

# **IBM Enterprise Storage Server**

**for**

## **Windows NT**

**Version 1.1**

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IBM Storage Systems Division

Author: Konstantinos Piperis  
Open Systems Technical Marketing  
IBM Storage Systems Division

## **Notices**

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Please send comments via e-mail to Konstantinos Piperis : [kostas@us.ibm.com](mailto:kostas@us.ibm.com)

## Introduction

### ESS overview

As e-business proliferates, managing the sheer volume of data needed to run daily operations is only part of the challenge. You'll also need next-generation storage technologies and systems that enable the sharing of data across multiple platforms and environments—more quickly and with less disruption than ever before.

The **Enterprise Storage Server** (ESS) a second-generation Seascape\* disk storage system, is designed to address these specific needs. It was designed from the ground up to support a new approach to disk storage in networked computing environments—one that is widely accessible, extraordinarily responsive, and centrally managed. With concurrent support for virtually all platforms, advanced performance features, extremely scaleable capacity, the IBM Enterprise Storage Server is one of the most powerful and versatile disk storage solutions available. While architected for today's most demanding applications, the IBM Enterprise Storage Server also is designed to easily integrate into your Storage Area Network (SAN) implementations.

Meeting the voracious demands for data in today's interconnected world of business and commerce requires more—much more—than the capability to just store terabytes of data. It requires that data to be universally and immediately available—regardless of the size of your network, the diversity of your platforms, or the operating systems and connection types you employ. In short, it requires a whole new approach to storage.

With the IBM Enterprise Storage Server, you can now protect and manage distributed data with the same level of performance previously available in the mainframe environment. Data from various servers can be stored into a single disk server. This can reduce data redundancy and increase administrative productivity through centralized management—for a more comprehensive enterprise solution.

## **ESS and the value of using NT**

The Enterprise Storage Server can attach to S/390, AS/400, UNIX systems and Intel PC based servers running Windows NT and Novell Netware. With respect to Windows NT, the ESS can provide:

- Lower costs through consolidation & reuse of resources
- Broader information access across the enterprise
- Management and security
- Sharing of information across multiple platforms
- Flexible & functionally rich technology that is easily managed
- Capability to grow with the industry

Windows NT systems can be connected to an ESS using a SCSI adapter. The two (2) SCSI interfaces that are supported on the ESS are:

- SCSI-Fast-Wide (20 MB/sec)
- Ultra-SCSI-Wide (40 MB/sec)

The SCSI protocols (command set) that are supported on ESS can be either SCSI-2 or SCSI-3.

The ESS provides continuous availability and round-the-clock data access to Windows NT servers by providing:

- No single point of failure or repair via redundant power supplies, cooling fans, interface adapters, internal buses, and processor complexes
- Comprehensive "call home" maintenance
- Integrated RAID-5 with floating Hot Spares
- SSA architecture for disk attachment, supplying high availability with multi-initiator loops and multi-path disk access.
- Hot pluggable/hot swappable components
- Support for high availability (Microsoft Cluster Server)
- Greater flexibility for e-commerce applications via the use of a single database for multiple servers
- Multipath failover and load balancing via the IBM Data Path Optimizer software

Using the Enterprise Storage Server StorWatch Specialist, administration is centralized for the ESS and all storage that is allocated for Windows NT systems. The ESS Specialist, which comes standard on the ESS, is a very valued feature to NT users because it allows them to:

- Remotely manage storage configurations and capacities easily using the familiar Netscape Communicator or Internet Explorer web browsers
- Setup, configure & monitor all storage
- Reallocate freed disk storage to different servers, without system interruption
- Perform remote problem analysis and diagnosis with automated SNMP alerts, pager and e-mail capabilities
- Provide secure access to ESS managed information

## How ESS differs from other solutions

Unlike other storage systems, ESS provides truly intelligent storage for the enterprise. With dual four way symmetric multiprocessors (SMPs) along with the developed and proven high performance, Serial Storage Architecture (SSA), disk attachment technology, ESS is by far the industry's most advanced storage system. As a result, the ESS provides superior performance. Most important, though, is its ability to work with heterogeneous hosts- S/390, UNIX platforms, Intel-based systems running NT and Novell, and with a variety of interfaces, including ESCON, Fibre Channel and SCSI.

