

Storage



The Hitachi Freedom SAN Solution—An Overview

by Dorian Naveh

Transforming IT into Business Agility

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The Business Need for Storage Area Networks

In today's fast-paced competitive environment, customers must have nonstop access to information, rapid-response server performance, quick and nondisruptive scalability of storage and server resources, and a lower total cost of ownership. Companies continuously seek solutions to address limitations in current storage architectures, explosive growth of data storage, and the consequent increases in storage management costs. Storage area networks (SANs) can help solve these problems, enabling customers to achieve greater scalability, availability, and reliability of storage and server resources while lowering their total cost of ownership.¹

A SAN is a high-speed network, separate from a LAN, dedicated to moving data between servers and storage devices. Moving data traffic from the traditional LAN and using data-centric protocols removes CPU load from the server and reduces LAN bandwidth congestion. Data management processes like backups are handled within the SAN, so that they don't compete with other applications for the general network environment. (See Figure 1.)

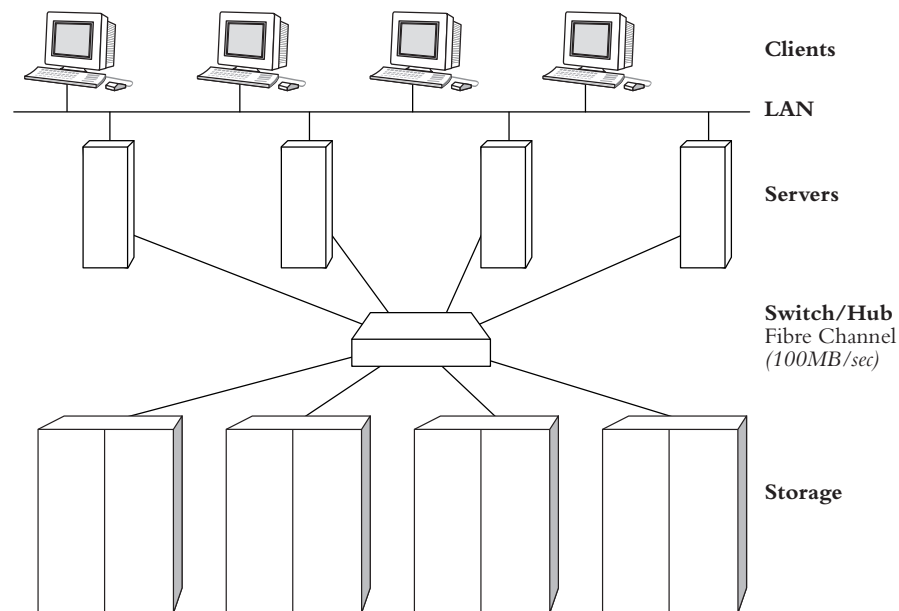


Figure 1: Typical configuration for a storage area network

¹ The management costs for distributed Windows NT are tangibly higher than those for centralized S/390®.

The limitations in current storage architectures, the explosive growth of data storage, and the increases in storage management costs are among the many factors driving the adoption of SANs. Customers who need to manage their server, storage, and network environment proactively can realize significant benefits by deploying SANs, which can help them to:

- Consolidate servers and storage to reduce infrastructure investments and decrease storage/server management costs
- Reduce network congestion by removing data traffic from the LAN
- Centrally manage server and storage resources to reduce administrative costs
- Enhance application performance and reduce backup times by offloading backup and other data movement from application networks
- Independently scale servers and storage
- Achieve higher availability through the introduction of path, server, and storage failover
- Build disaster-tolerant infrastructures by using high-speed remote copy capabilities
- Achieve greater scalability, availability, and reliability of resources

Hitachi Freedom Data Networks

Hitachi Freedom Data Networks (FDN) respond to the challenge of open architecture, multiple platforms, and the spiraling costs of information management. FDN is the locus of Hitachi's long-term vision for offering businesses complete freedom of choice in establishing data-centric enterprise networks. Hitachi's commitment provides the framework for flexible open-system configurations so that customers can access any information from any computer, anywhere, anytime.

Freedom Data Networks leverage SAN technology and enable customers to consolidate servers and storage, increase data availability, centralize storage management, and back up and migrate data without affecting network performance. Hitachi SANs don't just support the Storage Networking Industry Association's open-systems standards. They reduce total cost of ownership by minimizing support costs and downtime, and by optimizing server and storage configurations. The benefits include:

- Improved server/storage system scalability
- Improved information access
- Enhanced application/backup performance
- Increased resource manageability and reliability
- Higher availability.

