



SOLUTION OVERVIEW

CISCO STORAGE AREA NETWORKING IN HIGHER EDUCATION INSTITUTIONS

Empowering the academic community to meet new information demands, reduce total cost of ownership, and improve data integrity and availability.

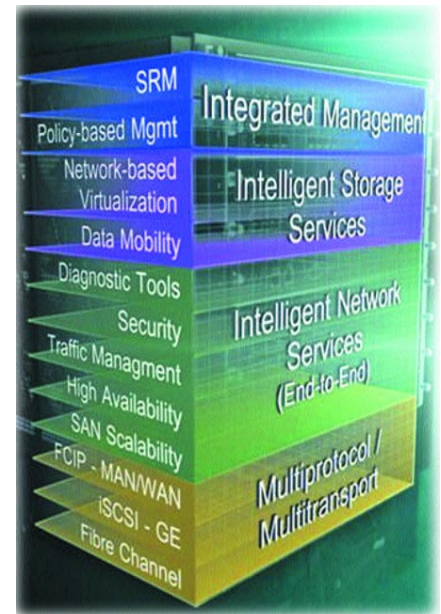
EXECUTIVE SUMMARY

Colleges and universities face an ever-increasing need for data storage, created by new administrative applications, more powerful research tools, distance learning applications, and a growing population of computer users. Storage area networking can help institutions meet these new requirements, as well as reduce total cost of ownership and improve data integrity and availability. The Cisco MDS Family provides a full line of products to meet requirements for storage networks of all sizes and architectures.

CHALLENGE

Higher education institutions must stretch scarce resources because of financial shortfalls, increasing enrollments, and increasing student expectations. Data-storage requirements are continually increasing for colleges and universities as a result of trends such as:

- Increasing numbers of new administrative IT applications in the higher education environment, such as student information systems, Web-based self-service applications for students, and financial reporting applications that generate large amounts of data.
 - More powerful and data-intensive research applications, such as bioinformatics, computer-aided design, and supercomputing applications used in academic research laboratories.
- A growing population of students using computers who demand more storage space for their data. According to the U.S. National Center for Education Statistics (NCES), between 1990 and 2000 enrollment in higher education increased from 13.8 to 15.3 million; during 2003 many institutions across the United States experienced record-high enrollments.
 - The rise of distance learning, broadcasted instructional programming, and e-learning, which generate an increasing amount of online content to be stored and distributed. According to the NCES, in 2002 approximately 84 percent of U.S. four-year colleges offered distance-learning courses, and total enrollment in distance-learning courses reached 2.2 million.
 - The near-universal adoption of online communications technologies, especially e-mail, that drive increased storage requirements.



WHY STORAGE NETWORKING?

Storage area networks (SANs) offer several important benefits for higher education institutions.

Reduced Total Cost of Ownership

Higher education campuses worldwide are experiencing increased competition for quality students, greater expectations from students, tighter budgets, and pressure to accomplish more without increasing spending. Consequently, these institutions are challenged with getting more value from each dollar spent on information technology. SAN technology can help IT managers enhance the value of IT investments by reducing the total cost of ownership (TCO) of storage resources in several ways:

- **Storage consolidation**—By implementing SAN and network attached storage (NAS) technology, institutions can consolidate their storage resources. Without an effective storage network strategy, disk utilization has been estimated as low as 40 to 50 percent. Storage consolidation enables organizations to avoid purchases of additional storage because storage can be allocated where it is needed.
- **Reduced management costs**—SANs are easier to manage than direct attached storage (DAS) because they offer a simplified, central point of control for monitoring, backup, replication, and provisioning. A recent study by McKinsey and Merrill Lynch shows that the TCO of SAN solutions typically is less than half that of DAS solutions, primarily because of management cost savings.
- **Reduced backup costs**—Backup and recovery applications can be much easier to run in a SAN environment. Centralizing and consolidating backup functions can reduce the number of tape drives that need to be purchased, and can decrease the time it takes to perform backups.
- **Improved utilization of storage resources**—Enterprisewide SAN and NAS resources can be shared across campus networks, metropolitan-area networks (MANs), and WANs. SANs allow any-to-any access and connectivity between storage and servers. This enables servers to be better matched with underutilized subsystems, and overall capacity utilization can increase. Sharing storage resources across networks also improves storage capacity utilization, reducing the need for additional storage space in the future.

