NetworkWorld white paper

STORAGE NETWORKS:

A Place For Everything

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The World Is Watching

WHO'D HAVE EVER THUNK IT?

There on the cover of *Forbes Magazine's* October 2 issue was the chief executive of a storage company with the simple headline, "BOOM! Suddenly storage is hot." Perhaps more accurately, the headline should have read, "Suddenly storage is mainstream." Because as you IT network managers know, storage has been white-hot for some time.

Being mainstream, now that's different. One thing mainstream means is that the multibillion dollar storage investments that businesses around the globe are making annually will increasingly attract the scrutiny of executives across the company. The simple question will be, "What is all this storage stuff doing for the bottom line?"

Fortunately, there are lots of good answers, owing in large measure to the networked, enterprise-wide nature of the action in storage today. For example, a lot of the effort of deploying network storage strategies is directed at consolidating the far-flung, static storage systems previously deployed.

Network storage strategies are not only more efficient, cost-effective storage architectures, but they also permit universal, ubiquitous access to enterprise data from anywhere at any time and from just about any device. That's a win-win any executive can comprehend.

So dive into "A Place For Everything" and see what's hot in storage network areas like security, standards, storage outsourcing, and network storage integration. And remember that when it comes to your approach to network storage strategies, for better or worse, "the whole world is watching."

Bill Laberis
Editor

NetworkWorld white paper

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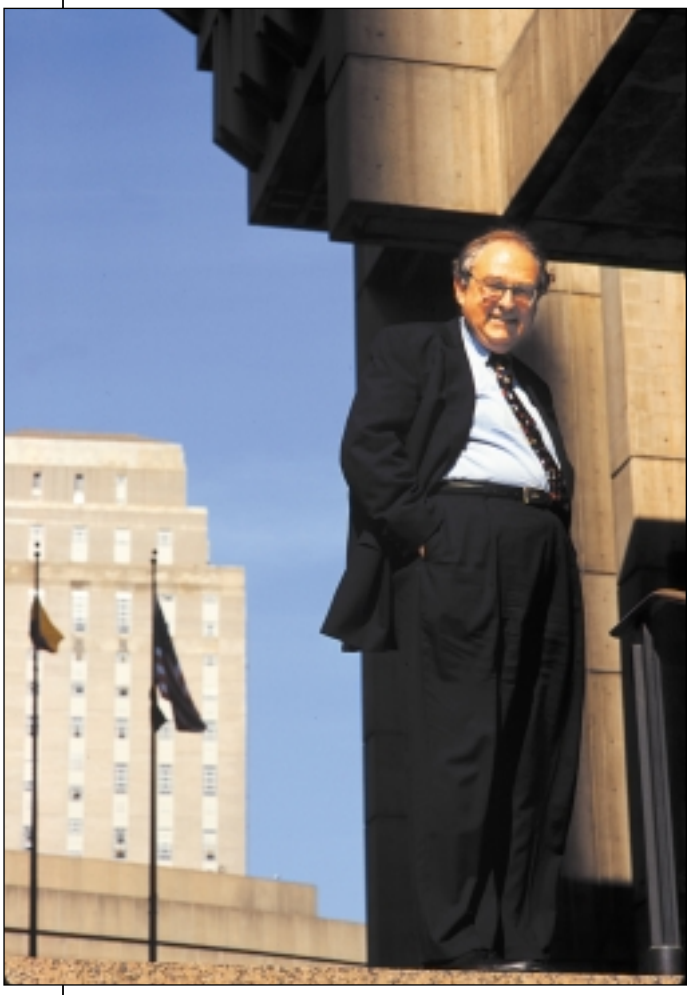
INSIDE THIS ISSUE:

GIVING STORAGE Some Respect

Aberdeen's Dave Hill, who calls storage management the Rodney Dangerfield of IT, advises enterprises to match storage solutions with business needs.



Dave Hill, *research director, storage and storage management, for Boston-based Aberdeen Group.*

Dave Hill, research director, storage and storage management, for Boston-based Aberdeen Group, advises storage and storage management suppliers on how to address enterprise needs for storage networking. He also is conducting an extensive review of storage and storage management suppliers for a comprehensive buyer's guide on enterprise storage. He recently spoke with reporter Betsy Harter.

What are the biggest issues in storage networking today?

Interoperability and manageability. You can't easily mix and match different brands of storage-networking equipment and different brands of storage. You must make sure you are as homogeneous as possible with servers and storage, to minimize any costs you might have with interoperability and manageability. Work closely with your key supplier in its interoperability labs to ensure everything will work together. You may have to contact a third-party interoperability lab.

Manageability is another issue. In a sense, storage is the Rodney Dangerfield of the IT infrastructure because people always wanted to go where the action was—the operating systems, networking, or applications. You don't have enough storage experts because people were not trained.

How can enterprises more easily manage their storage business?

To reduce complexity, you need software. For example, data placement allows you to do things such as storage personalization and storage resource management (SRM). But because people are not as familiar with storage personalization or SRM, they are not able to apply some of the techniques.

