



# **IBM Storage Area Network and Fibre Array Storage Technology**

*Central management, access and storage for business-critical information*

## **Executive Summary**

A storage area network (SAN) is a separate network that enables disk and tape storage to be isolated from the local area network (LAN). A SAN allows for improved security, reliability and management of a company's critical data. The benefits of a SAN can be achieved without having an impact on the company's primary communication network. A SAN using IBM Fibre Array Storage Technology (FAST) is a dedicated Fibre Channel (FC) infrastructure of servers and their adapters, external storage devices, hubs, switches and network and storage management tools.

IBM has developed a core set of products to help address the growing SAN market. This IBM initiative is designed to help customers manage, track and more easily share the ever-increasing volume of data being created by e-business applications. The IBM SAN initiative will also help customers manage their technology resources—application servers, storage servers, network hardware and storage management software—virtually anywhere, anytime and share information across storage networks regardless of the vendor that supplies the systems and applications. SAN technology can lead to lower total cost of ownership by allowing storage resources to be consolidated and shared by several servers.

Several factors are making the ability to manage resources and share information crucial. Among them are the growth of data-intensive applications such as data warehousing, data mining and enterprise resource planning. Add to this the increasing presence of the Internet, e-business applications and the need for companies to be open for business 24 hours a day, 7 days a week in multiple time zones—and around-the-clock access to business data becomes almost essential. In this environment, data storage is rapidly becoming a central component of corporate technology strategies.

A SAN addresses many of the critical business issues, including data backup and recovery procedures that can slow operations and affect end users across the enterprise network and, ultimately, potentially affect a company's profitability. The SAN allows data-intensive storage processing without disrupting network operations. IBM FAST SAN solutions include the hardware components to build the SAN best suited to your needs and the software tools to help you fully exploit a SAN in your business. Further, through IBM Global Services, IBM offers the resources to analyze your current storage solution and to install and maintain your SAN.

This paper gives an overview of the IBM @server xSeries SAN strategy. Because of the dynamic nature of the computer industry, changes may occur in the actual implementation and timing of product announcements.

## **Introduction**

The IBM SAN initiative has been developed to help businesses manage, track and more easily share the complex and ever-increasing volume of data being created by the Internet and e-business applications. In addition, the IBM SAN initiative will help companies manage their technology resources—application servers, storage servers, network hardware and storage management software—and share information across storage networks regardless of vendor computing systems and software applications. By using SAN technology, businesses can reduce the cost of computing by consolidating and sharing storage resources.

The phenomenal growth in storage requirements is being driven, in large part, by the data explosion fueled by e-business, the commercialization of the Internet, the emergence of data-intensive technologies such as multimedia and data warehousing, and the focus on server and storage consolidation. These customer requirements are driving technologies such as FC-attached storage subsystems, SANs, 4- to 8-way Intel® Xeon processor-based systems, server clustering and faster, higher-capacity disk drives. Each of these advancements separately would drive incremental storage requirements, but taken together, they mean an unprecedented demand for capacity and performance.

The IBM SAN initiative led to the development of the FAStT product line. These products are the next step in the evolution to provide centrally managed, open software and hardware solutions designed to help companies get the most value out of their business information and IT infrastructures. SANs offer an open architecture that allows customers freedom of choice in deploying data-access and data-sharing capabilities across the enterprise; consolidation of servers and storage; high data availability; centralized storage management; the ability to back up and migrate data without affecting enterprise network performance; the high reliability offered by clustering technology; and the security and protection of data in the event of disaster or computer hackers.

Basic SAN technology began with our ESCON® attached storage subsystems previously used for many years by the IBM zSeries product line. In 1998, after achieving the leadership position in high-end storage, IBM introduced FC technology which provided basic SANs in the Intel processor-based market. In 2000, IBM introduced the FAStT series of products that delivered scalable, fibre-to-fibre storage solutions. The FAStT products currently support a variety of popular operating systems including Microsoft, Novell and Linux. The IBM FAStT products announced in 2001 have heterogeneous support and interoperability across multiple platforms including Windows® NT and Windows 2000 Advanced Server, Linux, Netware 5.1 and multiple versions of UNIX.

