



IBM Netfinity Fibre Channel Directions

Bringing proven leadership in high availability, performance and scalability to industry-standard, business-critical solutions

Executive Summary

Today's information technology customers need expandable, high-speed, networked systems that support business-critical applications for users in diverse locations. Fibre Channel is a new technology, similar to a high-speed network, that can be used to connect large amounts of disk storage to a server or cluster of servers. Fibre Channel technology supports increased performance, scalability, availability and distance for attaching storage subsystems to network servers. IBM's Netfinity Fibre Channel products will provide this technology and the benefits it offers to businesses requiring enterprise server solutions.

Built on experience from decades of large- and midrange-system leadership, IBM's Netfinity servers allow businesses of all sizes to build an industry-standard foundation for their networks with increased availability, reliability and scalability. IBM is adapting this experience to the Netfinity product line to provide complete application solutions for today's industry-standard server marketplace.

IBM's Netfinity Fibre Channel solutions will offer you the power, scalability, control and service you need for your Intel-processor-based servers. During the first half of 1998, IBM will complete the testing and approval of new Fibre Channel-based products. In the second half of 1998, IBM will announce hardware and software products that use Fibre Channel technology, and that provide complete application solutions for stand-alone and clustered servers. Looking to 1999 and beyond, IBM will continue to enhance the Netfinity server product line, focusing on all aspects of computing to further improve performance and help you reduce the cost of ownership.

This paper offers a brief tutorial on Fibre Channel technology and discusses the current directions for IBM Netfinity systems. Because of the dynamic nature of the computer industry, changes may occur in IBM's actual implementations and timing of product announcements.

What is Fibre Channel?

Fibre Channel is the next generation in high-performance storage interface technology. It consists of an integrated set of standards that defines new protocols for flexible information transfer using several interconnection topologies. These standards have been created by the American National Standards Institute (ANSI) committee, with IBM playing a leadership role as it has done before in the development of many new industry-standard technologies.

IBM engineers worked on the ANSI committee and helped establish the three basic Fibre Channel topologies: Fabric, Point-to-Point and Arbitrated Loop. Each topology contains nodes and ports, which consist of transceivers and receivers connected together by wiring.

In a fabric topology, the flow of information is controlled by the fabric (routers or switches) instead of by the ports. In a Point-to-Point topology, the ports are connected by transmitters and receivers, all of which must be compatible. In an Arbitrated Loop topology, transmitters are connected to receivers, but messages not intended for a particular port are passed on until they reach their designated destinations. The maximum number of ports in an arbitrated loop is 127.

Fibre Channel combines the standard SCSI command set and protocol with the flexibility and connectivity of networks. Its ability to attach up to 127 devices using physically longer and smaller cables than SCSI, combined with its ability to transmit data at up to 100 MBps, makes it an attractive alternative to SCSI in many cases. Its flexibility and scalability enable it to handle different protocols simultaneously. This allows a Fibre Channel network to serve as a high-speed LAN supporting network protocols such as TCP/IP and to support attachment of storage devices.

The Fibre Channel Arbitrated Loop (FC-AL) supports the same commands as a SCSI bus but is wired much like a network, allowing protocol information to move over longer distances and at greater speeds than with traditional SCSI bus connections. It is a flexible, easy-to-use solution for high-speed clustered storage applications.

Advantages of Fibre Channel

Fibre Channel technology supports applications that require very large amounts of disk storage or clustered storage shared by two or more servers. With Fibre Channel, you can see a higher throughput rate over longer distances than is possible with SCSI, and a higher throughput rate than with IBM's serial storage architecture (SSA). These differences are illustrated in the following table.

Fibre Channel compared with other interface technologies:

	Fibre Channel	Fast/Wide SCSI	Ultra/Wide SCSI	Ultra-2 SCSI	SSA
Distance	Up to 10 km (6 mi.) with optical cable Up to 25 m (80 ft) with copper	Up to 3 m (10 ft) with copper	Up to 1.5 m (5 ft) with copper	Up to 15 m (50 ft) with copper	Up to 10 km (6 mi.) with optical extensions
Speed (data transfer rate)	100 MBps	20 MBps	40 MBps	80 MBps	20-80 MBps
Host systems per connection	1-126	1-2	1-2	1-2	1-126
Devices per connection	127	15	15	15	127

Combining Fibre Channel technology with Netfinity systems and SCSI storage expansion enclosures (EXP10s) makes the possibilities for scalable, high-performance solutions almost endless.

The advantages of Fibre Channel include distance, performance, availability and scalability.

Distance and Performance. With Fibre Channel, greater distances (up to 10 km [6 mi.]) can be supported. This means that your servers and the people who use them can be located miles apart and still share the same storage devices. And Fibre Channel can transfer data at speeds up to 100 MBps, giving you high performance over distance for your business-critical applications.

Availability. Businesses can face failures of operating systems or applications. Disaster recovery can be better managed through the use of Fibre Channel combined with the appropriate cluster software. For example, should a failure occur in a clustered environment, your failover system can be located as far as 10 km (6 mi.) away, and your work can be transferred to that location without interruption.