Improved Data Availability and Integrity

Storage downtime can have a serious adverse effect on daily operations. Today's diverse student population includes on-campus students, distance learners, and prospective students. All require 24-hour access to information on the network. Downtime can also severely affect university research activities, reducing productivity and even losing data. SANs can minimize downtime by providing:

- **High availability**—SANs allow for easier implementation of high availability, or greater than 99.999-percent uptime. Redundant, multiple paths from servers to storage provide scalable support for automated failover across all storage systems. Servers can connect to remote storage even over vast distances, bypassing traditional cable limitations.
- **Improved disaster recovery**—A consolidated storage network enables global management and execution of remote backup and restore, centralized tape archiving, and disaster recovery for SAN and NAS environments. By bypassing the geographical limitations of direct-attached environments, SANs enable remote replication of not just one storage subsystem, but, potentially, entire data centers.

SOLUTION

The conventional storage environment creates barriers for institutions that want to derive value from their storage platforms. These include:

- No sharing of storage infrastructure across the institution
- No single point of management
- No data access beyond the “SAN island” (that is, “silos” of inaccessible data)
- No integrated advanced diagnostics
- No single-vendor transport across LAN, MAN, or WAN for disaster recovery
- No integrated support for network-based storage services

Cisco Systems® offers a comprehensive portfolio of storage solutions designed to address these issues. Cisco solutions enable higher education institutions to build highly available, scalable storage networks with advanced security and unified management.

The Cisco MDS 9000 Family of storage networking products includes the following products:

- Cisco MDS 9500 Multilayer Director—Layering a rich set of intelligent features onto a high-performance, protocol-independent switch fabric, the Cisco MDS 9500 addresses the stringent requirements of large data center storage environments.
- Cisco MDS 9216 Multilayer Fabric Switch—This switch combines multilayer intelligence with a modular chassis, making it a highly intelligent and flexible fabric switch.
- Cisco MDS 9100 Multilayer Fabric Switch—This fixed-configuration switch provides the ideal balance of cost, performance, and enterprise-class features in a compact, one-rack-unit (1RU) form factor.
- Cisco MDS 9000 Port Analyzer Adapter—The device is a ready-to-use accessory for the Cisco MDS 9000 Family of directors and fabric switches that enables simple, transparent analysis of Fibre Channel traffic in a switched fabric. The Cisco MDS 9000 Port Analyzer Adapter eliminates the need for expensive, standalone protocol analyzers.
- Cisco MDS 9000 Optical Module—This module offers a broad range of SAN connectivity solutions for both local and extended reach.

The Cisco MDS 9000 Family provides a full line of products to meet requirements for storage networks of all sizes and architectures. These products help lower the TCO for storage networking by combining the robust and flexible hardware architecture with multiple layers of network and storage intelligence. This powerful combination helps organizations to build highly available, scalable storage networks with comprehensive security and unified management.

CASE STUDIES

Following are a few examples of universities that have deployed storage networking solutions from Cisco.

The University of Houston-Downtown

Using an Existing IP Network to Build an IP Storage Network and Drive Cost Savings

Since it was founded in 1974, the University of Houston-Downtown (UHD) has more than doubled the size of its student population, increased the number of degree programs from 1 to nearly 40—including two graduate programs—renovated and expanded the campus, achieved accreditation, and received national recognition for its student diversity and outstanding academic opportunities. To serve the growing demand of its students and the public for online study, UHD increased the number of content and courseware servers in its data center. But the growth of servers and DAS soon became unwieldy, creating both management and scalability challenges.



UHD decided to take advantage of its existing IP network infrastructure and build an IP storage network rather than construct a new Fibre Channel network. Using multiple Cisco storage routers for network redundancy and iSCSI software for its servers, UHD built an IP storage network across its Gigabit Ethernet infrastructure. *UHD estimates that it saved almost US\$10,000 per server by using an IP storage network rather than Fibre Channel.* UHD also avoided the dramatic increase in ongoing costs of maintaining a separate network infrastructure and gained a flexible, IP-based platform that would support its move to an online business model.

