices.

How to use this book

This book is organized as follows:

"Chapter 1. SAN solutions overview" on page 1, lists the major building blocks of a SAN solution, describes the configuration that is the focus of this guide, and presents an overview of the hardware components and software programs that comprise the IBM SAN Solutions portfolio.

"Chapter 2. Installation overview" on page 15, introduces the type of SAN configuration discussed in this guide and provides an overview of the installation process.

"Chapter 3. Installation sequence" on page 19, provides a step-by-step sequence to assembling a basic SAN configuration. These steps include verifying and updating the basic server, Fibre Channel switch, host bus adapter, and router firmware, as well as installing, configuring, and administering the hardware components.

"Chapter 4. Operation, maintenance, and scalability" on page 21, discusses the operation and maintenance of a SAN and the process of adding components to a SAN configuration.

Chapter 1. SAN solutions overview

The IBM SAN initiative provides a complete range of services, infrastructure, and technology required to successfully implement a Storage Area Network (SAN). Servers, storage devices, software, and Fibre Channel interconnect components are the building blocks used to construct, use, and manage a SAN. Because of the complexity of heterogeneous, multi-platform environments, service and system integration are critical to the success of a SAN implementation.

Building blocks

The following building blocks are included in a typical SAN configuration:

- **Operating systems**

    This guide details configurations using Microsoft® Windows® 2000.

- **Device configuration and management software programs and tools**

    This guide discusses programs to configure and manage switches, managed hubs, redundant array of independent disks (RAID) controllers, host bus adapters (HBAs), and SAN routers.

- **Storage management applications**

    Applications to manage tape libraries and hard disk enclosures are included in the IBM SAN Solutions configurations.

- **Storage, HBAs, other options**

    This guide discusses hard disk drive enclosures, Fibre Channel (FC) HBAs, and tape drives and libraries.

- **Servers**

    This guide details configurations using IBM @server xSeries servers.

- **Fibre Channel interconnect**

    This guide discusses Fibre Channel switches and managed hubs, Fibre Channel routers, Gigabit Interface Converters (GBICs), and Fibre Channel cables.

Configuration types

The following sample configurations are described in this chapter:

- Basic storage partitioning
- Cluster and non-cluster shared storage pool
- SAN with partitioned storage
- High-capacity storage configuration
- Multiple clusters in a switched fabric environment
- Direct attach multiple cluster configuration

1

Basic storage partitioning

The following illustration shows the functionality of partitioning. Partitioning the storage provides flexible management of available storage by subdividing the storage into separate independent sections or partitions. It also enables you to consolidate the storage from multiple host systems into one or more FAStT500 RAID Controller Enclosure Units and amortize the cost of the storage across the connected hosts rather than having one host incur the total cost of the storage.
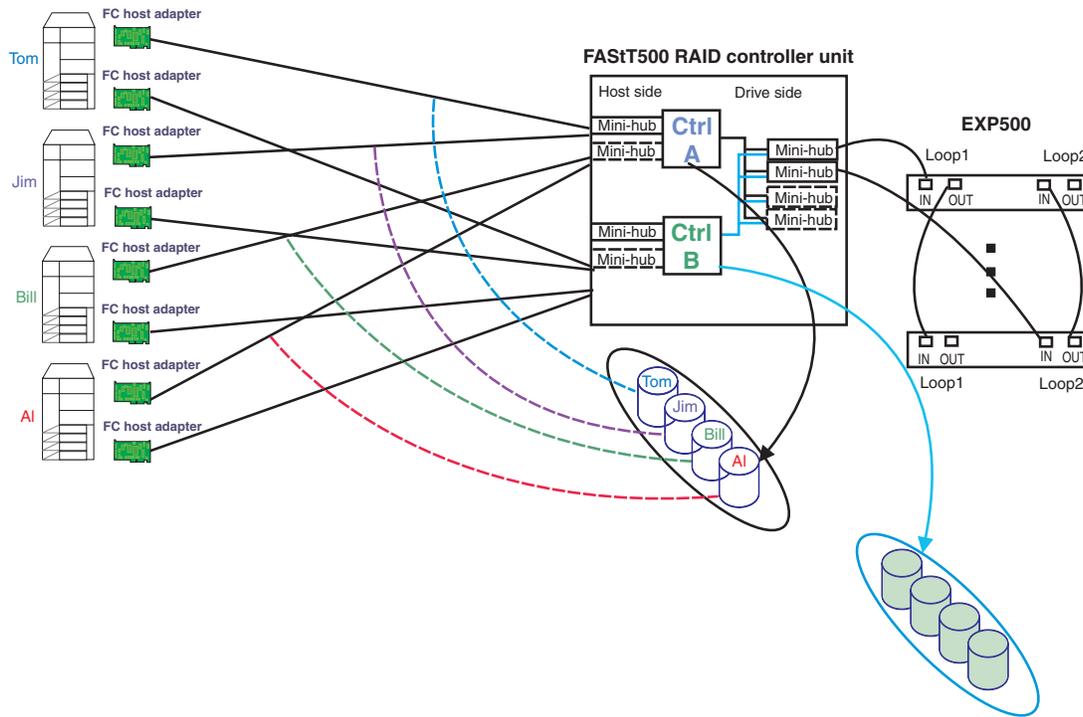
Figure 1. Basic storage partitioning

Note: Four partitions are shown. Eight are available in the base configuration.