In the SAN arena, Hitachi offers end-to-end solutions. Customers can rely on a single point of contact for all the systems, components, and services required by the SAN configuration. Servers, storage, switches, hubs, host bus adapters, cabling, management and security software, services for planning, implementation, and integration—all these critical elements are available from Hitachi.

Hitachi also offers an open SAN solution that will ultimately allow connection of any server platform and operating system, as well as the connection of any storage vendor's hardware to the Hitachi Freedom SAN Solution. Alliances and partnerships with the industry's leading network, communications, and software vendors support Hitachi's efforts to deliver full interoperability.

The Hitachi Freedom SAN Solution

The Hitachi Freedom SAN Solution is a suite of three packages based upon an existing, proven SAN implementation at a leading financial institution in the U.S. Each package includes a comprehensive range of support services for the installation, configuration, and management of SANs.

Package 1—Storage/server consolidation

The first package (see Figure 2) offers a basic SAN configuration, which enables storage consolidation and server consolidation, allows centralized storage management, and brings data-center-class storage to the Microsoft Windows NT environment. Package 1 features hardware-based RAID-5 storage arrays, high-bandwidth data paths, extended connection distances, and support for very large storage volumes (up to 3TB). The SAN architecture can also support a highly available Windows NT infrastructure in the future, because it offers redundant connections for path and host failover, along with shared storage for clustered computing environments. By consolidating resources, customers can also enjoy a reduction in administrative costs.

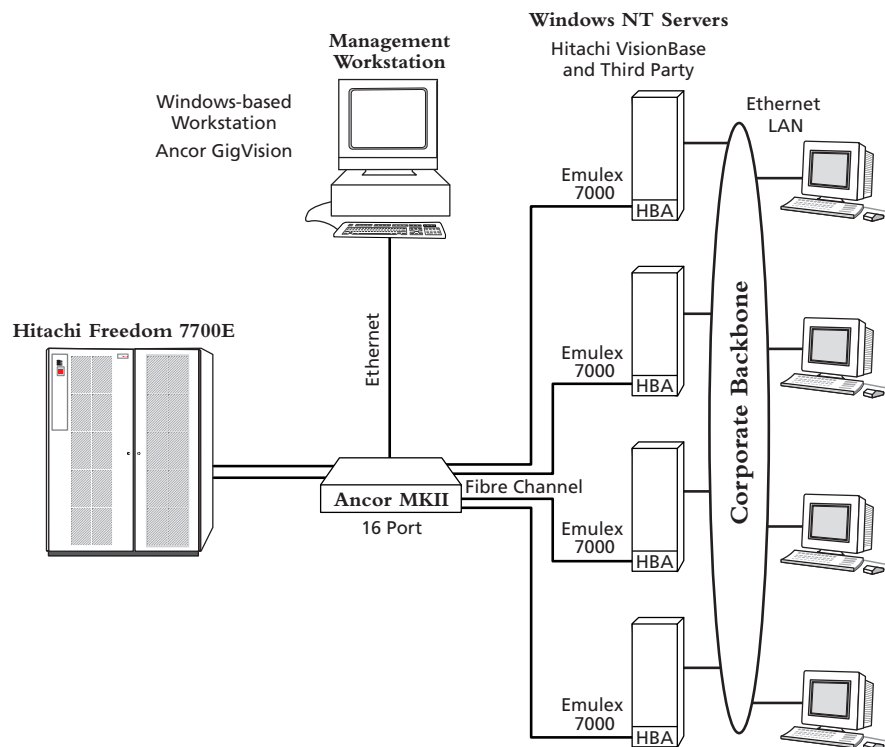


Figure 2: Hitachi Freedom SAN Solution, Package 1—Storage/server consolidation

Package 2— LAN-less backup

The second package (see Figure 3) offers LAN-less backup capabilities, adding data backup/exchange capabilities to the basic configuration of Package 1. LAN-less backup allows customers to use mainframe resources to centrally manage Windows NT backup. All tapes are singly formatted, eliminating the need for multiple formatted scratch tapes. Since all tape slots are dedicated to one platform, the silos are better utilized. Similarly, since all tape drives are dedicated to one platform, there is no need to dedicate separate drives to MVS™ and open systems, so that the tape drive resources are also better utilized. All data stored on the Windows NT volumes on the Hitachi Freedom Storage™ 7700E is backed up without having to traverse the SAN or the corporate LANs. This reduces the impact of additional traffic over the network, and of CPU load on the Windows NT servers.

