

Is iSCSI the Right Choice for Your Networked Storage Environment?

Lower-cost Technology Now Matches the Performance of Fibre Channel
Technology Brief

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Executive Summary

To create a shared storage environment, your business must first decide on a standard for your new storage area network (SAN). Usually this comes down to a choice of Internet SCSI (iSCSI) or Fibre Channel technology. In the past, if cost was the big concern, a company went with the more affordable iSCSI. But if performance, security and manageability were bigger issues, a company paid the premium for Fibre Channel technology.

Today, these distinctions have been blurred. While iSCSI remains the more affordable choice, it can now in many cases match the speed, manageability and security of a Fibre Channel network. Still, there are notable differences between the two technologies and each has its advantages. So is iSCSI the right choice for your SAN? This paper will help you answer that question.



Contents

Choosing the Right Standards for Shared Storage	1
How We Got Here	1
What's Right for Your Organization?	2
iSCSI Advantages	2
Fibre Channel Advantages.....	3
Making Storage Simpler with iSCSI	4
Hitachi Simple Modular Storage	4
Hitachi Adaptable Modular Storage.....	4
Enterprise-class functionality	5
Moving Forward with Shared Storage	5
For More Information.....	5



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Choosing the Right Standards for Shared Storage

To keep pace with runaway growth in data, many small and growing businesses are deploying networked storage solutions. These solutions allow you to pool resources and share storage capacity. Rather than attaching a disk storage device directly to each server, storage is consolidated into a single system that is shared by multiple servers over a storage area network.

This shared storage approach offers many advantages. With a SAN in place, you can make better use of your available storage capacity and simplify data management and protection, because you can focus on one pool of data rather than lots of different systems and storage devices. And a SAN gives you a more flexible storage environment. When a particular application needs more storage, you can allocate capacity from your SAN, rather than buying a bigger server or another direct attached storage device.

With these and other benefits in mind, your company may now be thinking about creating a SAN. To make this move, you have to first settle on the standard that you will use to connect your servers to your shared storage system. In most cases, this means choosing between the iSCSI and Fibre Channel protocols.

How We Got Here

In years past, most companies that built storage area networks used Fibre Channel technology. That is because it was by far the fastest option for moving data over a SAN. In addition, Fibre Channel SANs offered the scalability, security and manageability features that large companies need. With Fibre Channel, companies had the confidence that their SANs could grow easily to accommodate increasing amounts of data, while still offering enterprise-class security and management features.

These benefits didn't come cheaply, however. Historically, Fibre Channel SANs were expensive to buy, operate and upgrade — so expensive that few small or medium businesses (SMBs) could afford them. So because of their cost and complexity, Fibre Channel SANs have long been a technology used primarily by larger companies with big IT budgets.

Then came iSCSI, a technology that merged two well-established standards: SCSI, the widely used small computer system interface and Ethernet, a network standard. With the arrival of iSCSI-based products, businesses had a new, far more affordable option for building storage area networks. They could now build low-cost SANs based on the same equipment used in their office networks.

But there was one big drawback to iSCSI: slow data transmission. The transfer speeds of iSCSI SANs were limited by the speeds of Ethernet networks. The Ethernet networks of the past moved data at speeds of 10 or 100 megabits per second (Mbit/sec), compared with the gigabit speeds of Fibre Channel networks. This performance difference made iSCSI less attractive for SANs. In addition, iSCSI networks suffered from a perception that they were less secure and harder to manage than Fibre Channel networks.

In recent years, all of this has changed. You might say that iSCSI has finally come of age.

What's Right for Your Organization?

To find the technology that's right for your organization, consider the strengths of iSCSI and Fibre Channel. Each offers certain advantages.

iSCSI Advantages

Fast Data Transfer

Various studies have found that iSCSI SANs now can perform as well as Fibre Channel SANs. So how did iSCSI close the performance gap? In short, the underlying networks got faster. The leap forward for iSCSI came about with the arrival of Gigabit Ethernet, the next generation of the Ethernet standard.

This standard transmits data at a rate of 1Gbit/sec. That is 10 to 100 times faster than earlier generation Ethernet networks. While today's Fibre Channel networks can theoretically move data at rates of 1Gbit/sec, 2Gbit/sec or 4Gbit/sec, today's Fibre Channel SANs are not necessarily faster than iSCSI SANs. That is because data transmissions speeds are limited by many other factors, such as the capabilities of software, servers, storage devices, disk drives and processors.

In this sense, SANs are similar to highways. If there is no congestion on the road, a car might move at the same speed on a two lane highway as on an eight lane highway. In spite of the support for much more traffic on the larger highway, a driver using the eight lane road might get to a destination at the same time as the driver using the two lane road.