Cluster and non-cluster shared storage pool

The following illustration shows a configuration where both the clustered and non-clustered servers share storage. This configuration increases reliability and availability through redundancy of the Fibre Channel components, with no single point of failure. Storage is defined for each of the server environments that use the storage partitioning capability of the FAStT500 RAID Controller Enclosure Unit, provided that each server is its own storage subsystem.
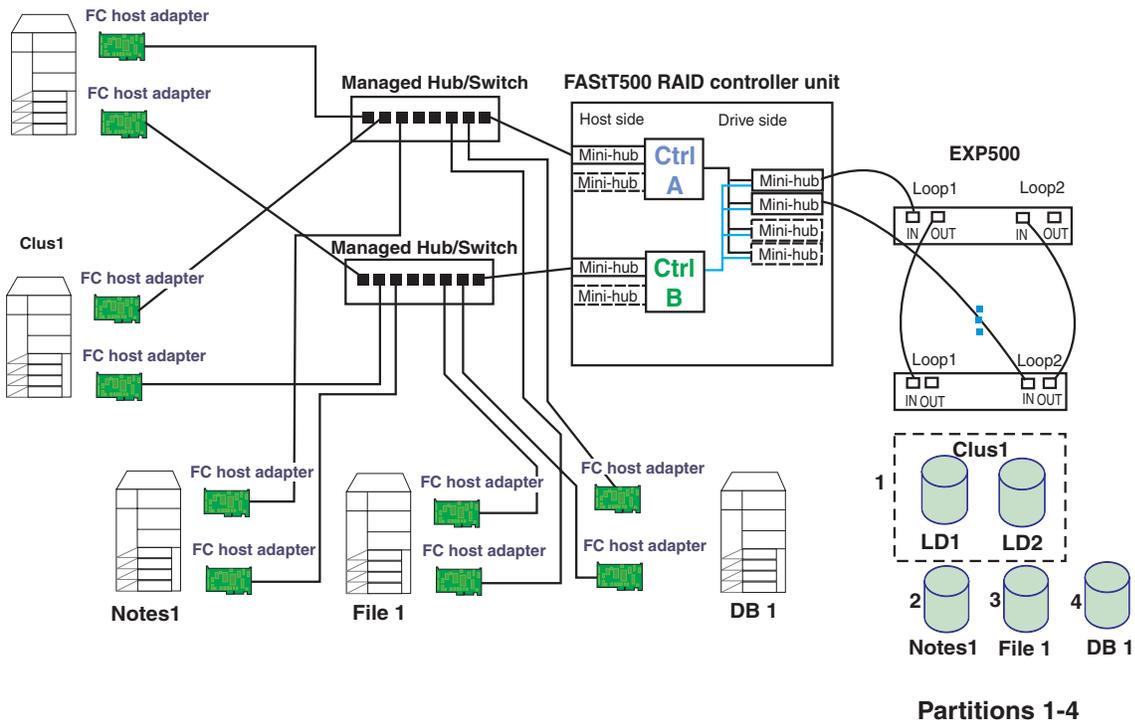
Figure 2. Cluster and non-cluster shared storage pool

Note: Factors such as performance and the number of storage partitions influence the number and type of node.

SAN with partitioned storage

The following illustration shows a SAN with partitioned storage. SANs with partitioned storage are separate, centrally managed, high-speed storage networks which consist of a variety of storage hardware, storage management software, and interconnect devices. SANs with partitioned storage can be configured to provide hundreds of terabytes of shared storage across an enterprise. This configuration heightens the level of availability and business continuity and optimizes use of corporate LANs by providing a storage infrastructure designed specifically for managing corporate information.
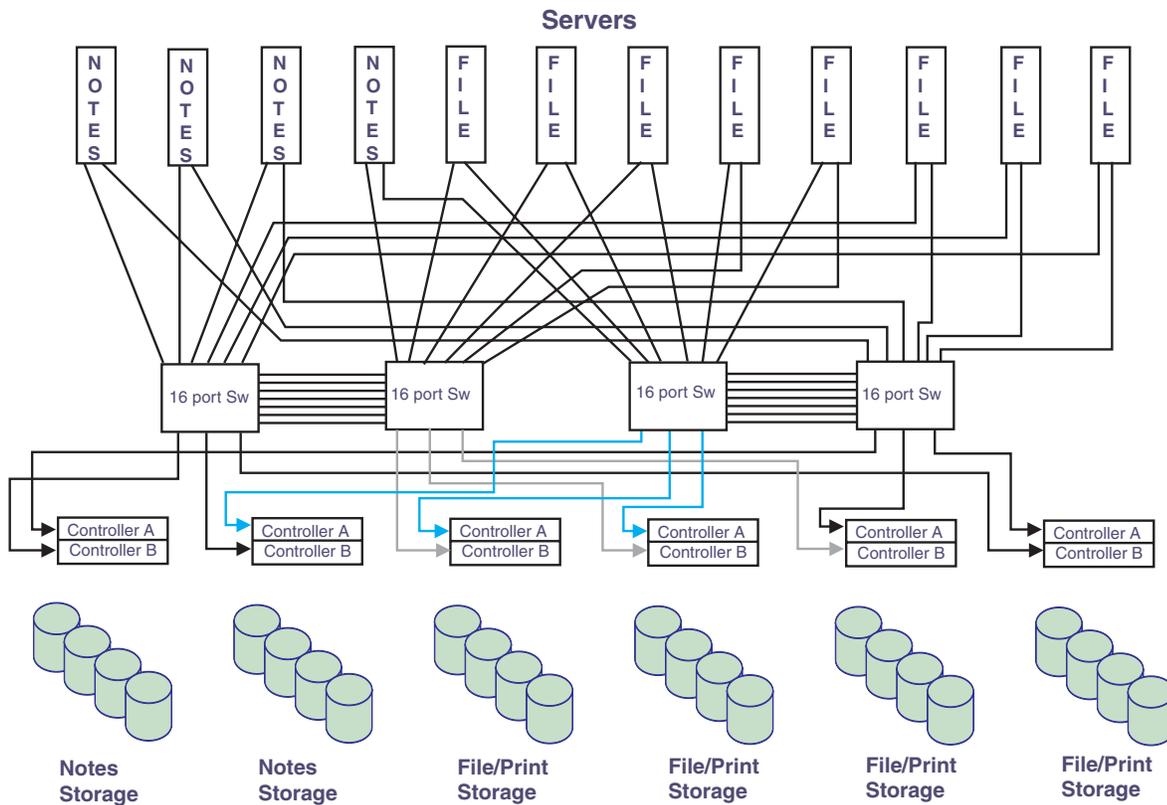
Figure 3. SAN with partitioned storage

