

Storage Networking

The Evolution of Information Management

Storage Rises

A fundamental shift has taken place in the Information Technology industry and in corporations utilizing IT. Today, information storage is a strategic asset for business-from mission-critical applications to data mining, marketing, and examining trends and business patterns. For today's enterprise, it is imperative to view storage strategically. Industry-leading systems manufacturers have noticed this shift-a shift that once focused on OSes and then processors and later networks, but has now focused on storage. This is evidenced by the number of storage divisions that have recently emerged within leading OEMs.

Storage Networking (SN) is a key enabling technology that is opening the door to 21st-century information management. Storage Networking answers the fundamental question of how a storage architecture will enable the next generation of information-centric computing.

Traditionally, client/server computing has been used to solve enterprise storage needs. There have been a number of unsolved issues, however, that prove this model inadequate. Limited clustering, cabling distance constraints, and file/data sharing across operating systems are just some of the key issues.

Fibre Channel alone has made an important impact on improving client/server computing. Fibre Channel's raw characteristics and capabilities increase the scalability, manageability, performance, fault tolerance, and cost efficiency (total cost of ownership) of today's client/server systems.

Fibre Channel also enables a new method of sharing information across networks and servers. Storage Networking (SN) is a unique model that supports the protocols of both networks and storage devices onto one common fabric, known as the storage network. Storage Network developments will carry all of the advantages of today's network architecture and move the information intelligence workload away from the server and more onto the individual devices (disc drives, tape drives, arrays, switches, etc...) within the network.

Under SN, servers do not explicitly own the information; they share a common back-end storage network with storage attached that allows all servers equal access to the information, allowing users to access more information much faster. SN also introduces hardware cost savings; rather than having various storage devices communicate first through a server and then the rest of the devices on the network, now arrays and other storage configurations can be directly attached to the network and accessed directly by the user or application server. This concept is similar to that of network-attached printers on a LAN: several years ago, a print server had to be established in order to receive and queue document requests from various users. Printer manufacturers embedded networking technology into printers, making the devices capable of direct network attachment. The same is now holding true with storage.

Additionally, Storage Networking delivers the centralized data management capabilities of mainframes with cost savings generated by offering much greater granularity. In order to increase the scale of a storage network, devices can be added on a piecemeal basis—a new array here, perhaps a new RAID later. This contrasts against the mainframe model that could require the addition of an entire, additional mainframe in order to increase scale.

There are multiple advantages to the Fibre Channel backbone that is rapidly becoming the dominant technology driver in Storage Networking. First, the bandwidth afforded by Fibre Channel today is tremendous: up to 1 Gbps on a single serial link. This rate is expected to continue to grow in the years ahead. High throughput is imperative for server-to-server and storage device-to-server connectivity, or else the advantages of SN are quickly lost.

Secondly, Fibre Channel is extremely scalable. Since Fibre Channel is now a well-accepted network medium, a number of topologies have been developed, ranging from point-to-point and switched connections to arbitrated loops. A single Fibre Channel loop can address up to 126 other devices. Each hub or switch can support a multiple number of loops, depending on the number of ports on the interconnection device. The interconnect devices can be linked together to provide a completely-scalable environment.

Further, Fibre Channel is very much protocol-friendly. Fibre Channel, in many ways, is nothing more than a huge pipe: all sorts of different forms of communications packets can be transferred across Fibre Channel topologies: conventional networking protocols, extended SCSI commands, video streams, and audio communications, just to name a few.

Fibre Channel also exhibits very low latency times. This provides a more ideal environment for server clustering, which depends on quick access to information. Thanks to Fibre Channel, the number of connections between servers is substantially reduced, and thus performance is improved.

Finally, Fibre Channel is very robust. While Fibre Channel can be implemented in the copper medium for smaller-scale systems, the beauty of optically-enabled Fibre Channel technology is the high data integrity it provides for very long distances without repeaters. A single point-to-point connection can span up to 10 kilometers with no signal degradation.

The Three Phases of Implementing Storage Networking

Rarely does an IT organization drop one architecture to immediately adopt another. Rather, most companies adopt an “add and embrace” strategy, adding new technology and devices to their existing IT systems and then marrying the technology and capabilities to legacy equipment.

Storage Networking is designed to support this model. The first phase of Storage Networking simply adds Fibre Channel as an interface. A server attached to a network will run Fibre Channel to a hub or switch, which are in turn connected to various Fibre Channel devices. SCSI bridges will allow non-Fibre Channel devices to also interact with the hub or switch.

At the second stage, multiple servers come into play. The servers address the same hub or switch, and thus the devices attached to the Fibre Channel fabric. Many companies today are between the first and second stage of implementation.

