



iSCSI: Networked Storage for the Masses

A White Paper

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Executive Summary

iSCSI is changing the storage networking landscape dramatically, particularly for IP-savvy small- and medium-sized companies. For the first time, they can afford to consolidate storage that was once dispersed throughout their IT infrastructures with some storage devices underutilized and others running out of space.

Leveraging their existing IP network infrastructures and internal expertise provides cost savings over Fibre Channel. Standard NICs are far cheaper and thus more appropriate than Fibre Channel host bus adapters (HBAs) when connecting relatively low-cost servers to storage. Moreover, Fibre Channel experts are scarce and expensive.

Fibre Channel is firmly established within today's data center environments, and end users have no plans to tear out and replace this valuable infrastructure. But even existing Fibre Channel sites can use iSCSI to deploy storage over IP in a way that is complementary to existing SANs, increases the number of storage access points, and enhances consolidation opportunities. Doing so leverages IP infrastructure features, including ever faster performance, quality of service (QoS) capabilities, and lack of distance limitation for data replication.

In an effort to serve the needs of small- and medium-sized businesses, Hitachi Data Systems and McDATA® have teamed to offer the Hitachi TrueNorth™ iSCSI SAN Solution, with McDATA, a cost-effective SAN alternative. Because most such companies have the Ethernet-IP network infrastructure and intellectual expertise required to accommodate these SANs, they are perfectly placed to take advantage of the higher productivity, lower implementation costs, enhanced SAN management capabilities, and proven technologies offered by the Hitachi TrueNorth iSCSI SAN Solution.

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Life without storage networking? Imagine islands of unaccountable, often inaccessible storage dispersed throughout IT infrastructures in a crazy-quilt fashion that defies understanding and organization. Storage devices vastly underutilized. Individual user groups treating their direct attached storage (DAS) as their own personal file systems. And banish the thought of sharing. Data as a shared strategic resource is an unfulfilled promise.

Fantasy or fact? The fact is that until the recent emergence of iSCSI—the application of SCSI storage device protocols to conventional IP networks—storage networking remained beyond the grasp of many small- and medium-sized companies that could benefit greatly from its advantages. It is only at the largest corporations that storage networking has fulfilled its potential through the use of high-speed Fibre Channel storage area networks (SANs) and advanced network attached storage (NAS) implementations. Why the disparity? There are several reasons:

- Fibre Channel technology has been prohibitively expensive for small- and medium-sized businesses.
- There are significant interoperability issues with Fibre Channel components.
- Fibre Channel and IP have existed as separate networks.
- Fibre Channel expertise is a scarce commodity and therefore expensive to obtain.
- Despite its wide bandwidth, Fibre Channel is distance-constrained.

iSCSI is changing this landscape dramatically, and these changes are expected to accelerate. According to IDC, the iSCSI market will jump from US\$216 million in 2003 to over US\$1 billion by the end of 2004, and almost US\$5 billion in 2007. Among the things driving the boom are the spring 2003 ratification of the iSCSI specification, the increasing prevalence of Gbit IP LANs, and the fact that the CPU performance of today's servers is able to absorb the TCP/IP processing overhead that was once thought to be a serious inhibitor to iSCSI acceptance.

iSCSI: Resolving the Disparities

Like Fibre Channel, iSCSI is a block storage protocol. However, Fibre Channel encapsulates SCSI commands, status, and data in Fibre Channel framing, while iSCSI performs the same encapsulation in TCP/IP. Using iSCSI device drivers and standard Ethernet network interface cards (NICs), iSCSI can be used to consolidate servers into more comprehensive shared storage SAN solutions.

iSCSI is generally attractive to IP-savvy small- and medium-sized companies that find themselves with an ever larger inventory of DAS that has accumulated as “stranded” storage. This stranded storage is not “SAN-worthy,” meaning it is so inexpensive that the cost of connecting it to a Fibre Channel switch is higher than the value of the storage itself.

These small- and medium-sized businesses are understandably price-sensitive. After spending US\$2,000 to US\$3,000 on a server, they are unwilling to shell out up to US\$2,000 per server to connect to a Fibre Channel SAN. What sounds a lot better is installing a free iSCSI device driver on the server’s existing Fast Ethernet or Gigabit Ethernet card, and front-ending Fibre Channel storage with an IP storage switch. This makes iSCSI an ideal solution for those stranded servers, which can now use existing IP network access for block data access or backup.

Fibre Channel Replacement? NAS Competitor?

Interoperability is the holy grail of storage networking, but Fibre Channel has failed to fully achieve it. At this point, end users are still waiting for the day when they can choose their Fibre Channel vendors based simply on price, functionality, and performance, as opposed to whether or not Vendor A can plug into Vendor B’s products. In the meantime, iSCSI promises universal connectivity through the SCSI parallel interface. That connectivity is even extending to Fibre Channel SAN islands, which, in the wake of iSCSI’s growing popularity, are commonly being connected via IP networks.