High-capacity storage configuration

The following illustration shows how the FAStT500 supports large, business-critical applications for today's e-business. Internet service providers, storage service providers (SSPs), or any business that relies on highly scalable solutions will benefit from a high-capacity storage configuration.
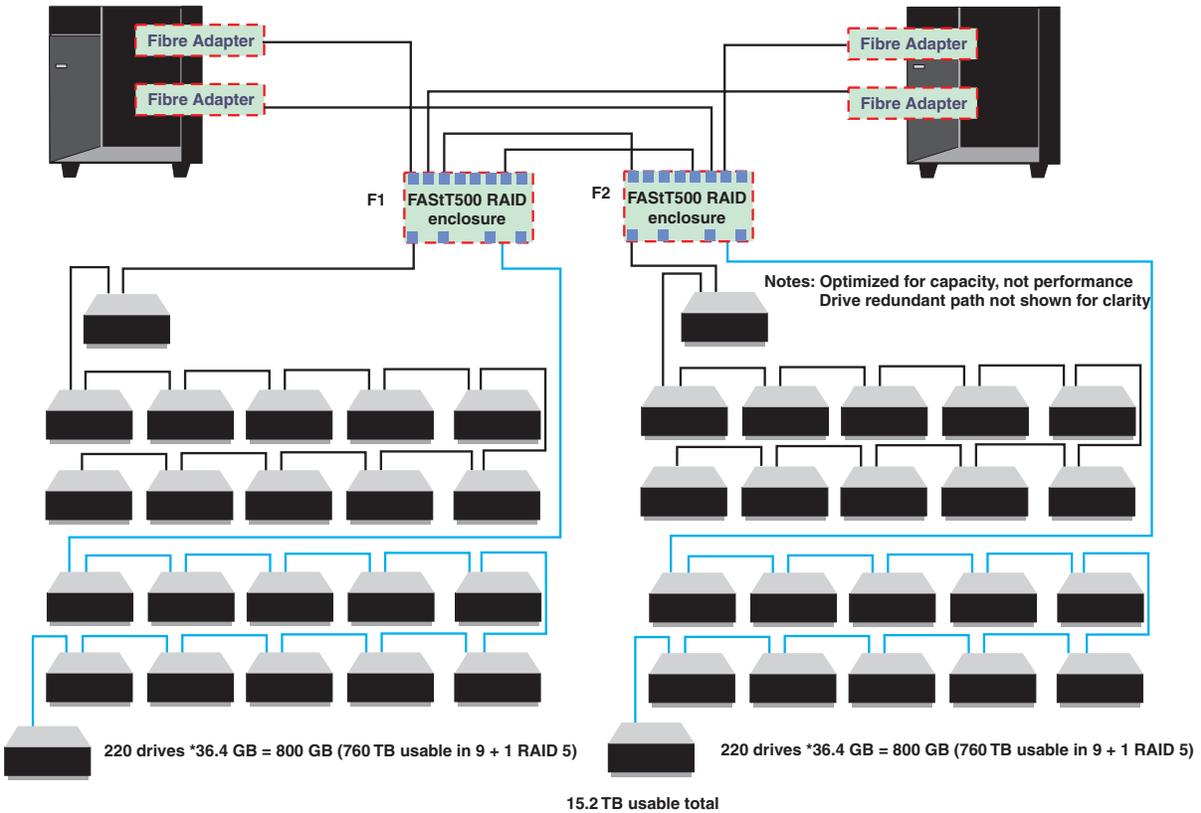
Figure 4. High-capacity storage configuration

Note: This configuration is optimized for capacity, not performance. For clarity, the drive redundant path is not shown.

Multiple clusters in a switched fabric environment

IBM SAN Fibre Channel switches enable high-performance, highly scalable SAN with multiple clusters to be created. The following illustration shows a SAN with four-port grouping (for redundancy) supporting a two-node cluster that enables the configuration to accommodate multiple clusters. This type of configuration helps reduce downtime and enables unencumbered access to storage through partitioning. Use of 16-port switches (versus the 8-port displayed in the figure) can increase port count and the number of servers or FAStT500 RAID storage.
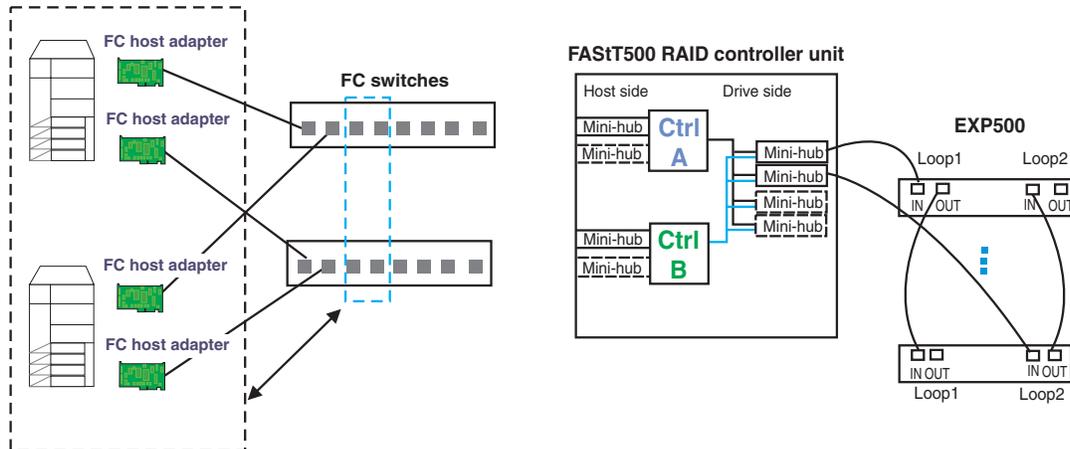
Figure 5. Multiple clusters in a switched fabric environment

Note: Each group of four ports on the switches (gray dash box) can support one cluster element (black dash box). Storage partitioning is used to separate clusters. Sixteen port switches enable more clusters, provided this fits within performance needs and available partitions.