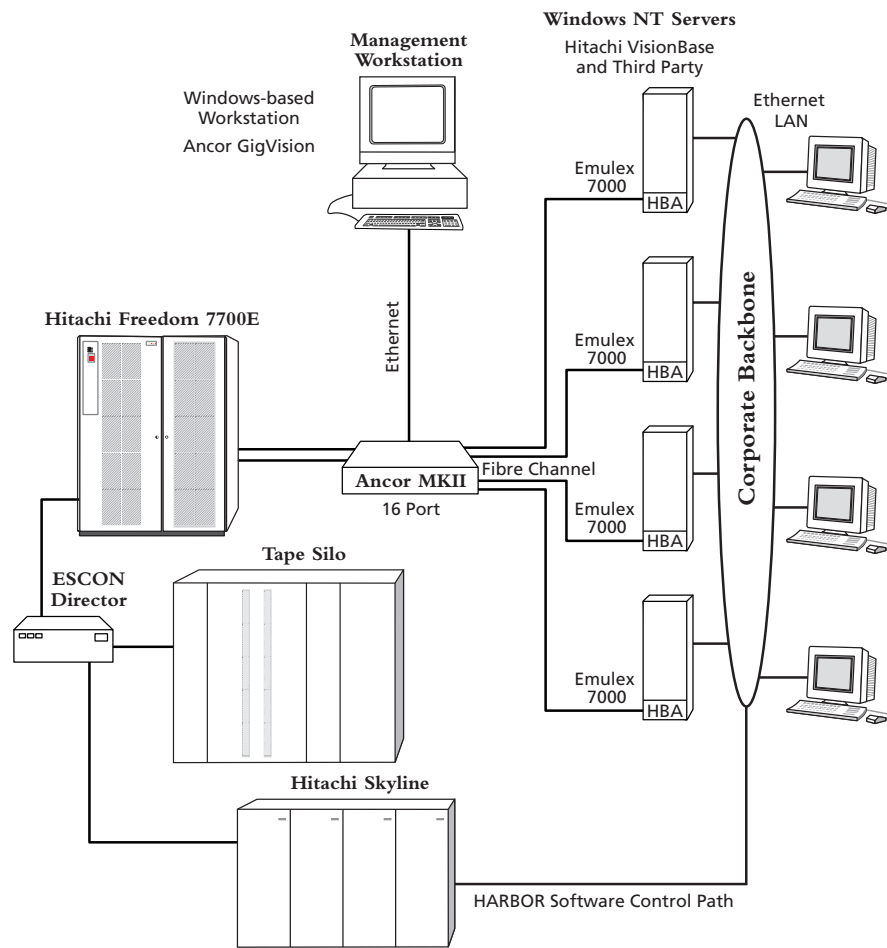


Figure 3: Hitachi Freedom SAN Solution, Package 2—LAN-less backup

Package 3— LAN-less data migration

The third package (see Figure 4) helps to simplify data movement between the mainframe and Windows NT, adding data exchange/transfer capabilities to the basic configuration of Package 1. Since data migrated between the mainframe and Windows NT does not have to traverse the SAN or corporate LANs, customers can count on out-of-band data migration to support their data warehousing applications.

They gain a data migration path for disparate information on Windows NT volumes to be consolidated on the mainframe (for example, in a batch program that consolidates subsidiaries or departments).

Since there is no need to transfer data using an LU 6.2 or 2.1 architecture, there is a potential for improving throughput without affecting the SNA, CPU, or front end. This solution also reduces the ESCON® channel requirement in the short term (until FICON reaches its full potential). Customers don't have to use expensive ESCON channels on a director for ESCON-to-fibre-channel bridges.