Even though this connectivity advantage plus the potential for iSCSI to ride the Ethernet fast track to higher throughput have been enough for some to declare iSCSI the likely successor to Fibre Channel, most experts view the two as complementary—rather than conflicting—technologies.

Indeed, Fibre Channel is firmly established within today’s data center environments, and end users have no plans to tear out and replace this valuable infrastructure. iSCSI is most attractive to companies with no existing Fibre Channel investment, or organizations with existing SAN environments that have a need to centralize server storage in situations where Fibre Channel is not a cost-effective or realistic option.

Another source of confusion is a replay in the trade press of the NAS versus SAN debate, when NAS and SAN were originally cast as arch competitors in many reports. A similar rivalry is being foisted on iSCSI and NAS, primarily because they both use TCP/IP and Ethernet as network infrastructure. As a result, iSCSI appears to compete with NAS for LAN-based storage access.

In reality, the underlying “plumbing” is immaterial. iSCSI, like Fibre Channel, is optimized for block I/O using encapsulated SCSI. NAS is a file serving technology that doesn’t extend block I/O across the network.

The Benefits of Tapping IP Infrastructure

The hard-to-find and expensive nature of experienced Fibre Channel IT personnel has been another deal-breaker for small- and medium-sized firms. Experienced Fibre Channel technicians almost always work for large companies, and they have been paid handsomely to do so. Small- and medium-sized companies have little hope of luring these high-priced IT professionals away. Fortunately, that no longer matters because the companies deploying iSCSI SANs already have the IT infrastructure and internal expertise needed to implement and optimize iSCSI networking.

In fact, iSCSI's use of existing IP network infrastructures translates into multiple cost savings for end user organizations, which:

- Do not have to extensively upgrade existing hardware to support their iSCSI storage solutions.
- Do not have to train employees on Fibre Channel technology to the tune of \$1,000 per day.
- Are able to implement their solutions more quickly than they can with other protocols.

If connecting servers distributed across a wide area to storage is an issue, iSCSI also has an edge over Fibre Channel's 10-kilometer distance limitation. iSCSI users can employ iSCSI links over IP networks that are only limited by the extent of the IP networks themselves. (Fibre Channel SANs can be extended or interconnected over IP networks.)

iSCSI's leverage of IP infrastructure also contributes to its growing popularity with major IT vendors. For example, Microsoft now offers a free iSCSI driver from its Web site. In addition, many vendors, including industry giants Cisco Systems and Intel, offer iSCSI software and/or hardware products.

Bottom line: iSCSI presents a cost-effective opportunity to deploy storage over IP while leveraging IP infrastructure features, performance, QoS capabilities, network management, end-user expertise, and economics. It is complementary to existing SANs, increases the number of storage access points, and enhances consolidation opportunities. iSCSI can be used for many applications, including database management, mail serving, backup, and streaming media.

Postal Remittance and Savings Bank: a Happy iSCSI User

One example of iSCSI in action is Taiwan's Postal Remittance and Savings Bank (PRSB). In Taiwan's competitive financial markets, PRSB stands above the crowd. At the end of 2001, the bank's Postal Savings System (PSS) accounted for 15.43 percent of the country's total outstanding deposits.

In 2002, PRSB embarked on a Mail Consolidation Project. Designed to simplify, streamline, and improve the efficiency of PRSB mail services, the project's goal was to fulfill the bank's immediate needs while developing the capacity to respond quickly to an accelerating market. The result is one of the most advanced iSCSI implementations to date.

At PRSB, Hitachi Data Systems deployed Fibre Channel storage systems with IP-based hosts using iSCSI. The final solution included two Hitachi storage systems, one Nishan IPS3300 IP storage switch (note: Nishan Systems was acquired by McDATA in the autumn of 2003) and 16 Gigabit Ethernet NICs from Alacritech, along with Hitachi software. Hitachi Data Systems partners Acer and Wahoo assisted with integration and networking applications, respectively.

This mixed protocol solution allowed PRSB to leverage existing assets with iSCSI for high availability, high scalability, and high performance while staying within budgetary limits. The bank can now manage its storage traffic using existing in-house expertise, and is prepared for the future—i.e., remote data access—because it already operates its storage traffic on an IP network.

As testimony to how smoothly the project went, the implementation took less than six months from initiation to go-live, beginning in November 2002 and ending by April 2003.