Direct attach multiple cluster configuration

This configuration shows multiple clusters connecting to a single FAStT500 RAID Controller Enclosure Unit. It uses the pre-installed mini-hubs as a starter solution with the option of adding additional FAStT500 mini-hubs and Fibre Channel switches/managed hubs for added host and drive scalability.
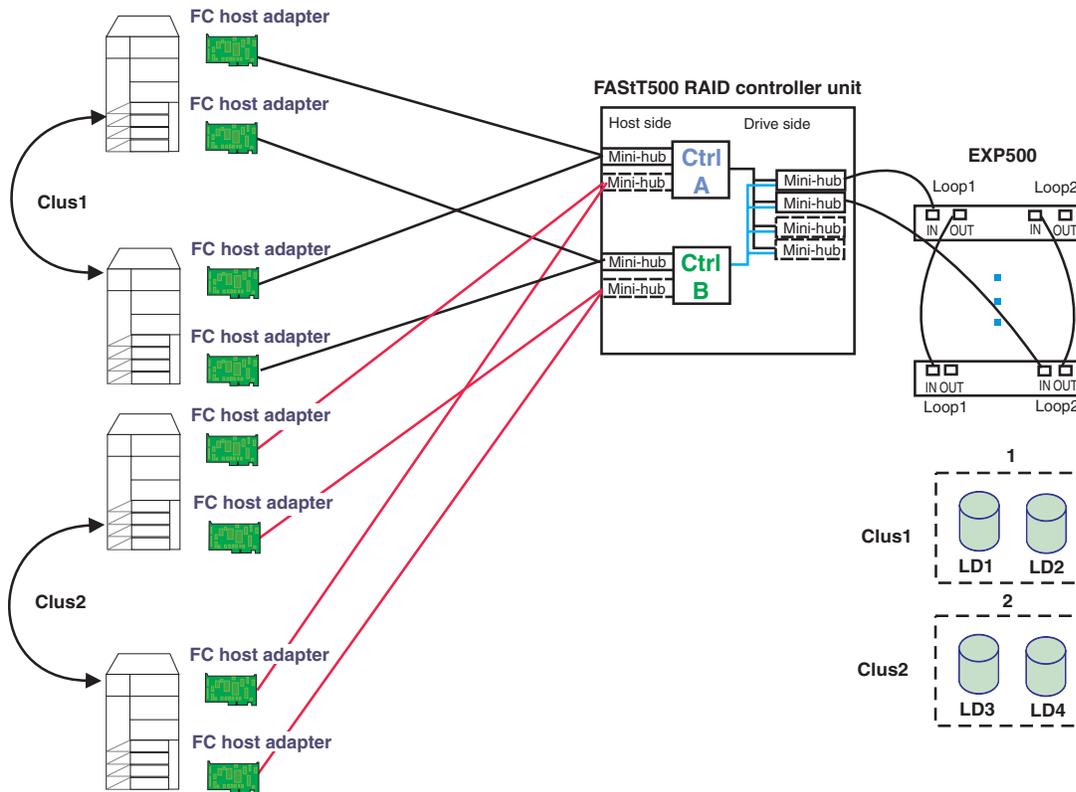
Figure 6. Direct attach multiple cluster configuration

Note: Two partitions are shown; the Clus1 partition is separate from the Clus2 partition. LD is a logical drive.

Hardware components overview

This section provides an overview of the hardware components that comprise the IBM SAN solution. New components are frequently added from the IBM portfolio or third-party vendors.

The following hardware components are discussed in this section:
- Server
- Fibre Channel host bus adapter
- Fibre Channel RAID controller unit
- Fibre Channel switch
- SAN Data Gateway
- Tape library
- Hard disk drive enclosure

Note: Please refer to the product documentation to resolve any product-specific questions.

Server

The following lists IBM Servers that can be used in a SAN:

- **IBM** @server **xSeries mission-critical servers**

  xSeries mission-critical servers contain features that help deliver superior performance and scalability. xSeries mission-critical servers deliver unmatched performance and reliability through IBM X-architecture technology.

- **IBM** @server **xSeries price/performance servers**

  These servers offer fast Intel® processors, excellent scalability, and industry-leading performance benchmarks. Integrated features and bundled software enhance the value and performance of these economical servers.

- **IBM** @server **xSeries value servers**

  xSeries value servers offer an affordable, off-the-shelf solution that provides a high-quality design, craftsmanship, and bundled software.

- **IBM** @server **xSeries rack-optimized servers**

  xSeries rack-optimized servers have ample room for expansion and options. For heavy-duty computing capability in minimal space, xSeries rack-optimized servers and options can help any organization that needs to maximize its computing space.

Fibre Channel host bus adapter

The IBM FAStT Host Adapter is an intelligent, high-performance, direct memory access (DMA) bus master host adapter designed for high-end systems. The intelligence and performance of this leading-edge PCI adapter are derived from an ISP2200A chip.

The ISP2200A chip combines a powerful RISC processor, a fibre protocol module (FPM) with gigabit transceivers, and a 64-bit peripheral component interconnect (PCI) local bus interface in a single-chip solution. The IBM FAStT Host Adapter is compatible with all Fibre Channel peripherals that support private loop direct attach (PLDA) and fabric loop attach (FLA).

Fibre Channel RAID controller enclosure unit

The IBM FAStT500 RAID controller enclosure unit provides dual, redundant controllers with Fibre Channel interfaces to both the host and drive channels. The controller unit has redundant cooling, redundant power, and battery backup of the controller cache.

Designed to provide maximum host and drive side redundancy, the controller enclosure unit supports direct attachment of up to four hosts containing two host adapters each. Using externally managed hubs and switches in conjunction with the RAID controller unit, you can build even larger configurations.