The ESS internal bus bandwidth is 800MB/sec, in combination with ESS's high performance caching algorithms, allows Windows NT servers to reach their optimum performance. In addition, ESS can support more than 11TB of customer storage, allowing Windows NT users to consolidate all their storage in a single subsystem, thus reducing their total storage costs. The variable size logical volumes supported on ESS (i.e. 0.5GB - 215GB) provide significant flexibility for NT users to easily migrate their data from other storage subsystems. Also, the RAID-5 implementation provides the necessary redundancy to protect the NT users' data from any single failure.

The high performance RAID-5 reduces the need for mirroring and, thus the need for additional disk. In addition, consolidation of storage systems and managing the storage centrally lowers costs significantly. The comprehensive storage consolidation allows for the ESS to be scaleable to over 11TB usable RAID storage. Windows NT customers can choose 9.1GB, 18.2GB (10K RPM drives) or the 36.4GB drive (7200 RPM).

The Seascope Architecture building block approach ensures future compatibility, easy and inexpensive upgrades through replacement of components rather than the replacement of the total subsystem. Customers that have 7133 Serial Disk Systems can easily move their storage to ESS and protect their investments as they grow.

## HUBS

The IBM Fibre-Channel Storage Hub can be used with the ESS to implement high-availability or for extended distance configurations. Some highlights of the IBM Fibre Channel Storage Hub are:

- Interconnects multiple servers and storage systems over fiber media
- Supports data transfer speeds of up to 100 MB per second
- Enables extended distance configurations of up to 10 kilometers between servers and/or storage systems
- Provides seven hot-pluggable gigabit FC-AL ports with automatic bypass of unused ports
- Supports scaleable FC-AL loop expansion with cascading hubs

Server and storage system connections with distances of up to 10 kilometers can be achieved with the IBM Fibre Channel Storage Hub. With four standard, short-wave gigabit interface converter (GBIC) ports, the IBM Fibre Channel Storage Hub provides flexible attachments—of up to 500 meters over fiber optic cables—to host system adapters or to another IBM Fibre Channel Storage Hub short wave GBIC port. Three optional ports can be configured as short-wave or long-wave.

The standard IBM Fibre Channel Storage Hub configuration is a rack-mounted tray that requires 1U(1) of rack space. Two IBM Fibre Channel Storage Hubs can be housed side-by-side in an industry-standard 19" rack or in an IBM Seascope\* rack. An optional stand-alone table-top configuration is also available.

The IBM Fibre Channel Storage Hub is designed for implementing multi-node server clusters and storage systems for high-availability and disaster recovery solutions. In the event of a failure or natural disaster, work can be transferred--with the appropriate software--to a failover location immediately, without interruption of operations or loss of data.

### **IBM SAN Fibre Channel Switch**

The IBM SAN Fibre Channel Switch provides Fibre Channel connectivity to Intel\*\*-based servers running Windows NT\*\* and to UNIX\*\*-based servers. Enables connectivity to Fibre Channel-attached disk and tape storage and to an IBM SAN Data Gateway for Ultra SCSI-attached IBM disk and tape storage.

- Provides enterprise-level scalability and a fault-tolerant switch fabric containing hundreds of Fibre Channel ports
- Offers eight-port and sixteen-port Fibre Channel Switch models
- Uses IBM StorWatch\* SAN Fibre Channel Switch Specialist to manage multiple switches across the IBM Enterprise SAN
- IBM SAN Fibre Channel Switches provide any-to-any SAN connectivity.

The IBM SAN Fibre Channel Switch also supports the interconnection of multiple IBM SAN Fibre Channel Switches. The interconnection of IBM and IBM-compatible switches and hubs creates a switch fabric containing hundreds of Fibre Channel ports. IBM SAN Fibre Channel Switch fabrics provide the high performance, scalability, and fault tolerance required by the most demanding e-business applications and enterprise storage management applications--such as LAN-free backup, server-less backup, disk and tape pooling, and data sharing.