So under the right circumstances, today's Gigabit Ethernet networks allow iSCSI networks to move data at speeds that are on par with Fibre Channel networks. As an example, a system with four iSCSI ports, such as Hitachi Simple Modular Storage 100, supports in excess of 1,000 average Microsoft® Exchange 2003 users and 2,000 average Microsoft Exchange 2007 users. This level of iSCSI SAN performance was unheard of prior to support of the Gigabit Ethernet. And iSCSI network bandwidth will only get better with the arrival of the upcoming 10 Gigabit Ethernet networks.

Easy Management

In addition to being the lower-cost alternative, iSCSI is a simpler technology. It uses the common tools of today's office networks, such as Gigabit Ethernet switches, standard network interface cards (NICs) and the widely used TCP/IP protocol.

If you put an iSCSI SAN in place, you should not need to recruit storage specialists to install, manage and maintain your SAN. Because you are leveraging the same IT networking equipment with iSCSI, whoever takes care of your current IT systems and office networks should have the right skills to get your iSCSI SAN up and running and manage it on an ongoing basis.

Enhanced Security

You may have heard that Fibre Channel SANs are more secure than iSCSI SANs. That is not necessarily the case. An iSCSI network can be just as secure as a Fibre Channel network if it is set up with security in mind.

For tighter security, you can build your iSCSI SAN as a network dedicated to one purpose: moving data back and forth between your servers and your storage systems. An off-the-shelf Gigabit Ethernet switch can serve as the hub of this network.

Or, should you want to use your regular office network for your iSCSI SAN, you can create a virtual local area network (VLAN). A VLAN is like a private network that lives within a larger network. With either approach, you can sleep easier, knowing that you have taken extra steps to enhance the security of the data in your storage area network.

Lower Cost

The long running iSCSI advantage — lower cost — remains today. If your company has already invested in a Gigabit Ethernet backbone, an iSCSI SAN should cost just a fraction of the price of a Fibre Channel alternative. Consider the Fibre Channel versus iSCSI cost comparison in Table 1.

Table 1. Cost Comparison for Fibre Channel and iSCSI

	<i>Fibre Channel (low end)</i>	<i>iSCSI* (low end)</i>
Host-based adapter (each)	\$800	Free Microsoft initiator available for download
Cables (each)	\$150	\$15
Switch (cost per port)	\$500**	\$80
One extra Gigabit Ethernet server card for full redundancy (iSCSI only)		\$100
Cost to connect each server with full redundancy	\$2,900	<\$250

* Assumes Microsoft Windows environment with an existing Gigabit Ethernet infrastructure.

** The cost per port on Fibre Channel Director class switches is typically higher and in some cases double the cost stated.

As this comparison shows, it can cost ten times more to set up a Fibre Channel network than to set up an iSCSI network. And this doesn't consider the time savings brought by the simplicity of iSCSI networks. Default name server functionality, for example, simplifies installation and configuration on an iSCSI SAN.

Once your SAN is up and running, iSCSI can deliver ongoing operational savings, stemming from simplified management, maintenance and troubleshooting — made possible by the use of familiar networking tools, devices and standards. It all adds up to a lower total cost of ownership.


Given these and other advantages, iSCSI SANs are usually the right choice for businesses that have fewer than 500 employees and run fewer than 25 servers. They are also often a good choice for workgroups, departments and branch offices within larger companies that have servers that do not warrant the higher cost of Fibre Channel SAN connectivity.

Fibre Channel Advantages

For larger storage environments Fibre Channel SANs continue to offer important advantages. They are particularly well suited to the need of enterprises running large-scale mission critical applications with demanding input/output (I/O) requirements.

Fibre Channel is still the mainstay of large back-office SAN implementations. Current Fibre Channel backbones (4Gbit/sec) are four times faster than iSCSI SANs, and overall host throughput on a Fibre Channel SAN can easily be eight times faster than the same host on an iSCSI SAN. Fibre Channel host bus adapters (HBAs), required on Fibre Channel SANs, are increasing system performance by offloading I/O requests from host processor(s).

So, if a company has hundreds or even thousands of servers, it probably already has a well established Fibre Channel SAN in place. Similarly, if an enterprise is running eight-socket servers tied to databases accessed by thousands of users, Fibre Channel is probably the best choice.