FAStT500 RAID Controller enclosure unit features include:
- Dual RAID controller units
- Support for up to 220 HDDs in a dual-loop
- Built-in fail-over protection; no single point of failure
- Two host and two drive mini-hubs included

- Hot-plug for easy configuration
- Four additional slots available to support RAID levels 0, 1, 3, 5, 10
- 256 MB battery-backed cache

Fibre Channel switch

When using FAStT Storage Manager, you must have isolated paths to each controller within the FAStT500 RAID Controller Enclosure Unit. This requires having no inter-switch links (ISL) between the two 2109-S08 or 2109-S16 switches. Prohibiting ISL is required because the Redundant Disk Array Controller (RDAC) that is used by the FAStT Storage Manager software is not a multi-path driver and can only failover between two paths.

The switch is a high-performance Fibre Channel gigabit switch with the following features:

- Simple

  It is easy to setup and configure. After Power-On Self-Test (POST), you only need to add the switch's Internet Protocol (IP) address. The remainder of the switch setup is automated.

- Intelligent

  The switch fabric operating system enables discovery of all connected devices and determines optimum data paths without intervention, supporting up to 32 interconnected switches.

- Flexible

  The switch contains multiple GBIC modules supporting fiber transmission media. It's modular design gives the switch a range of flexibility in creating, upgrading, maintaining, and configuring a fabric.

- Reliable

  Highly integrated, reliable, multifunction (ASIC) devices are used throughout the switch.

- High performance

  Low-latency, high-performance design enables a worst-case data-transfer latency of less than two microseconds from any port at peak Fibre Channel performance of 100 MB/sec. The latency may differ when the destination or device is a loop.

- Automated congestion management

  Virtual channels enable the switch to use sophisticated congestion management techniques automatically.

- Cascading

  Switches can be cascaded for large fabric support.

- Universal

  The switch ports are designed to support F, FL, and E-port modes of operation with the software selecting the optimum mode of operation.

SAN Data Gateway

The SAN Data Gateway is an essential component of the SAN infrastructure. The gateway integrates storage and networking interfaces through a number of different technologies such as Fibre Channel point-to-point, Fibre Channel arbitrated loop, and small computer system interface (SCSI).

The SAN Data Gateway connects an interface as either an initiator or a target. The gateway is a fully scalable product with Fibre Channel and SCSI interface options.

The gateway has up to four ultra SCSI channels and up to two SAN interfaces, each configured using plug-in adapters. These interfaces, used for host or device point-to-point and loop connections, create powerful SAN solutions.

The SAN Data Gateway data mover option enables server-free backup capabilities. SAN Data Gateways can move data directly between attached storage devices regardless of storage type. Data mover frees up system resources and substantially increases the speed of tape backup and restore operations.

Tape library

Many tape libraries can be used in a SAN configuration. Refer to the http://www.pc.ibm.com/ww/eserver/xseries/serverproven/index.html Web page for compatibility with your hardware.

Hard disk drive enclosure

IBM FAStT EXP500 features include:

- Full Fibre Channel support
- Support for up to 10 high-speed Fibre Channel connections
- Fully redundant base unit
- Hot-plug redundant power supplies and fans
- Support for converged carrier HDDs

IBM Hot-Swap HDD features include:

- 9.1 GB and 18.2 GB slim, 10k-3 rpm
- 36.4 GB half-high, 10k-3 rpm

Software programs overview

This section provides an overview of the programs that comprise the IBM SAN solutions. New components are frequently added from the IBM portfolio or from third-party vendors.

The following software components are discussed in this section:

- IBM FAStT Storage Manager software
- Fibre Channel switch utility program
- Fibre Channel SAN router utility program
- Storage management program

Note: Refer to the product documentation to resolve any product-specific questions.

IBM FAStT Storage Manager software

IBM FAStT Storage Manager 7.x is a Java-based tool that simplifies the management of the IBM Fibre Array Storage Technology (FAStT)500 RAID Controller Enclosure Unit. This software provides an interface for storage management based on information supplied by the storage subsystem controllers.

Storage Manager 7.x contains the following software components:

- **Client software**

The Storage Manager 7.x client (SM7 client) component provides the graphical user interface for managing storage subsystems through an Ethernet network or a host connection.

The SM7 client contains two main components:

– **Enterprise Management** for adding, removing, and monitoring storage subsystems within the management domain.

– **Subsystem Management** for managing the components of an individual storage subsystem.

• **Host-agent package**

The Storage Manager 7.x agent (SM7 agent) consists of two software components:

– **Host-agent software**

The host-agent software answers requests made to the host server over the network and routes those requests to the storage subsystem over the Fibre Channel link.

– **Storage Manager 7 devices utility**

The SM7devices utility enables you to associate storage subsystem logical drives with operating system device names.

• **RDAC package**

The Redundant Disk Array Controller (RDAC) package consists of two software components:

– **RDAC multipath device driver**

The RDAC multipath device driver provides failover support to the other controller if a component along the I/O path fails.

– **Hot-Add utility**

The Hot-Add utility enables you to register newly created logical drives with the operating system (this feature is only available in Windows NT® 4.0).

Fibre Channel switch utility program

The IBM StorWatch Specialist enables users to remotely monitor and manage a Storage Area Network (SAN) of switches using a Java-capable Web browser from a standard desktop workstation. You can dynamically interact with any switch in the SAN to monitor status and performance. By using the information provided, you can manage overall topology or make administrative changes to switches or the network.

The IBM StorWatch Specialist provides the following capabilities:

• **Central status monitoring**

From the Fabric View, display all switches in a fabric on a single screen and access detailed switch information or administer any switch in the SAN.

• **Rapid access to any switch**

From the Fabric View, click on a switch icon to access switch status, port status, throughput, performance, and operating conditions such as temperature or fan and power supply status.

• **Comprehensive asset management**

From the Name Server Tables, get detailed information on all SAN devices in the fabric.

• **Extensive administration and configuration capability**

Configure and administer individual ports or switches through a wide range of functions encompassing switch configuration, port management, and license key administration.

- **Distributed zoning control**

  Apply zoning functions to appropriately configured switches. Through Fabric OS, zoning configuration changes are automatically distributed to all switches in the fabric.