The third stage is where the capabilities of SN truly become apparent. At this point, devices are migrating from SCSI bridges to direct connectivity with Fibre Channel. Heterogeneous servers all connect to the same Fibre Channel fabric and less sophisticated, ethernet-based storage solutions begin to gain access to the Storage Network as well.

Object-Oriented Devices

Seagate is also developing object-oriented device (OOD) technology. OOD delivers intelligence at the disc drive level to manage individual files by parameters set by the user. Currently, operating systems serve in such a function, creating substantial bottlenecks for data throughput. With OOD, one storage device can communicate directly with another without interacting with any platform OS. The manageability OOD envisions is also promising: a device can automatically know to back up a certain series of files every X hours, and so on.

The intelligence that SN brings to Fibre Channel is the ability to efficiently and optimally manage all of the various storage devices within the SN. SN software can be configured to create several different storage management scenarios for the network. Data clustering can be established to provide high availability to information while also providing high scalability. SN also boosts data interchange, the automated movement of data from one storage system or environment to another. Information that would normally be kept online can effectively be moved to a nearline or offline state with SN, while still offering both the accessibility of an online medium and cost reduction found with nearline and offline media. Data protection is also extended with SN; more elaborate and intelligent RAIDs, clusters, and mirrors can be developed with SN intelligence. With Fibre Channel's extended cable lengths, remote mirroring of systems can be achieved in a cost-effective manner that is ideal for disaster recovery situations. Information can be stored offsite while still connected directly to the SN and offering the same performance and accessibility as a device found in the local IT closet.

Bringing the Pieces Together

Seagate is a key enabler of SN technologies. As an initiator of over four drive interfaces throughout the years and a leader within several fields of storage devices and technology, Seagate has delivered much of the technological innovation necessary to deliver the information storage, access, and management intelligence that we have today. And with the company's legacy of making the formerly impossible suddenly possible, Seagate is ideally positioned to lead the initiation of exciting, new capabilities for tomorrow.

Seagate Software's award-winning products are well recognized for the data storage, access, and management they provide. This division of Seagate demonstrated the capabilities and benefits of HSM while also developing some of the most recognized and sought information reporting and backup tools available. Seagate Software has developed the

technology to make widespread implementation of Networked Storage Management a success, and it is aiming ahead at delivering the software necessary to make the next generation of SN an even greater success for users.

As the first company to introduce Fibre Channel-enabled disc drives in 1994, Seagate's high-end drive division provides the products that are a cornerstone for today's server and enterprise environments. Seagate is also exploring new products to bring fresh perspectives to storage solutions. One example of this is the company's purchase of Quinta Corporation and continuing development of Optically-Assisted Winchester recording technology, designed to boost storage capacities past the paramagnetic limit and up to such heights as areal densities reaching toward 250 Gbits per square inch. The company's high-end drive operations are sure to lead the industry in the application of onboard storage device intelligence for SN, as well.

Seagate's Removable Storage Solutions (RSS) offers an equally favorable, bright future. With the development of blisteringly-fast and capacious tape drives using Linear Tape Open (LTO) technology-the revolutionary, industry-standard tape technology co-developed by Seagate, Hewlett-Packard, and IBM-as well as the innovative Advanced Intelligence Tape (AIT) drives, Seagate's RSS is perfectly poised to continue the development of SN-friendly tape storage products. With these tape drives, all sorts of new storage paradigms will be made possible. Beyond data imaging (storage system duplication), safety nets can be implemented for various parts of the SN. Archival library storage will be implemented through Seagate Software applications and be completely transparent to the end-user.

Seagate has also invested in Gadzoox, a developer of Fibre Channel hub and switching equipment. This partnership provides Seagate with a unique insight to the development of Fibre Channel as a network interface.

The Business of Providing Information, the Way You Want It

Seagate is now the company that people look to for the products and technologies that let them store, access, and manage information, the way they want it. With Seagate's broad line of storage products-information and storage management software, disc drives, tape drives, and beyond-all being developed jointly to integrate seamlessly in the developing SN environments, customers gain tremendous advantages from the company's information management expertise.

Seagate's leadership in the science of electronic data storage is clear, and it has already catapulted the world of computing from booting personal computers from a floppy diskette to tying together countless volumes of information that lay only a mouse click away. Seagate, working hand-in-hand with leading companies in the networking, systems, and peripherals fields, has established a vision for tomorrow, and the future is bright. And, as the only company solely committed to the development of products that enable users to store, access, and manage their information, customers can rest assured that Seagate will deliver the broad set of components necessary for SN's success. And ultimately, through these and many other technologies provided by Seagate, users will be better empowered to get their information, when, where, and how

they want it.

By Tyson Heyn
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