Rice University

Realizing Significant Financial Efficiency Through iSCSI

Like many higher education institutions, Rice University had storage requirements previously met by directly attaching storage to servers. Rice found that adding storage to servers was expensive to manage and inefficient because server-attached storage does not accommodate a global approach to storage management. Without storage consolidation, the university's storage resource utilization was unacceptably low. Rice conducted an analysis and determined that new, more efficient operating practices were available with iSCSI-based storage networks.

iSCSI uses a well-understood network and delivers a low-cost solution for consolidating storage. The result is equipment and staffing cost reductions through the improved efficiency that comes with iSCSI-based storage pools. The university took advantage of iSCSI and Ethernet to further lower its costs. It implemented a quad Fast Ethernet interface from its servers that trunked the quad interface for higher throughput and provided automatic failover among the trunked links. This solution accounts for SCSI being both a physical interface and a protocol.

Applications use the protocol to communicate with storage devices. Between the application and the storage device are several transport systems. First there was the parallel interface, followed by Fibre Channel, and now the SCSI storage protocol that operates over TCP/IP and Gigabit Ethernet. Cisco storage routers deliver the critical link between Gigabit Ethernet and Fibre Channel. Applications are not affected and because applications interface with a generic SCSI layer in the host, they cannot distinguish the difference between iSCSI and Fibre Channel. This transparency gives Rice University complete flexibility in architecting its storage network.

Deakin University

Deakin Deploys an Intelligent, Multilayer SAN to Better Manage Records for 30,000 Students

Deakin is one of Australia's most progressive universities, serving about 30,000 students across 6 campuses. To reduce the cost of managing data, make data more accessible to teachers and students, and create a storage platform that can handle e-learning and Web-based applications, the university is migrating to a centrally managed, consolidated storage model using a solution provided by Cisco and one of its solution partners. The consolidation will more than triple Deakin's storage capacity and make managing data easier. Deakin has deployed two Cisco MDS 9509 multilayer directors with IBM's Total Storage Enterprise Storage Server (ESS) 800 Turbo, capable of holding 55.9 terabytes (TB).

Deakin has initially implemented 30 TB. The combined storage system will be one of the largest in Australia in terms of data capacity. Deakin will logically partition capacity within this larger SAN using virtual SAN (VSAN) technology available on the Cisco MDS 9509. VSANs allow Deakin to manage a single physical storage network that maintains the security and access control of separate SAN "islands."

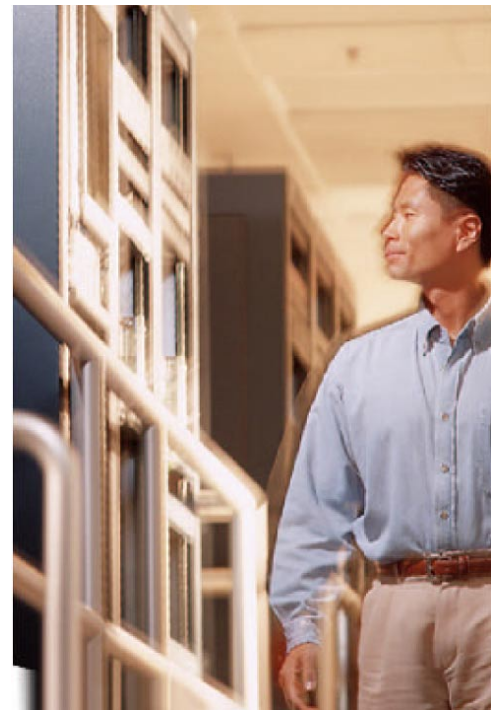
Deakin plans to expand and extend access to this SAN to more of its servers using the multiprotocol capabilities of the Cisco MDS 9509. Specifically, Deakin plans to use iSCSI for low to mid-range servers and applications to connect to its SAN and to use Fibre Channel over IP (FCIP) for remote connectivity and disaster recovery applications.

WHY CISCO

Storage networking can yield significant benefits such as lower TCO and higher data availability. Cisco has incorporated intelligent network services into a protocol-independent, flexible platform designed to transparently integrate SAN, LAN, MAN, and WAN connectivity for a complete, end-to-end storage networking solution. Cisco offers proven network expertise for storage networking such as:

- Scalable, highly available network elements featuring a high-speed architecture, high port density, VSAN capability, and robust management and debug features
- Multitransport capability based on a scalable network platform
- A highly manageable, feature-rich intelligent services platform
- Integrated data center with LAN, MAN, and WAN management
- Award-winning service and support

The diverse storage networking product portfolio offered by Cisco helps your institution extend its storage network to better support students, faculty, and other network users.



FOR MORE INFORMATION

For more information about the Cisco storage networking, visit <http://www.cisco.com/en/US/products/hw/ps4159/index.html> or contact your local account representative.

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