- **Telnet interface for access to specialized functions**

  Through the telnet interface, perform functions available only through telnet.

- **Central maintenance functions**

  Add new firmware from your desktop.

Fibre Channel SAN router utility program

The StorWatch SAN Data Gateway Specialist application remotely configures and monitors multiple SAN Data Gateway routers and SAN gateways. The manager uses a combination of industry-standard Simple Network Management Protocol (SNMP) requests and a technology known as SCSI over TCP, which encapsulates SCSI commands and data in TCP packets. The utility program has three components:

- **Agent**

  Each router is a stand-alone, SNMP-manageable host. The StorWatch SAN Data Gateway Specialist uses SNMP as the primary method of communication with the agents. This enables you to set and retrieve information that controls the operation of the agent. It also provides alerts (traps) when an event has occurred that requires intervention. The SCSI/TCP component enables you to update the routers and target devices and manipulate device operational parameters. The agent component is embedded in the operating software of the router.

- **Server**

  The Java application server component runs on a host computer system and maintains communication with the managed agents, acting as an intermediary between the agent running on the router and multiple clients. The server component provides security features by maintaining account names and passwords on behalf of the client application. By keeping track of different client configurations, a user can recall a saved configuration from any client. The server coordinates the requests from multiple clients to manage multiple routers. Communication between the server and the agents is carried out either by SNMP or SCSI/TCP. The Java Management Application Programming Interface (JMAPI) is used, where possible, to provide an industry standard and transportable interface. All communication between the clients and the server are implemented using the Java Remote Method Invocation (RMI), a form of remote procedure call (RPC).

- **Client**

  The Java application client component operates from any compatible computer with a TCP/IP connection established to the server component. One or more clients connect to a server in order to manage the routers. This TCP/IP connection enables dial-in configurations using Point-to-Point Protocol (PPP), intranet, or Internet access (where allowed by local network policy and firewall configurations).

  The client application provides the user interface and enables the viewing and manipulating of all router and device parameters. Each client can be configured

by the individual user to display only the routers of interest. This enables one client to monitor one set of routers and other managers to monitor other routers, without interfering with each other.

Storage management program

With the advanced device and media management capabilities of VERITAS BackupExec for Windows 2000, it is easy to configure tape devices and libraries to efficiently maximize the use of stored information. Accelerator technology ensures optimal performance in backing up and recovering business critical data.

BackupExec has led the industry in Storage Area Network technology by providing tape virtualization through the Shared Storage Option (SSO). SSO enables tape drives to be dynamically shared among backup servers. This improves backup and recovery performance by providing LAN-free movement of data while lowering overall tape hardware expenditures.

Chapter 2. Installation overview

This chapter lists the major considerations in the installation of a basic SAN configuration, the considerations for one sample installation and information for planning and installing devices in a rack. This information does not cover all possible installation scenarios.

Example SAN solution configuration

The solution used in this guide to illustrate the setup process is a direct attach multiple cluster configuration. It uses pre-installed mini-hubs as a starter solution with the option of adding additional FAStT500 mini-hubs and Fibre Channel switches or managed hubs for added host and drive scalability.
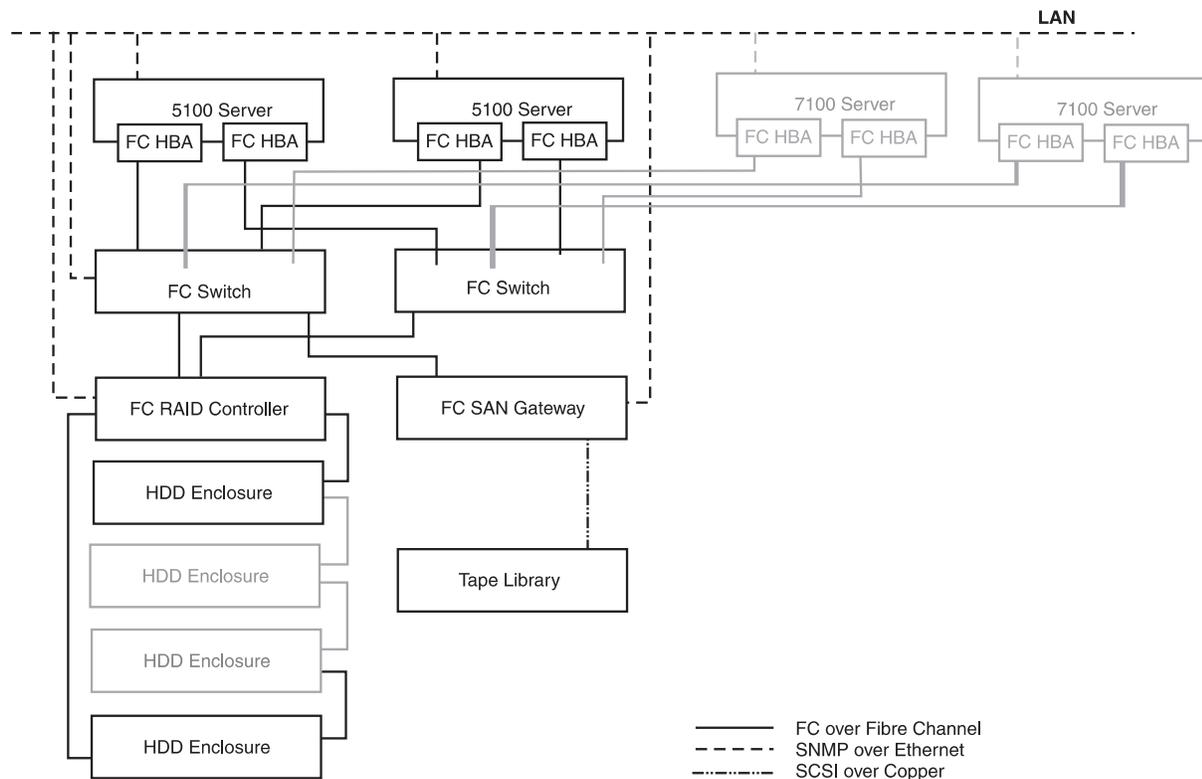
Figure 7. Example SAN configuration

Fibre Channel cable installation

To avoid damage to your fiber-optic cables, follow these guidelines:
- Do not route the cable along a folding cable management arm.
- When attaching cable to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius smaller than six inches when extended or become pinched when retracted.
- Route the cable away from places where it can snag other devices in the rack.
- Do not over-tighten the cable ties or bend the cables to a radius smaller than six inches.
- Do not put excess weight on the cable at the connection point.