The Hitachi TrueNorth™ iSCSI SAN Solution, with McDATA®

In an effort to serve the needs of small- and medium-sized businesses, Hitachi Data Systems and McDATA have teamed to offer the Hitachi TrueNorth iSCSI SAN Solution, with McDATA, a cost-effective SAN alternative.

This turnkey solution includes the Hitachi Thunder 9570V™ high-end modular storage system, the McDATA Eclipse™ 1620 SAN internetworking switch, and the Hitachi Data Systems Global Solution Services Enablement Service for Hitachi TrueNorth iSCSI SAN Solution (GSS Enablement Service). The product bundle allows small- and medium-sized businesses to gain the benefits of networked storage, while lowering total cost of ownership through storage consolidation, improved capacity utilization, centralized backup, and unified storage management over IP networks.

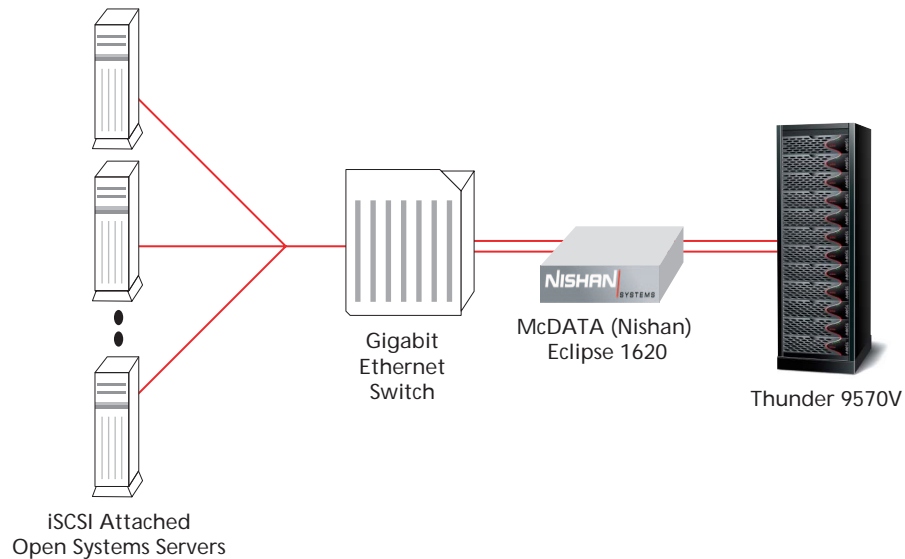


Figure 1: The Hitachi TrueNorth iSCSI SAN Solution, with McDATA.

The highly versatile Thunder 9570V system delivers the performance for demanding applications, the intelligence for simplified management, and virtual host ports to safely accommodate multiple heterogeneous hosts attached a single physical port. By connecting a Thunder 9570V system to native iSCSI hosts, end users can increase the number of servers attached to the storage, further enabling storage consolidation.

The McDATA Eclipse 1620 multi-protocol storage switch uses cost-efficient, standards-based IP and Gigabit Ethernet for storage fabric connectivity. The switch supports iSCSI, iFCP, and E-Port for trunking to both IP backbones and Fibre Channel fabrics. It also connects to a variety of end systems, including Fibre Channel and iSCSI initiators and targets. It has a non-blocking architecture that supports Ethernet Layer 2 switching, IP Layer 3 switching, and Fibre Channel switching over extended distances at full gigabit wire speed. It can be fully integrated into existing IP networks.

GSS Enablement Service

The GSS Enablement Service for the Hitachi TrueNorth iSCSI SAN Solution is designed to help customers understand the basic concepts pertaining to the configuration and use of the solution in a Microsoft® Windows® environment. Through a workshop approach, GSS professionals provide a pilot installation on one non-production computer to access the storage from an iSCSI initiator.

Those who should attend the GSS Enablement Service include storage, system, SAN, and network administrators. The presentation and lab materials used during the workshop are left with the customer. Documents include the overview of technologies and components, as well as the lab materials containing step-by-step instructions for performing allocation of storage to a Windows environment via iSCSI.

Conclusion

Small- and medium-sized businesses that were previously excluded from the benefits of storage networking are now in a position to fully realize these benefits through the use of iSCSI-based SANs deployed across IP networks. Because most of these companies already have the Ethernet-IP network infrastructure and intellectual expertise required to accommodate these SANs, they are perfectly placed to take advantage of the higher productivity, lower implementation costs, enhanced SAN management capabilities and proven technologies offered by the Hitachi TrueNorth iSCSI SAN Solution, with McDATA.

This solution fits into the Hitachi Data Systems open and collaborative TrueNorth strategy and its Partner Beyond Technology way of doing business. In the future, Hitachi Data Systems will continue to provide the appropriate solutions for each of its customers' particular environments and needs, whether they be iSCSI, NAS, or Fibre Channel SANs.

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