#### **High-performance, scalable switch fabric**

Each port delivers up to 100 MB/sec, full-duplex data transfer. Unlike hub-based Fibre Channel Arbitrated Loop (FC-AL) solutions—which reduce performance as devices are added—the switch fabric performance increases as additional switches are interconnected.

#### **Intelligent self-management**

The fabric intelligently manages the SAN and solves problems. For example, it automatically identifies and registers hosts and storage devices. In addition, the fabric isolates problem ports and reroutes traffic onto alternate paths. Security and integrity are provided by hardware-enforced zoning that controls data access among ports. Automatic traffic rerouting occurs as traffic and network conditions change.

#### **NT capacity**

IBM's Seascope architecture allows customers to easily add the latest technology to their ESS. Windows NT systems, an integral operating system in the market place, can take advantage of this technology. The ESS, if configured with sixteen (16) SCSI adapters provides a total of 32 SCSI ports. Each SCSI port supports SCSI-3 standard, providing 16 target IDs with 64 LUNs per target. Thus, giving  $15 \times 64 = 960$  Logical Devices on one SCSI port (15 are used here because, one of the 16 IDs must be used by the initiator).

The ESS supports up to 256 LUN's per LSS so even though you can have 960 Logical Devices on each SCSI port  $960 * 32$  SCSI ports = 22080 LUN's. .

Using industry standard SCSI host based adapters within Intel based servers, NT can attach and take advantage of the ESS. The ESS can scale from 420GB to over 11TB, making a solid shareable storage solution for Windows NT environments.

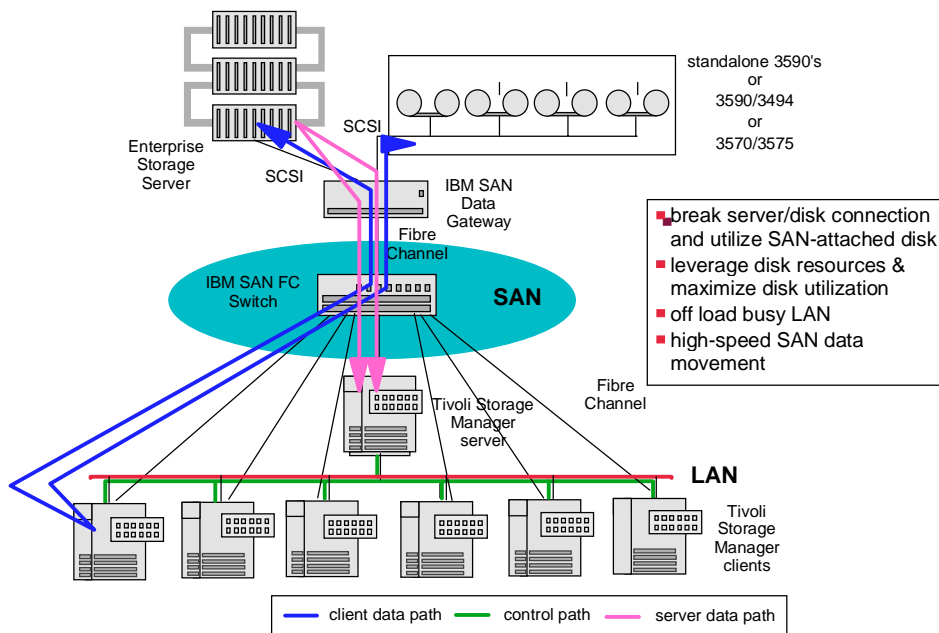
### Windows NT Clustering Support

Customers who are using Windows NT systems and want to take advantage of the ESS as a centralized storage system can use Microsoft Cluster Server (MSCS) to provide high availability, easier manageability of independent servers.