## *Expanding on the industry-standard environment*

IBM FAStT solutions are designed and optimized to complement the full range of product offerings in the xSeries line. The xSeries options portfolio of storage products is considered to be among the broadest in the industry, with leadership technology that is constantly being refreshed and improved. Products in the portfolio include:

- FC hard disk drives (HDDs)
- Tape backup solutions
- FC connectivity and storage solutions
- Storage expansion solutions
- IBM rack solutions
- Clustering solutions

FC combines the standard SCSI command set and protocol used by storage devices with the flexibility and connectivity of networks. Its ability to attach large numbers of devices using physically longer and smaller cables than traditional SCSI, combined with its ability to transmit data at up to 100MBps, makes it an attractive alternative to SCSI. Its architectural flexibility enables it to handle different protocols simultaneously. This allows a FC network to serve as a high-speed LAN supporting network protocols such as TCP/IP and to support attachment of storage devices simultaneously.

IBM has an unparalleled history of technology leadership, service and support in the enterprise systems marketplace. Not only did IBM invent magnetic disk storage, we currently hold some 650 patents and many awards for our storage technology and customer solutions in the past 40 years. As customers in the Intel processor-based server environment expand their networks into business-critical arenas, IBM is applying its vast experience in storage and storage management to help meet their needs.

IBM storage patent leadership and long-term involvement with every facet of enterprise storage enable us to understand the diverse challenges that your business faces in this environment. It also helps us develop solutions to meet these challenges and take advantage of business intelligence, increased Web performance, tape backup, high-speed communications and disaster recovery solutions.

IBM FAStT solutions bring the outstanding characteristics of mainframe and midrange storage to the Intel processor-based server and UNIX SAN marketplace. These features include: high availability, powerful performance, massive scalability, redundancy, centralized storage and problem prevention through alerts and notifications of potential disruptions.

## **IBM Fibre Array Storage Technology and SANs**

IBM is committed to delivering products with proven, reliable technology while helping you reduce the total cost of ownership of enterprise-class computing. This commitment is expressed in IBM FAStT products, which integrate the latest in FC-attached storage and the best management capabilities from larger IBM systems and adapts them into a framework that will integrate with a wide range of industry-standard, customer-chosen management and operating system environments.

The following is a summary of the key elements of FAStT that have been incorporated into the FAStT200HA and FAStT500 storage servers.<sup>1</sup> They include powerful processors, core logic, reliable and highly available memory systems, scalable I/O, advanced caching software and world-class silicon and module technology.

## *Expanding on the industry-standard environment*

- FC-attached storage options for scalable, highly available, cluster-enabled storage, improved security and disaster protection
- Hot-swap fibre HDDs, redundant power supplies and fans for availability and reliability
- Clustering solutions for continuous system availability and performance scalability
- Light Path Diagnostics to improve availability and serviceability
- Integration with enterprise systems management software such as Tivoli™ Management Software

## **IBM FAST Components**

IBM FAST delivers on the vision of SAN technology by combining the best of IBM and industry-standard technologies using our experience from decades of mainframe, UNIX® and Intel processor-based computing in cooperation with strategic industry partners.

**Fibre Channel Switch.** The switch, available as an 8- or 16-port model, enables the interconnection of various storage servers and devices. It optimizes the advantages of FC technology for distance, performance and heterogeneous connectivity. It uses the latest technology with an advanced, nonblocking switch architecture and delivers multiple, concurrent connections up to 100MBps for large-block transfers, with reliability and data integrity. It provides scalability from small to very large SAN environments. Also, it has an embedded Web server for easy browser-based setup, configuration and ongoing management. And, it offers the option of a second power supply that supports dual power-source installations to minimize outages and nondisruptive maintenance if one power supply fails (second power supply not included).

**Fibre Channel SAN Data Gateway Router.** The router provides a simple, entry-level connection between FC-enabled hosts to new or existing SCSI tape libraries (thereby offering investment protection for existing SCSI libraries) to support sharing of tape devices by several servers and/or remote location of tape backups for disaster protection. Two models are available to support two Ultra SCSI single-ended or differential bus connections routed to a single FC connection. Additional SAN Data Gateway models are available to support higher numbers of SCSI and/or FC connections.

**Fibre Channel Managed Hub.** The managed hub supports entry-level workgroup FC arbitrated-loop (FC-AL) connectivity for applications such as high-availability clustering, storage consolidation and LAN-free backup. The managed hub is designed for implementing entry-level homogeneous multinode server clusters and storage systems, providing high-speed interconnections for FC-AL environments.

**IBM FAST Host Adapter.** The adapter offers speeds up to 100MBps and FC direct-drive, short-wave optical cable to 500m (1640ft) rather than the 25m (82ft) limitation imposed by copper cable to eliminate electrical interference and ground shift problems caused by copper cable, which is still used by some vendors; the optional long-wave optical cable drives 10km (6mi.), and a 64-bit PCI bus master transfers data up to 264MBps. The adapter is also compatible with 32-bit PCI.