Applications that can benefit from the capabilities of Fibre Channel SANs typically have large amounts of data and fast I/O requirements. These include such applications as:

- Video and data streaming
- Databases with high read and write throughput requirements
- Cross-campus and remote site data replication
- Large backup applications that write to disk
- E-commerce and Web servers
- Messaging and e-mail

At an operational level, Fibre Channel SANs require a special skill set for storage administrators as well as special hardware, beyond the Ethernet components used with iSCSI networks. The costs of training or hiring these specialists can be high. But if they are already on staff, an organization has an additional incentive to stick with Fibre Channel solutions — and continue to leverage its substantial investments in Fibre Channel expertise.

Given their differences and their abilities to meet different needs, iSCSI and Fibre Channel are not so much conflicting technologies as complementary technologies. And, indeed, many enterprises with existing Fibre Channel environments are deploying iSCSI SANs to meet shared storage needs that do not warrant the expense of larger, more scalable Fibre Channel SANs. For example, enterprises are increasingly using iSCSI SANs in branch offices, at remote sites and in some self-contained workgroups and departments.

Making Storage Simpler with iSCSI

When you review the relative merits of iSCSI and Fibre Channel, it becomes clear that each offers advantages under certain circumstances. So, when choosing the right technology for your storage environment, what you are really doing is looking for the technology that best matches your particular storage requirements. The goal is to identify the technology that gives you the right balance of cost, efficiency, performance and manageability.

Whatever your decision, Hitachi Data Systems can meet your needs. Hitachi Data Systems offers native iSCSI and Fibre Channel connectivity in various modular storage products. These include Hitachi Simple Modular Storage and Hitachi Adaptable Modular Storage systems.


Hitachi Simple Modular Storage

Hitachi Simple Modular Storage was designed to make the benefits of enterprise-class shared storage available to a wide range of organizations. It was built for the needs of SMBs and the workgroups, departments, branch offices and remote sites of larger companies.

With Simple Modular Storage, Hitachi Data Systems delivers market leading availability, performance and an uncompromised reputation for reliability. Advanced self-healing features, coupled with a RAID-6 (dual parity) configuration, protect your most important information assets. Hitachi Simple Modular Storage 100 is engineered to run nondisruptively for several years without onsite maintenance.

Hitachi Adaptable Modular Storage

Should your company need increased capacity and performance, you may want to consider Hitachi Adaptable Modular Storage. These systems are designed to deliver an ideal mix of price/performance, availability and best-in-class scalability in the modular storage market.



Leveraging many high-end features, such as cache partitioning and available RAID-6, these systems are easily managed by Hitachi Storage Navigator Modular software. Hitachi Adaptable Modular Storage systems are ideal for businesses that require high availability, high-performance storage in a scalable system that can be seamlessly expanded without interrupting ongoing operations.

Enterprise-class functionality

In addition to the advantages of an iSCSI or Fibre Channel architecture, Hitachi modular storage systems offer many other enterprise-class features. These include:

- **High Availability.** Hitachi modular storage systems offer storage with no single point of failure. This is one of the benefits of an active-active controller architecture. If one controller is unavailable, all data volumes are still available via a second controller.
- **Simple Maintenance.** Should a disk drive malfunction, the easy-to-use Hitachi Storage Navigator Modular 2 software will give you a heads up on the problem and direct you to contact a support center, which will send a replacement.
- **Data Protection.** To help you protect your data, Hitachi Simple Modular Storage and Adaptable Modular Storage support RAID-6 configurations. With RAID-6, any two drives can fail at the same time — a highly unlikely event — and you still will not lose any data.
- **Built-in Data Protection.** Data protection tasks are simplified with a point-and-click, graphical user interface or GUI-based Hitachi Copy-on-Write Snapshot software. This software allows you to quickly replicate volume changes via point-in-time snapshots, without impacting host server performance.
- **Easy Installation.** Hitachi modular storage systems make it easy to deploy a SAN, even if this is your first venture into shared storage. They include easy-to-use wizards and utilities to simplify installation and configuration.

Moving Forward with Shared Storage

With the performance improvements in iSCSI and the advent of products such as Hitachi Simple Modular Storage, SANs are now easily within the reach of growing businesses, as well as workgroups, departments and branch offices within larger companies.

No longer do you have to sacrifice performance to move forward with an iSCSI SAN. If your organization is running a Gigabit Ethernet network, you already have the fundamental infrastructure in place for a high-performance iSCSI-based SAN that brings you the benefits of shared storage.

When you are ready to move forward, Hitachi Data Systems and its partners have all the hardware, software and services you need for a SAN solution — one that brings you enterprise-class benefits on an SMB budget.

For More Information

To learn more about networked storage solutions for your business, visit the Hitachi Data Systems SMB Resource Center: www.hds.com/solutions/smb.

Or to explore the broad range of storage products, services and solutions from Hitachi Data Systems, stop by: www.hds.com.