Scalability. As businesses grow and become more complex, so do systems. The flexibility and scalability of Fibre Channel technology enable you to manage this increased complexity and expand your current system while protecting your base investment. This is possible because Fibre Channel technology allows for system expansion by increasing the number of devices that can be attached per PCI slot. Another key point is that you can connect more than two host systems to Fibre Channel; SCSI supports only two.

IBM Netfinity Fibre Channel Strategy

Today's networked business solutions must be able to grow horizontally through scalable I/O devices. IBM's Netfinity strategy and products support this growth requirement. Some of the Netfinity products currently supporting horizontal growth are the ServeRAID II Ultra SCSI adapter, SSA adapters and the EXP10 external SCSI expansion enclosure.

But tomorrow's computing environments will demand more horizontal growth, and IBM's Netfinity server strategy is to provide products that meet these demands. Adoption of Fibre Channel is expected to grow throughout 1998, and to grow significantly toward the end of the year, with complete horizontal-growth solutions (hardware and software) becoming available in the second half of the year.

IBM began demonstrating Netfinity Fibre Channel hardware solutions to customers in the fourth quarter of 1997. Today, IBM is developing different hardware and software Fibre Channel products as part of comprehensive computing solutions that meet IBM's requirements for quality, reliability and performance.

IBM's strategy for introducing Fibre Channel into the Netfinity product line is:

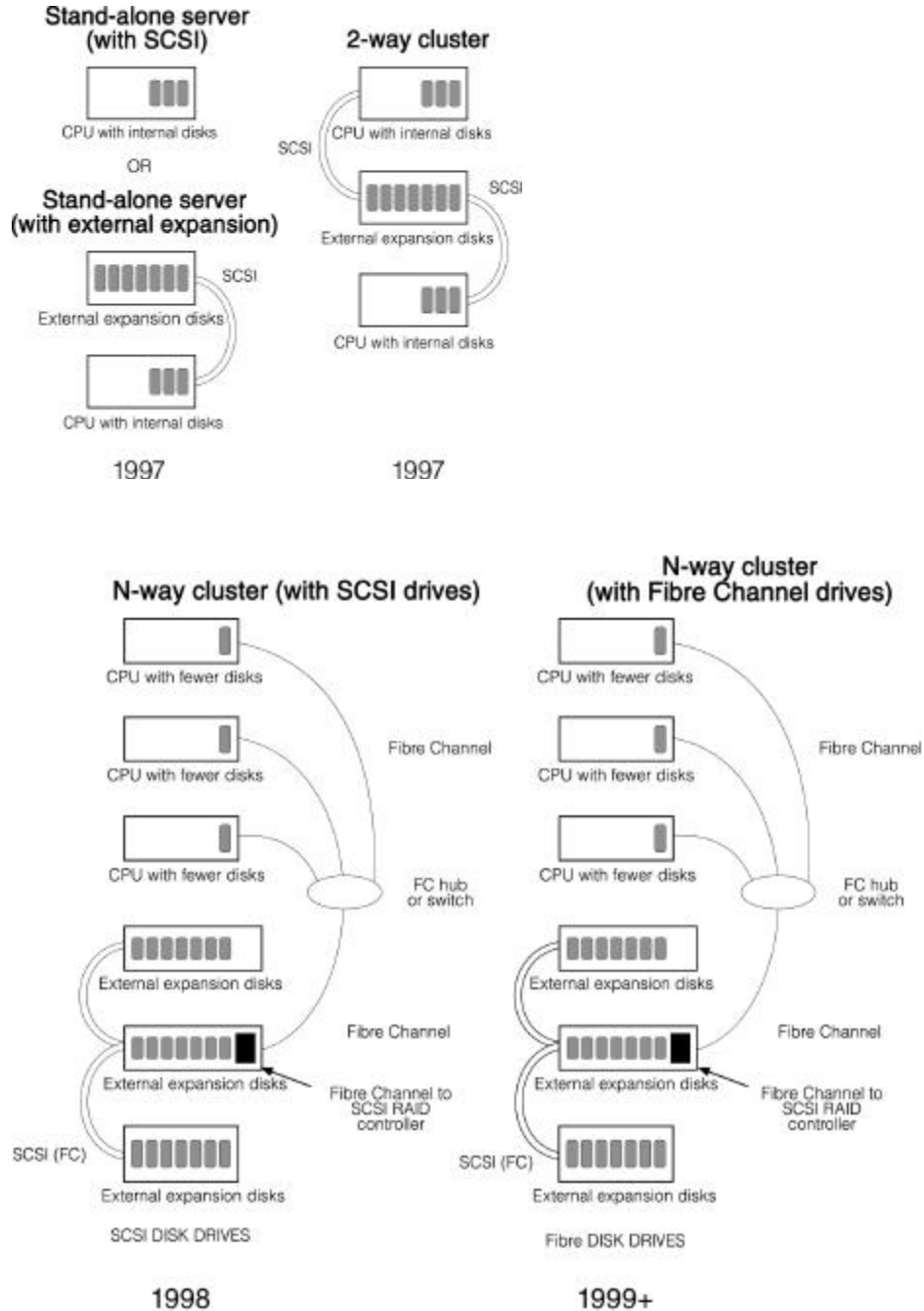
- Develop and test Fibre Channel-based hardware RAID storage solutions for customers' use and evaluation
- Offer total hardware and software solutions, when they are ready, that meet IBM's high standards for quality, reliability and performance
- Test, certify and approve complementary Fibre Channel products (adapters, RAID controllers, hubs, switches and hard-disk drives) as the technology matures and new products become available from multiple sources

By taking these steps, IBM will continue to offer technology leadership with investment protection and a smooth, cost-effective transition to Fibre Channel-based solutions when they have been proven ready for business-critical applications.