## *Expanding on the industry-standard environment*

**FAStT200 Storage Server.** The IBM FAStT200 Storage Server contains a single RAID controller and two redundant power supplies that are ideal for creating a cost-effective SAN using fibre-to-fibre technology. This entry-level, cost-effective solution is for applications where a high degree of redundancy is not immediately required. The FAStT200 supports ten internal FC HDDs and can be expanded to 30 FC HDDs using the FAStT EXP500 expansion unit.

This product is upgradable to a high-availability model by adding a FAStT200 redundant controller.

**FAStT200HA.** The FAStT200HA is optimized for cost-effective, fully redundant SAN implementations. The FAStT200HA can support dual-host loops and dual-drive loop storage configurations using fibre-to-fibre connections. The FAStT200 HA supports ten internal hot-swap FC drives for a total internal storage capacity of 734GB<sup>2</sup>. Maximum storage of 4.3TB is achieved by adding up to five additional FAStT EXP500 storage expansion units.

This unit is designed for easy service. Hot-swap components, Light Path Diagnostics and Customer Replaceable Units are used throughout to help minimize downtime and service costs. Enterprise information can be accessed across two host systems from various storage systems or devices that are local or remote. Configurations support disk and tape pooling connected to xSeries and Netfinity servers in redundant loops to create a highly available SAN.

**FAStT500 Storage Server.** The IBM FAStT500 Storage Server provides the latest in FC connectivity. Each unit contains dual hot-swap RAID controllers, two redundant power supplies with battery backup and support for up to 16TB of fibre-attached storage using FAStT EXP500 Storage Expansion units. The FAStT500 is the ideal solution for mission-critical environments where reliability and high throughput are required. This high-availability product can support dual-host loops and dual-drive loop storage configurations using fibre-to-fibre connections. The FAStT500 supports four direct-attached host connections or up to 16 connections using a fibre hub or switch. The unit ships with two host and two drive GBICs standard. Four additional expansion slots are available for FAStT500 Mini Hubs.

The FAStT500 ships standard with IBM Storage Manager software that provides comprehensive utilities to manage up to 128 logical drives, 16 drive partitions and provide SNMP management. This unit is designed for easy service. Hot-swap components, Light Path Diagnostics and Customer Replaceable Units are used throughout to help minimize downtime and service costs.

**FAStT EXP500 Storage Expansion Unit.** The FAStT EXP500 supports up to ten high-speed FC HDDs for up to 734GB of storage. The FAStT EXP500 combines with both the FAStT200HA and FAStT500 storage servers for an end-to-end FC SAN solution. Each unit ships with dual hot-swap power supplies, dual-cooling fans and Light Path Diagnostics to warn of faults, over-temperature and other environmental concerns.

**FAStT500 Mini Hub.** The FAStT500 Mini Hub provides additional connections to the FAStT500 Storage Server and supports complex clustering and advanced storage applications. The unit ships with two available GBIC slots to support additional drive enclosures or host systems. The FAStT500 supports an additional two mini hubs for drives and two mini hubs for systems.

As enterprise storage requirements continue to increase and more companies turn to e-business, IBM intends to enhance the performance, capacity and reliability of IBM FAStT products to help businesses keep up with increasing information demands.

## **Storage Management**

### **FAStT Storage Manager v7.1**

The IBM FAStT500 and FAStT200 storage servers include FAStT Storage Manager software. FAStT Storage Manager v7.1 is a Java™-based tool that provides the functionality and user interface to install, configure and maintain your SAN. The latest version provides the ability to connect up to 16 host systems using a variety of operating systems. FAStT Storage Manager v7.1 includes the following features:

- Integration that allows data-management and data-protection functions to work together
- Management that allows distributed data (including local and remote storage systems) to be managed from a centralized point within the enterprise
- Interoperability that supports heterogeneous SAN environments and enables high availability, helping ensure that you get the intended benefits of enterprise storage
- Scalability that supports ever-increasing amounts of data and types of enterprise applications
- Easy-to-use Web browser and graphical user interfaces (GUIs) for daily administrative and user tasks
- Support for third-party, SAN-focused applications
- Comprehensive monitoring and messaging using standard SNMP protocols
- Support for launching and executing FAStT Storage Manager within Tivoli IT Director and HP Openview

## **A service-driven SAN strategy from IBM**

Although the implications of falling behind—not keeping pace with technology—can be devastating to a business's ability to compete, the impact of a major architecture change can be huge and potentially disruptive. The margin for error is thin, the technology is still largely unproven, standards are not yet fully ratified and many interoperability issues have yet to be resolved, and the data management is complex.