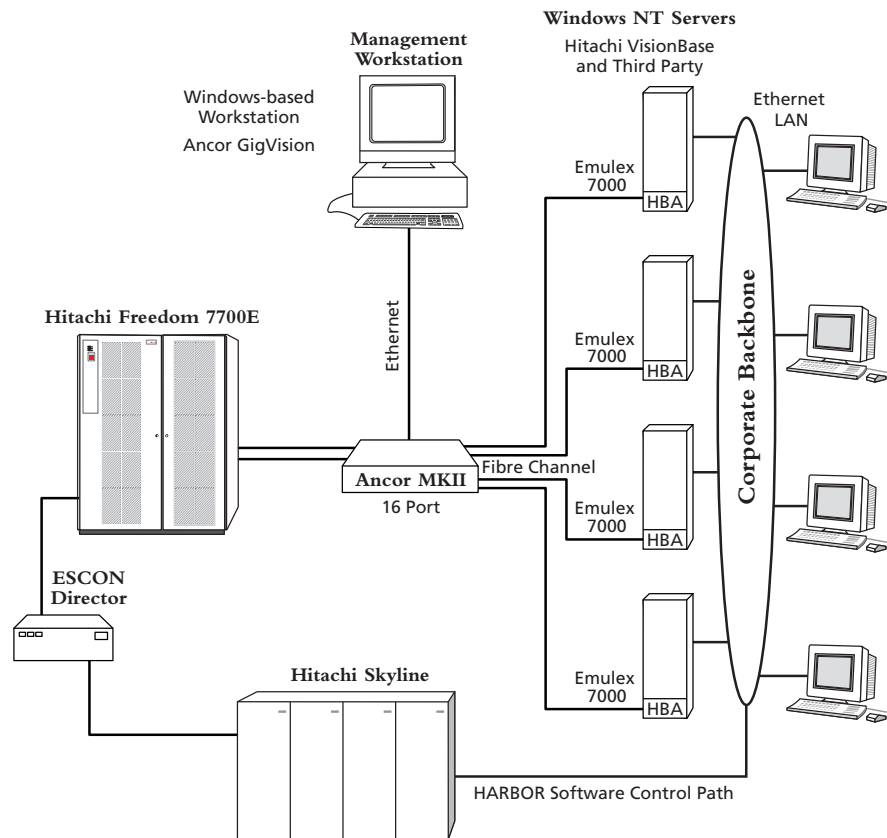


Figure 4: Hitachi Freedom SAN Solution, Package 3—LAN-less data migration

Specialized Services Can Help Define SAN Direction

SANs represent a nascent technology. Many customers are uncertain about how to initiate the transition towards SANs. Hitachi's SAN services are a key differentiator of the Hitachi Freedom SAN Solution. Comprehensive in range, these services define the role SANs can play in the enterprise, and pave the way for customers to take full advantage of SAN benefits.

The following SAN services are available to help customers develop, design, configure, deploy, install, and manage a SAN solution:

- **SAN Enterprise Infrastructure Assessment** involves a structured interview process to acquire relevant information about the customer's computing environment. This service is an invaluable tool in determining future SAN requirements. Customers who do not feel an urgent need to deploy SAN technologies can prepare for the eventual adoption of SANs through this initial assessment study.
- **SAN Configuration Management** focuses on the fiber optic infrastructure for the transmission medium and control devices required by the SAN. The service addresses all the phases required for planning, installing, and maintaining the fiber optic system.
- **SAN System Design** provides global design services to satisfy the total storage-solution requirements of the customer. This offering relies on information gathered from the Hitachi SAN Enterprise Infrastructure Assessment to create a system design.
- **SAN Project Management** provides the global project management services required to coordinate the successful installation of the packaged solution. Problem management, solution delivery timing, resource supply coordination, on-site and remote customer coordination, and project planning are part of this service offering.
- **SAN Installation Services** include the many phases of installation that are not covered by a typical hardware installation. The specific SAN solution package is configured and integrated into the customer environment. These services also cover the installation, configuration, and integration of value-added software products that are specific to the solution package.
- **SAN Business Continuance** addresses the customer's data management requirements, and facilitates the transition of mass data movement from interactive user environments. This service takes full advantage of industry-leading applications to handle the increased distances between a data center and a disaster recovery site.

Components of the Hitachi SAN Implementation

A brief overview of the components of the Hitachi Freedom SAN Solution follows. (More detailed information is included in the Appendix.)

Hitachi Freedom Storage features unparalleled reliability and a SAN-ready architecture, supports S/390, UNIX[®], and Windows NT platforms, and includes fabric login, a unique attribute which enhances security mechanisms and offers a control point when many nodes access shared ports.

Hitachi VisionBase Servers use Pentium II Xeon processors. They are scalable, price-competitive, and ideally suited to Windows NT clustered environments.

Hitachi Multiplatform Data Exchange makes it easy to transfer data at high speeds between platforms without tying up valuable communication links.

HARBOR Backup with the HARBOR 7700E HMDE Agent is based on a multi-tier architecture and expands to accommodate the addition of servers, clients, applications, and storage media, without causing network disruptions.