For solutions requiring the ultimate in distance, performance and shared storage by clusters of greater-than-two nodes, IBM will offer the choice of Fibre Channel or SSA. Both will allow for increased scalability to support up to multiple terabytes of storage, allowing you to choose the solution that best fits your business needs.

SCSI to Fibre Channel: Storage Subsystem Evolution

The following diagrams illustrate how a typical transition from a SCSI-based storage system to a Fibre Channel-based system could take place over time.



Leadership in Fibre Channel technology

For most of 1997, customer solutions were based primarily on stand-alone servers with internal SCSI disks and/or a single, nearby SCSI storage expansion enclosures. Then, the introduction of the EXP10 in November 1997 made 2-way clustering possible, allowing two servers to share one external storage device.

In 1998, it is expected that new hardware and software products will begin shipping that allow more advanced "N-way" clustering solutions to be configured. This will be done primarily with SCSI disk drives and will consist of multiple servers sharing multiple expansion enclosures. Fibre Channel is an excellent technology solution for such applications, offering the following advantages:

Users and servers no longer need to be near their shared storage devices.

Solutions for disaster recovery can be provided more easily because redundant fail-over elements of the system can be located miles apart.

In 1999, the migration from SCSI disk drives to Fibre Channel will gain momentum as the industry standard shifts from SCSI to Fibre Channel.

Furthermore, IBM's Fibre Channel solutions will be able to use today's SCSI disks, storage expansion enclosures and servers. This protects your current SCSI hardware investments, which often constitute a high percentage of your total system cost. Native Fibre Channel-attached disk drives are not readily available today from multiple suppliers and are incompatible with existing SCSI adapters, enclosures and cables. This is currently limiting market acceptance of these drives. IBM will support Fibre Channel-attached disk drives when customer benefits outweigh these compatibility and supply issues.

Looking further into the future (1999 and beyond), as the number of vendors producing Fibre Channel hard-disk drives and other system components (such as Fibre Channel adapters, RAID controllers and backplanes) increases, these new devices should become more cost-effective and available. This will allow solutions based entirely on Fibre Channel to become more prevalent. In fact, it is possible that Fibre Channel will eventually replace SCSI as the most popular server storage technology. Given this technology trend, the IBM Netfinity Fibre Channel strategy will allow you to:

Begin using and evaluating IBM tested and approved Fibre Channel hardware products (including host adapters, RAID controllers and hubs) by mid-1998

Start your migration to Fibre Channel when complete hardware and software solutions become available in the second half of 1998 (and still protect your existing SCSI disk investments)

Migrate to solutions based entirely on Fibre Channel in 1999 and beyond, when it is cost-effective and appropriate for your business needs

Conclusion

Fibre Channel is an emerging, powerful technology for businesses that need available, reliable, high-speed storage interconnected over long distances. Its high bandwidth, flexibility and connectivity, coupled with its ability to handle multiple protocols simultaneously, make it a wise choice for the next generation in storage interface technology. Ease of use is improved because of the need for fewer cables and controllers, which makes it attractive to network planners and administrators. Its scalability allows you to add more devices per system PCI slot and thus protect and expand your current SCSI investments. Its ability to transmit data at up to 100 MBps makes it an outstanding alternative to traditional SCSI connections. And it allows you to locate your failover system as far as 10 km (6 mi.) away from your networks and, in the case of an operating system or application failure, work will be transferred to that location without interruption.

As in the past, IBM is again playing a leadership role in the development of a new industry-standard technology. Fibre Channel is another step in the migration of IBM's strengths to industry-standard computing platforms. By delivering Fibre Channel software and hardware products in 1998, IBM will continue to be the only vendor to offer a complete range of solutions for your business-critical needs.

IBM's heritage with campus and enterprise computing, our leadership role in the development and implementation of new technologies, and IBM Netfinity products give you the confidence to run your business-critical systems today and in the future. And with our worldwide service and support, we'll help you keep your business up and running 7 days a week, 24 hours a day, 365 days a year.

Additional Information

For more information on IBM Netfinity directions, products and services, visit our Web site at **www.us.pc.ibm.com/server**.

The following white papers are listed under Information Briefs:

IBM Netfinity Technology Directions

IBM Netfinity 8-Way SMP Directions

IBM Netfinity Cluster Directions

System Management for Servers

At Your Service...Differentiation beyond technology

Leadership in Fibre Channel technology

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Department MFZA
3039 Cornwallis Road
Research Triangle Park NC 27709

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