- Make sure the cable is well supported.

Solution bill of materials

Table 1 is a list of the components used to build the sample direct attach multiple cluster configuration:

Table 1. SAN solution bill of materials

Description	Part Number	Required
IBM 5100 Server	86596RY	1
IBM 7100 Server	86661RY	1
IBM 3502-R14 Tape Library Rack	3502R14	1
IBM 3502 Tape Library DLT Drive Upgrade	33L4979	1
IBM FAStT RAID Controller	35521RU	1
IBM FAStT FC Host Bus Adapter	00N6881	4
IBM FAStT EXP500 FC Storage Unit	35601RU	2
IBM FC Hard Disk Drive 9.1 GB	36L6209	20
IBM 10/100 Ethernet PCI Adapter	34L0901	2
Fibre Channel Cable 5m	03k9306	10
IBM SAN Fibre Channel Switch	2109-S08	2
IBM SAN Data Gateway Router	2108-R3S	1
IBM Fibre Channel Short Wave GBIC	03K9308	17
IBM 42U Rack	9306-900	1
IBM Rack Keyboard Tray	28L4707	1
Console Cable Set	94G7447	2
Console Switch 8-port	94G7445	1
Keyboard with TrackPoint	28L3644	1
Rack Flat Panel Monitor Adapter	37L6857	1
Flat Panel Monitor	9513AG1	1
High Voltage PDU	94G7450	2
1 Meter FC cables	37L0083	4
Microsoft Windows 2000 Advanced Server		
IBM StorWatch SAN FC Switch Specialist		
IBM StorWatch SAN Data Gateway Specialist		
IBM FAStT Storage Manager		
VERITAS BackupExec & Shared Storage Option		

Planning and installing devices in a rack cabinet

It is beyond the scope of this guide to provide the steps of installing various hardware components in IBM rack cabinets. For specific installation guidelines, refer to the original documentation for each component. Following are some installation considerations:

- All rack-installable devices come with the necessary rack-mounting hardware and complete instructions. If your IBM server is a tower model and you want to install it as a rack model in a server rack cabinet, you must order the appropriate tower-to-rack kit. This kit contains the appropriate covers, brackets, and the cable-management arm that you need to install the server into the rack cabinet. Follow the instructions included in the tower-to-rack kit.
- Some installation procedures require two people.
- Before you begin to install your server in the rack cabinet, review the safety information that came with your server. These guidelines will help you work safely while working with your server and options.
- Review the documentation that came with your rack cabinet for additional safety, cabling, and operating considerations.
- To ensure rack cabinet stability, install the servers starting from the bottom of the rack cabinet.
- If you are installing different server models in the rack cabinet, install the heaviest models in the lower part of the rack cabinet.
- Ensure that you plan the rack cabinet installation within the guidelines for:
  - Heat generation
  - Electrical requirements
  - Air flow
  - Mechanical loading

Chapter 3. Installation sequence

This chapter documents the steps required to set up a basic SAN configuration that incorporates most of the hardware components and software programs in the IBM portfolio. Use the Web sites listed for detailed instructions for your specific hardware.

1. Install the server in a rack cabinet (http://www.ibm.com/pc/support).
2. Install the switch in a rack cabinet (http://www.ibm.com/storage).
3. Install the drive enclosure in a rack cabinet (http://www.ibm.com/pc/support).
4. Install the SAN Data Gateway in a rack cabinet (http://www.ibm.com/storage).
5. Attach the tape library in a rack cabinet (http://www.ibm.com/pc).
6. Attach SAN Data Gateway to the tape library (http://www.ibm.com/storage).
7. Install the host bus adapters (http://www.ibm.com/pc/support).
8. Cable the configuration.
9. Power on the drive enclosures.
10. Power on the switch.
11. Power on the RAID controller unit.
12. Power on the servers.
13. Attach a serial cable to the switch to set IP (http://www.ibm.com/storage).
14. Connect the switch to the Ethernet network for management. (http://www.ibm.com/storage).
15. Connect the SAN Data Gateway to the Ethernet hub.
16. Update the BIOS on the server (http://www.ibm.com/pc/support).
17. Update the service processor firmware (http://www.ibm.com/pc/support).
18. Update the diagnostic code (http://www.ibm.com/pc/support).
19. Update the host bus adapter firmware (http://www.ibm.com/pc/support).
20. Update ServeRaid BIOS (http://www.ibm.com/pc/support).
21. Create arrays on the local system.
22. Install Windows 2000.
23. Install the service processor driver (http://www.ibm.com/pc/support).
24. Install the video driver (http://www.ibm.com/pc/support).
25. Install the Java Runtime Environment (http://java.sun.com).
26. Update firmware on the switch through Ethernet (http://www.ibm.com/storage).
27. Configure zones on the switch (http://www.ibm.com/storage).
28. Install the SM7 client (http://www.ibm.com/pc/support).
29. Create a second partition on the boot drive.
30. Install the SM7 RDAC (do not reboot) (http://www.ibm.com/pc/support).