HARBOR File Transfer provides high-speed, automated, reliable, and secure transfer of data between OS/390®-compatible mainframes and open system servers.

Hitachi Superfly fibre channel interface card allows for fibre channel connectivity and fabric login capabilities, enabling connection to a switch-based SAN.

Ancor 16-port MKII fibre channel switch includes both switched and loop fabric ports, and delivers optimal performance in storage, compute cluster, and high-performance LAN applications.

Emulex host bus adapter plugs into a host (NT server) and allows it to connect electrical signals to optical, and to “talk” to a fibre channel protocol.

SAN services help customers determine, design, and deploy SAN-based solutions. (A detailed description of Hitachi’s SAN services is presented in the previous section.)

Hitachi’s Future Direction

The Hitachi Freedom SAN Solution is one of the most important solutions being developed within the Hitachi Freedom Data Networks architecture. The three introductory packages in the Hitachi Freedom SAN Solution are the foundation for future developments in SAN technology. For example, Hitachi is working in the Enterprise Interoperability Laboratory with partners and customers to create solutions that include other Hitachi products, and are compatible with other operating systems and partners’ products.

Solutions based on Freedom Data Networks capitalize on state-of-the-art developments in storage, servers, interconnection devices, network protocols, and network configurations—the technologies currently deployed in SANs. But the FDN architecture encompasses much more than SANs. It provides the foundation for Hitachi’s “no-limits” vision: free access at any time to any information, from any computer, located anywhere.

Appendix—Components of the Hitachi Freedom SAN Solution

Hitachi Freedom Storage

Hitachi Freedom Storage features unparalleled reliability, a SAN-ready architecture, and support for S/390, UNIX, and Windows NT platforms. The Hitachi Freedom SAN Solution is based upon key industry differentiators built into the Hitachi Freedom Storage hardware. Hitachi is one of the first in the SAN arena to provide **fabric login** to their disk subsystems. This unique attribute offers enhanced security mechanisms as well as a control point when many nodes access shared ports.

Hitachi Freedom Storage includes three different product lines that address the varied IT challenges faced by today's businesses. The Freedom 7700E offers multiplatform centralized storage with high-level functions. The Freedom 5700E serves distributed database environments. And the Freedom 5800 is ideally suited for large-scale archival and OLAP database environments.

Hitachi's first SAN implementation relies on the Hitachi Freedom 7700E. Currently, Hitachi is working in the Enterprise Interoperability Laboratory with partners and customers to create solutions that include the Hitachi Freedom Storage 5800, and are compatible with other operating systems and other partners' products.

Hitachi VisionBase Server

The Hitachi VisionBase 8450 is a four-way, midrange server based on the Pentium II Xeon processor. This scalable, price-competitive server can be configured either as a tower or in a rack-mount, and is ideally suited to Windows NT clustered environments. The 8450 complements the VisionBase line, which includes the highly configurable four-way VisionBase 8460 and the two-to-eight processor VisionBase 8880R.

When running Windows NT Server 4.0 Enterprise Edition, the VisionBase 8450 is optimized for Microsoft Cluster Server. With up to four 500MHz Pentium III Xeon processors (each with 512MB or 1GB of second-level cache), the 8450 supports up to 4GB of main memory and features seven 32-bit PCI slots. Six externally accessible hot-swap drive bays deliver maximum serviceability in either rack or tower arrangements. The rack chassis is 7U high and fits in a standard 19-inch rack. The VisionBase 8450 will also be certified for SCO UNIX and Novell NetWare environments.

Hitachi Multiplatform Data Exchange (HMDE)

This unique software feature makes it easy to transfer data between platforms without tying up valuable communication links. HMDE delivers high-speed data transfer through Extended Serial Adapter™ and SCSI channels. With HMDE, customers don't need any additional software on their host. They can simply write a sequential dataset and access it directly through HMDE's File Access Library, a user-callable routine on their server. Conversely, customers can filter output from the File Access Library directly into Hitachi's File Conversion Utility. The necessary EBCDIC-to-ASCII code conversion and variable length record padding is performed automatically.

HMDE is especially useful for data warehousing and data mining tasks, where vast amounts of data need to be moved from mainframe OLTP systems to Windows NT environment in a very short time. HMDE delivers this capability without having to access the customer's networking resources or intermediate tape media. With HMDE, customers gain maximum platform flexibility and quick, reliable data transfer.