IBM Global Services' commitment is to providing open, vendor-neutral solutions that fit a company's technology profile and address short- and long-term business objectives. From early consulting, planning and design through integration and testing, IBM Global Services can offer end-to-end service solutions for SAN deployment designed to maximize the benefits of information sharing across the enterprise. Plus, IBM Global Services' business and technology consultants understand the key role that a storage infrastructure must play to enable business-critical applications such as enterprise resource planning, e-business, customer relationship management, business intelligence and supply-chain reengineering.

Leveraging our extensive experience, knowledge base and lessons learned in IT planning, design and implementation, IBM Global Services can help you:

- Protect your current investments in people skills, hardware and software
- Integrate new technologies as they emerge, mature and become more affordable by deploying a building-block infrastructure

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- Apply experience and lessons learned from the mainframe arena, such as systems management, storage concepts and switched fabric management to the open systems environment
- Support multiplatform interoperability
- Limit the risks of unproven technology by providing the “mix and match” freedom of choice to deploy what makes the most sense for your unique environment

In addition, IBM Global Services will provide the services and education required to support multi-vendor SAN implementations, allowing companies to manage their technology resources—application servers, storage servers, network hardware and storage management software—and share information across storage networks regardless of vendor computing systems and software applications.

To learn more about IBM storage services or other IBM Global Services solutions, contact your local IBM sales representative or Business Partner, or visit our Web site at [ibm.com/services](http://ibm.com/services).

**IBM ServerProven program.** The IBM ServerProven<sup>®</sup> program, part of the FAST Storage Solution strategy, helps give companies the confidence to implement a robust SAN solution tested and optimized for xSeries systems in industry-standard, heterogeneous environments.<sup>2</sup> Hundreds of products from xSeries Options and other leading industry vendors have been tested for compatibility with IBM *@server* xSeries products, so you can add new capabilities with confidence.<sup>3</sup> And we have expanded our ServerProven program to incorporate ServerProven Solutions, a commitment by IBM to work with some independent software vendors and industry-leading hardware manufacturers to provide you with fully integrated solutions that meet your business needs.

## **Conclusion**

The SAN is the next generation in the evolution of enterprise storage solutions. Its development has become necessary as a result of worldwide customer requirements for data storage and processing around the clock in multiple time zones—storage and processing that are reliable, powerful, secure and separate from the enterprise LAN.

xSeries SAN components and solutions are among the leading products in the industry. We bring our decades of experience and expertise in mainframe technology to the Intel processor-based environment with xSeries servers and our xSeries options' broad portfolio of storage products. Both our xSeries servers and xSeries options installed on them are covered by our three-year limited warranty<sup>4</sup> with onsite service available, which provides hardware problem determination onsite, as well as remotely, with the latest IBM technology and tools.

We also provide the software management tools that help you fully exploit the value of a SAN in your business and make your business intelligence work for you. And the IBM ServerProven Program gives businesses the confidence to implement robust SAN solutions tested and optimized for xSeries systems in industry-standard, heterogeneous environments.

IBM Global Services provides the capability to help you plan, design, set up, integrate and test your SAN, as well as the ability to help you support and manage multivendor technology resources across your enterprise. The long-term vision of the IBM SAN initiative is to provide interoperability across computing platforms and operating systems. To achieve that strategic goal, companies can find no better partners than IBM *@server* xSeries and xSeries options to implement disaster-tolerant, anywhere, anytime access to highly available and easily managed data.

*Expanding on the industry-standard environment*

IBM takes a leadership role in the development of a new industry-standard technology. Our heritage with enterprise computing and storage, our IBM Global Services and our worldwide service and support, help you build and exploit the SAN you need to take advantage of your business-critical data now and in the future.

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**Additional Information**

Visit [ibm.com/pc/ww/eserver/xseries/fa\\_san.html](http://ibm.com/pc/ww/eserver/xseries/fa_san.html) for more information on xSeries FC and SAN products.

Visit [ibm.com/eserver/xseries](http://ibm.com/eserver/xseries) for more information on IBM @server xSeries servers, products and services.

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1) Visit our Web site at [ibm.com/pc/www/eserver/xseries/fa\\_san.html](http://ibm.com/pc/www/eserver/xseries/fa_san.html) to learn more about IBM FASTT products.

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