### SAN Data Gateway & ESS

With its multi-platform support and fibre channel attachment, the IBM Enterprise Storage Server is "SAN-ready". As SANs become more prevalent, the Enterprise Storage Server can act as an essential SAN building block, supporting true storage consolidation and management—virtually future-proofing your network and providing added investment protection.

The IBM SAN Data Gateway provides industry-standard Fibre Channel attachment to Intel based servers running Windows NT. In addition, the gateway simplifies migration to Fibre Channel technology for IBM SCSI-attached disk and tape system. The SAN Data gateway extends distances between the server and SCSI attached storage systems up to 500 meters, and up to 11 kilometers using the IBM Fibre Channel Storage Hubs.

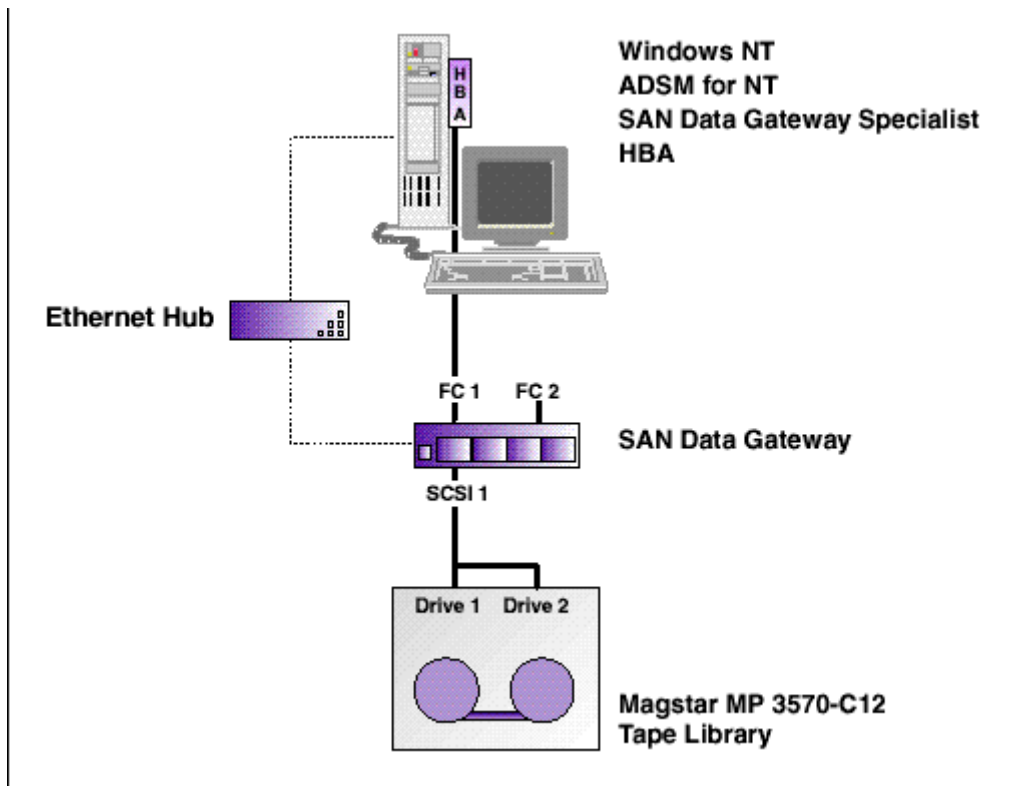


The IBM SAN Data Gateway provides:

- Industry standard Fibre Channel attachment to wide range of servers including Intel-based servers running Window NT and UNIX-based servers from Sun Microsystems and IBM.
- Simplified migration and acceleration of Fibre Channel SAN implementation - IBM SAN Data Gateway provides connectivity between existing SCSI-attached disk and tape storage systems and newer FC-attached storage via a Fibre Channel SAN.
- Extended distance between servers and SCSI-attached storage are supported - up to 500 meters with Data Gateway and short wave, multimode fiber optic cable and up to 11,000 meters with IBM Fibre Channel Storage Hubs with long wave, single mode fiber cable. (10 K between the Hubs and 500 M between the Hubs and server and the Data Gateway).