HARBOR Backup with the HARBOR 7700E HMDE Agent

Through intelligent data management and superior performance, HARBOR Backup delivers a cost-effective backup solution for medium-to-large-sized corporations. HARBOR Backup makes optimal use of storage media by incorporating automatic file redundancy checker and automatic data classification features. Administrators can also schedule HARBOR Backup to perform periodic backup consolidations in order to reorganize data to help speed recovery and free up valuable storage space.

Based on a multi-tier architecture to ensure unlimited scalability, HARBOR Backup can expand to easily accommodate the addition of servers, clients, applications, and storage media, without causing network disruptions. HARBOR Backup also supports an extensive range of popular applications to guarantee comprehensive protection. It operates transparently without causing disruptions, and features a common GUI across all platforms, providing exceptional ease of use.

With HARBOR Backup, simple point-and-click recovery empowers end users to recover files without administrator intervention. Ease of use for both administrators and end users, combined with unlimited scalability, secures HARBOR's place in any well-defined storage management strategy.

Hitachi's LAN-less backup and recovery solution utilizing HARBOR Backup provides a single platform backup through the S/390 tape facilities. This allows operators to centralize backup through one console. It also alleviates the requirement of dedicating tape resources to open systems platforms. All the tape resources can be managed by one S/390 platform.

HARBOR File Transfer (HFT)

In today's highly distributed computing environment, organizations need a powerful, high-performance, cost-effective solution to manage the increasing flow of information. Simply moving data from point A to point B is no longer sufficient. Organizations need a high-speed solution that can secure, automate, and intelligently manage the flow of mission-critical information. HFT is designed to provide high-speed, automated, reliable, and secure transfer of data between OS/390®-compatible mainframes and open system servers. HFT is the highest performing, most cost-effective, and most flexible data movement solution ever introduced to the data center.

HFT works with Hitachi Multiplatform Data Exchange to deliver the functionality traditionally secured through a "data exchange" gateway or by using UNIX services under OS/390 Open Edition. HMDE provides an alternate path for data to traverse the S/390 to open systems world without translation programs on the host or gateway. Data throughput is increased since data is transferred from the S/390 at ESCON speeds, not terminal speeds.

Hitachi Superfly fibre channel interface card

The Hitachi Superfly card allows for fibre channel connectivity and fabric login capabilities, enabling connection to a switch-based SAN.

Ancor 16-port MKII fibre channel switch

The GigWorks MKII fibre channel switch is the newest generation fabric switch from Ancor Communications, and the first commercially available fibre channel switch to include both switched and loop fabric ports. The 16-port GigWorks MKII is designed for the unique needs of storage and compute system OEMs, systems integrators, and network managers, delivering optimal performance in storage, compute cluster, and high-performance LAN applications.

Highlights of the GigWorks MKII:

- 1.062 gigabit-per-second performance, with latency of less than 600 nanoseconds—*the lowest switch latency in the industry.*
- 16-port chassis, with up to eight arbitrated loop ports per switch.
- Available with short-wave optics.
- Scalable to 192 ports (128 non-blocking) on a single fabric.
- Fully non-blocking, full duplex communication.
- Hot-pluggable ports, and redundant, hot-swappable power supplies and fans.
- Protocol-independent, supporting all data communications between storage, server, and workstation nodes.

Emulex host bus adapter (HBA)

An HBA is a device that plugs into a host (Windows NT server) and allows it to connect electrical signals to optical, and to “talk” to a fibre channel protocol. The LightPulse LP7000/E fibre channel PCI host bus adapter utilizes a state-of-the-art, dual-ported, on-board memory architecture to provide high-performance I/O solutions for applications like client/server, database I/O, multimedia, imaging, and clustering, which require sustained high throughput coupled with low latency characteristics.

The LP7000/E HBA offers sustained I/O performance and sustained throughput over 85MB per second using standard industry benchmarks. Utilizing the large on-board buffering included with the LP7000/E, these high levels of performance can be maintained even in large loop configurations.

The LP7000/E HBA supports point-to-point, arbitrated loop, and switch fabric connections. Support for both copper and fiber optic cabling is provided through a standard gigabaud link module (GLM) or embedded interfaces.

SAN Services

The following SAN services are available to help customers develop, design, configure, deploy, install, and manage a SAN solution:

- SAN Enterprise Infrastructure Assessment
- SAN Configuration Management
- SAN System Design
- SAN Project Management
- SAN Installation Services
- SAN Business Continuance.

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