    Note: If the boot device is inaccessible, call the IBM HelpCenter®.
31. Install the SM7 agent (do not reboot) (http://www.ibm.com/pc/support).
32. Install the Qlogic device driver (http://www.ibm.com/pc/support).
33. Reboot - Disable the SAN Data Gateway.
34. Apply scripts for:
    - Windows 2000
    - clustering

- Lun0off
- nomigrate
- DRmigrate

35. Install Symplicity Storage Manager Field Tool (SymFT)
    (http://www.ibm.com/pc/support).

36. Update the drive firmware (http://www.ibm.com/pc/support).

37. Open the SM7 client and create arrays (http://www.ibm.com/pc/support).

38. Setup storage partitioning (http://www.ibm.com/pc/support).

39. Configure drives under Windows NT.

40. Install clustering.

41. Connect the SAN Data Gateway through the serial port.

42. Update firmware on the SAN Data Gateway (http://www.ibm.com/storage).

43. Set the IP address on the SAN Data Gateway (http://www.ibm.com/storage).

44. Install SAN explorer.

45. Install StorWatch.

46. Install the tape backup software.

47. Proceed with normal use.

Chapter 4. Operation, maintenance, and scalability

This chapter describes the operation, maintenance, and scalability considerations of a basic SAN configuration.

Powering Sequence

The configuration power down sequence is the reverse of the power up sequence.

Table 2. Power up, power down sequence

Power up sequence	Power down sequence	Device
0	5	Drive enclosures
1	4	FC switches
2	3	Tape libraries
3	2	SAN gateways
4	1	FC RAID controller enclosures
5	0	Servers

Scaling capacity and change management

This section describes installing additional servers, Fibre Channel host bus adapters, hard disk drive (HDD) enclosures, and Fibre Channel switches.

Installing additional servers

Additional servers can be added to a new configuration or to an existing pool of servers. Whether the server is new or existing, you should plan the server location in the rack according the rack safety installation procedures.

If the server is new, use the installation and user manuals that came with the server.

If the server is existing, use the following procedure:
1. Attach the server to the management network.
2. Update the BIOS code.
3. Update the service processor code.
4. Update the diagnostic code.
5. Perform a low-level format of the hard disk.
6. Install Windows 2000 Advanced Server OS (setting IP addressing).
7. Install the service processor device driver.
8. Install the video device driver.
9. Install the Fibre Channel host bus adapters and drivers.
10. Update Fibre Channel adapters firmware.
11. Install and configure the FAStT Storage Manager.
12. Set up (or redesign settings for) storage partitioning.
13. Install and configure SAN Explorer software.
14. Install and configure Fibre Channel switch and managed hub utility program.

15. Install and configure the storage management program.
16. Proceed with normal use of the device.

Installing additional Fibre Channel host bus adapters

If the HBA device driver has already been installed once, and you are adding an additional HBA onto the system, when the system starts, it will detect the device and display the `Found New Hardware with QLogic QLA2200 PCI Fibre Channel Adapter` message. Use the following procedures to complete the driver installation:

1. When the Digital Signature Not Found screen is displayed, select **Yes**.
2. When the Insert Disk message appears, browse to your downloaded QLogic driver file and click **OK**.
3. Click **Finish** on the Found New Hardware Wizard/Completing the Found New Hardware Wizard screen. You will be prompted by the message:

   ```
   Your hardware settings have changed. You must restart.
   Do you want to restart your computer now?
   ```

   Click **Yes** to restart the computer.

The latest versions of the device drivers and documentation are available on the http://www.ibm.com/pc/support IBM Web site.

Installing additional drive enclosures

Additional drive enclosures can be added to a configuration using the following procedure:

1. Install the drive enclosures in a rack cabinet.
2. If there is more than one enclosure, use cable redundancy in the drive configuration.
3. Add additional drive enclosures. *Do not* power them up. *Do not* add drives at this time.
4. Make sure Tray IDs are unique for each drive enclosure.
5. Power on the drive enclosures with *no* drives installed.
6. Run the DisableDriveMigration.scr script under SM7. (If you run scripts, you *must* reset the controllers. See step 7.)
7. Reset each controller by pressing the white button next to the LEDs on the front panel of the RAID controllers or follow the Fibre Channel solution shutdown and startup procedures on page 23.

   Note: Resetting the controllers does *not* reset the configuration. If you reset the configuration, all data will be lost. Resetting the controllers means that you are restarting the controllers for the scripts to take effect.

8. Open the SM7 console to see the additional enclosures and to monitor drive additions.
9. Add drives two at a time. Make sure they are seen in the SM7 console. They should be listed as unconfigured capacity.
10. Continue to add drives two at a time until all drives are inserted and verified.
11. Run the EnableDriveMigration.scr script.
12. Reset each controller again by pressing the white button next to the LEDs on the front panel of the RAID controllers.
13. Use the SM7 configuration console to create additional arrays and to configure any additional storage partitioning.

14. Use Windows 2000 Disk Management to configure and manage drives.

Important:

It is important to run the DisableDriveMigration.scr script whenever adding additional enclosures and drives. Not all factory device drives come without data or previous configurations. Running this script prevents SM7 from importing a configuration that was previously on the drive, thus preventing loss of array configurations.

It is also important to run the EnableDriveMigration.scr script when the task of adding the drive enclosures or drives is completed. There is the risk of losing the configuration and all data if the EnableDriveMigration.scr script is not run, *and* if an improper SAN shutdown or startup order is performed. Always run the EnableDriveMigration.scr script after the addition of drives and enclosures.

Fibre Channel solution shutdown and startup procedures

The proper shutdown order is as follows:
  a. Servers
  b. RAID controller enclosures
  c. Drive enclosures

The proper startup order is as follows:
  a. Drive enclosures
  b. RAID controller enclosures (wait several minutes for the drives to spin up depending on the amount of drives present)
  c. Servers

Installing additional Fibre Channel switches

Additional Fibre Channel switches can be added to a new configuration or to an existing pool of switches.

If the switch is new, use the installation and user manuals that came with the Fibre Channel switch.

If the switch is existing, use the following procedure:
1. Install the switch in a rack cabinet.
2. Update the switch firmware.
3. Configure IP addressing.
4. Attach the switch to the management network.
5. If necessary for configuration, set up zoning.
6. Attach hosts and devices.
7. Proceed with normal use.

Appendix. Notices

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