IBM SAN Data Gateway is designed to provide performance transparency for most workloads.

- IBM StorWatch SAN Data Gateway Specialist management software simplifies the management of SAN Data Gateways across the enterprise with network attachment to remote Windows NT workstations.
- IBM SAN Data Gateway provides investment protection for SCSI-attached disk and tape storage devices and systems when attaching to fibre channel servers.



SAN elements added to a configuration like extended distance and less host elements that can fail. This configuration gives you two access host. This means that in case of a failure in a Fibre Channel host adapter or in one of the SAN Data Gateways, you can still reach the tape devices from your production host. This is possible, thanks to the two SCSI ports provided by the 3590 tape drive, thus allowing each drive to be connected to two SAN Data Gateways.

**IBM (2108-G07) SAN Data Gateway Packaging consists of:**

- 4 Ultra SCSI Differential ports (with customer supplied SCSI cables)
- One, two or three FC-AL ports (short wave, optical interface with either 50 or 62.5 micron) and IBM fiber optic cables of 5, 13, 25 or 61 meters. (Customer supplied short wave cables support up to 500 meters.)
- 2U (3.5 inch) high rack space. (1U is 1.75” and a standard rack provides 32U, or 56” of height.)
- Universal power (100 to 127 V and 200 to 240 V single phase) support
- Rack mounted or desktop package (Desktop requires country specific power cord option)
- StorWatch SAN Data Gateway Specialist management software.

**Virtual Private (VP) SAN - LUN masking:**

Until now, Enterprise Storage Server (ESS) LUN-masking has not been available. LUN-masking is a feature which controls access by multiple hosts to shared access disk devices (ESS LUNs). LUN-masking will broaden ESS Windows NT server opportunities.

The IBM SAN Data Gateway, which provides Fibre Channel (FC) connectivity for ESS now provides LUN-masking. The new Virtual Private SAN (VP SAN) function, available on March 10th, 2000 enables ESS to participate in the rapidly growing Windows NT SAN disk pooling solution opportunity.

**Windows NT Disk Pooling**

With high availability Windows NT configurations, each server has dual host adapters and dual paths its storage servers and devices. With Microsoft Clustered Server (MSCS) software, multiple servers can share access to the same storage devices. These shared access, disk pooling configurations create the possibility of one server gaining access to another server's disk devices and data. VP SAN provides the control and management needed in this shared disk access environment.

When IBM SAN Fibre Channel Switches (FC Switches) are used to create a switched fabric, multiple host adapters can gain access to the same FC port on a FC-attached storage system. Connecting multiple NT servers to a single FC storage port with a switched fabric is a common requirement. The FC Switch provides zoning to limit access between attached host ports and storage ports. This manages and controls unplanned for shared disk access with partitioned disk sharing applications.

The IBM SAN Data Gateway provides ESS disk and Magstar tape with FC connectivity to FC hosts and to FC Switches. The Gateway provides up to three FC ports and four SCSI ports. The Gateway enables access between all FC ports and all SCSI ports and with Channel Zoning, you can control access between the FC ports and the SCSI ports.

The new VP SAN function provides "LUN masking" to control and limit access by FC host adapters to ESS LUNs. The IBM StorWatch SAN Data Gateway Specialist provides easy to use dialog boxes to control and manage both Channel Zoning and LUN-masking with the VP SAN feature.

### **SAN Data Gateway VP SAN RPQ**

VP SAN is available as a RPQ for the IBM 2108 Model G07 SAN Data Gateway. It collects all the attached host and storage target information and manages end-to-end access control in the SAN which consists of the Gateway and the attached ESS. It allows a system administrator to control access privileges between individual FC HBAs and target devices (LUNs) connected to the Gateway. The system administrator uses the IBM StorWatch SAN Data Gateway Specialist to administrate the VP SAN feature.

### **VP SAN Functions**

- Multiple host users can share the same connectivity channels to access the same or different storage resources.
- Completely host-independent and requires no special host software components. There is an optional automatic host registration service that provides periodic host status information.
- No interface dependencies: It supports FC, SCSI, or any other SAN interface.
- Keeps track of FC HBAs by using their unique world-wide name (WWN).
- Manages access for hosts connected through the FC Switches and FC Hubs to the Gateway.
- Creates and maintains a database in non-volatile memory to hold persistent information about each HBA or initiator and its LUN access privileges.
- It saves all configuration settings. This information can be loaded onto another Gateway in the event that a Gateway needs to be replaced.
- When enabled for the first time, VP SAN takes a snapshot of the existing SAN configuration. It automatically assigns access between HBAs and the storage elements.
- The system administrator can set access privileges to the desired storage element for each host connection using StorWatch SAN Data Gateway Specialist.

### **StorWatch SAN Data Gateway Specialist**

The SAN Data Gateway includes a CD-ROM that provides the StorWatch SAN Data Gateway Specialist, which is a set of management tools for the Gateway. This software is installed on the host or host servers attaching to the SAN Data Gateway and provides an easy to use graphical interface to configure, manage and service the Data Gateway. The tools enable status monitoring, and dynamic changes to the Gateway setup.

The management tools on the CD-ROM optionally provide networked-based configuration and management of one or more Gateways from a single Windows NT workstation. The functions are the same as the attached host software, providing the added convenience of centralized management.

The network-based software requires an Ethernet network connection, and the assignment of an IP address to each SAN Data Gateway. The Ethernet connection is a RJ45 connector, and supports 10BaseT standards.

There is also a simple command line service port interface for initial configuration and enablement of the SAN Data Gateway.

There is also the StorWatch SAN Data Gateway Specialist interface for ongoing remote management of the Data Gateway. StorWatch SAN Data Gateway Specialist management functions include:

- Asset Management
  - Descriptions and product data for gateways, channels, and devices
  - View of current SAN Data Gateway status on front panel
- Capacity Management
  - Determine capacity of attached devices
- Configuration Management
  - Current topology; set Gateway, channel and device parameters
  - Upgrade microcode of Data Gateways from central point
  - Access control of Data Gateway internal paths between Fibre Channel ports and SCSI ports. This enables user control for heterogeneous server attachment and concurrent disk and tape attachment.
- Device and Event Monitoring
  - Health checks, set SNMP alert thresholds, event log
  - Error analysis to isolate Fibre Channel and SCSI problems
- Discovery of Gateways on the network

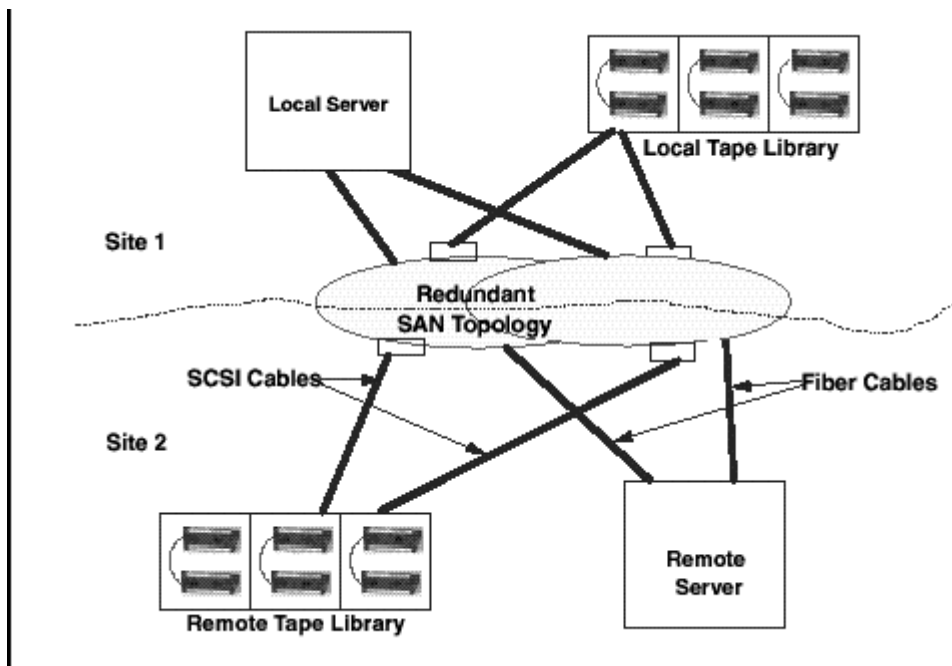
Today many vendors are rushing to the market with new Fibre Channel products and putting them together into networks they call Storage Area Networks (SANs). IBM with its SAN strategy which includes, but not limited to the ESS, offers SAN solutions for such a demand. The promise to resolve many of the industry's major issues (speed, connectivity, availability, reliability, and manageability) is creating quite an energetic market place. Using a SAN can potentially offer the following benefits:

- Improvements in application availability: Storage that is independent of application and accessible through alternate data paths.
  - Higher application performance: Delegate storage processing to storage subsystem off-loading server.
  - Centralized and consolidated storage: Simpler management, scalability, flexibility, availability.
  - Data transfer and vaulting to remote sites: Enables remote copy of data for disaster protection.
  - Simplified centralized management: Single image of storage media simplifies management.

IBM has launched a SAN Initiative, thereby leaping onto the band wagon. Today several products like the ESS are available from IBM to begin the process of creating and exploiting this new technology. Thus, today, the major issue facing SAN technology is the inter operability between the pieces of the SAN. SANs create new methods of attaching storage to processors. These new methods promise great improvements in both availability and performance. Currently they are most commonly used to connect

shared storage arrays to multiple processors, and are used by clustered servers for failover. They can create the opportunity for various servers to share tape drives and tape libraries. A SAN can be used to bypass traditional network bottlenecks. It supports direct, high speed data transfers between servers and storage devices in the following three ways:

- Server to storage: This is the traditional model of interaction with storage devices. The advantage is that the same storage device may be accessed serially or concurrently by multiple servers.
- Server to server: A SAN may be used for high-speed, high-volume communications between servers.
- Storage to storage: An example is a disk device backing up its data to a tape without processor intervention. It could also be remote device mirroring across the SAN.



*Fully redundant tape subsystem configuration*

## **Build for the future**

Given the ever-accelerating pace of change in today's business environment, it is imperative that your information technology systems not only can keep pace—reliably and affordably—but also adapt almost instantly to market changes. It's a tall order. As the data storage technology leader, IBM has invented—and continues to invent—much of today's most advanced technology in hard disk drives, storage systems, media, tape and optical drives, and storage management software. As a result, the IBM Enterprise Storage Server is a key part of an ever-evolving family of Seascope storage solutions specifically designed to meet your storage needs today—and well into the future.

## **IBM Is Serious About Windows NT**

Developing exceptional storage products for the Windows NT environment is a top priority at IBM. In fact, IBM tape, disk, and storage management solutions for Windows NT lead the industry with performance, superior data access and availability, unsurpassed scalability, and robust management that boost performance and reduce your total cost of ownership. Plus, IBM takes the extra step of sending its developers to work at the Microsoft campus to ensure that they fully understand Windows NT and Microsoft's strategy for the future. When it comes to storage in the Windows NT environment, the IBM global team has continuously delivered unique technological innovation and a comprehensive range of integrated solutions.

Now more than ever, data is crucial to your company's success. Yet the demand for intelligent data pushes hard against the capabilities of most IT professionals and the infrastructures that they manage. Given the demands of e-business, you should brace yourself for a tidal wave of data when you open your doors for business on the Internet. Regardless of where your company does business, it will need to capture, access, and store all of that dynamic data to retain a competitive edge.

The IBM Enterprise Storage Server is an ideal solution for large data intensive applications providing storage capacities from 420 gigabytes to over 11 terabytes. Concurrent attachment multiple NT servers and a variety of UNIX, AS/400, and S/390 servers is becoming an ultimate need for the enterprise. Advanced copy functions eliminate lost productivity due to backup and batch processing and with its web interface, ESS delivers remote management and administration from anywhere in the world.