Storage personalization helps hide complexity. For example, you have two arrays of storage: One is always running

out of space and the other has more space than it needs. You can combine them into a virtual pool of storage that is easy to manage, so every application gets the storage it needs. It also is easier to add capacity without bringing down the server.

Another problem is space allocation. SRM helps you better manage your storage space. For example, when you create a file, data is captured about when and where you saved it, how big it is, etc. A SRM tool can capture that information and map it for your file, as well as all the other files you have on your disk or in a storage pool. It measures how much is being used versus how much is available. If you are at 90 percent of usage, it issues alerts. It also calculates how long it would take to run out of space. And it determines who the big users are, and when those peak loads occur. It is basically planning capacity better.

One issue a lot of organizations have is obsolete data, such as some e-mail. The question is, do you want to move it off to some other storage? It may take you longer to find it, but the higher storage management will allow you to bring it back if you need it.

Another problem is somebody shares a 1MB attachment with 30 friends via e-mail. That needs 30MB of storage, and it is all on a server that doesn't recognize it as duplicates. Software gets rid of obsolete files, figures out which are duplicate files, and gets rid of the duplicates.

What are some advantages or disadvantages of network-attached storage (NAS) versus storage area networks (SANs)?

They share the same pool of storage, but not in the same way. In NAS, I can take the same files and have two different users on two different operating systems accessing the same data. On a SAN, I reserve part of the SAN for you and part for the other server. They are sharing, but in the sense that you would share an apple with someone—you cut off a piece to give to someone and you keep the other. NAS is more like two people sharing a soda using two straws.

The advantage of a NAS is it can operate with multiple network file systems. Users can share files; for example, CAD/CAM files. If a large engineering organization is working with a supplier, one company may use Unix and the other may use Windows 2000, and they would like to share updates of drawings. The other advantage is that as the Internet becomes more popular, we will be moving from HTML to XML, which allows you to mix different types of data. You have structured data, which is database data, semistructured data, which is textual data, and unstructured data, which is video and audio.

Amazon.com is an example. The text is semistructured. A picture of the book is probably unstructured. And if you buy the book, a database takes your credit card. It must be very structured. So you are starting to mix them. XML can help you do all those things, and NAS will work fairly effectively with XML-type files.

What are some suggestions for implementing a storage area network?

Know where you are going. If you don't know what you want to accomplish in the long run, you are not necessarily going in the right direction—it is like trying to remodel a 747 while it is flying. The problem is, you can't do a rip and replace. You can't tear up your whole infrastructure in three years and start over. You have an investment in product and in the skill set of people who manage that storage.

Also, wait until you have a real need for a SAN. You may simply use fibre channels to give you greater distances between your server and your storage, so then you can be more flexible in setting up and managing your computer room. You can have storage in one part and the server in another. It can be that simple. Too often you will think the answer is a SAN, but it may be a tape solution, a NAS solution, or a combination. Figure out your business needs, then figure out the storage solution.

Which storage route is best?

Think about what the main applications will be. One company had document repositories in two different locations that exchanged information at night. They thought they needed a SAN, but they didn't have a high frequency of access. Access to archives must be available, but the archives do not necessarily have to be available online. You don't have to create a SAN to handle those types of situations. Or, if you are dealing with all file-oriented data, you may want a NAS environment. On the other hand, if you are very heavy database-oriented and very online-transaction-processing-oriented, you may want a SAN that gives you higher performance and better availability.

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Outside Options

Storage outsourcing provides storage on demand, and puts the burden for increased capacity and trained personnel squarely on the shoulders of the provider. By Alan Radding

THERE IS A FUNNY PARADOX in the storage world: Despite 35 percent annual drops in the cost-per-megabyte of storage, according to San Jose, Calif.-based Dataquest, part of the Gartner Group, the storage investment keeps rising. The researchers expect IT spending on storage hardware and services to increase 16 percent to 20 percent a year.

Behind the growing investment in storage is surging demand—doubling every year, according to Dataquest. This growth is fueled by the ballooning size of new operating systems and new applications, as well as the need to archive an explosion of e-mail. In addition, new Internet business models, which rely on the capture of clickstream data, require massive amounts of storage.

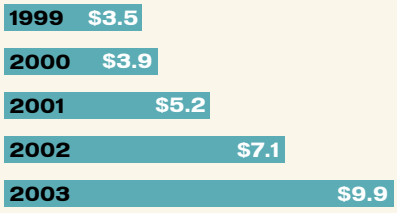
It is no surprise then that organizations are turning to storage outsourcing. Storage outsourcing, in effect, provides storage on demand and puts the burden of keeping up with the seemingly insatiable appetite for storage on the storage provider. Storage outsourcing not only relieves the organization from having to continually boost storage capacity, but it also eliminates the need to hire and retain skilled storage personnel.

Still, storage outsourcing isn't for every organization, at least not yet. "The initial acceptance will take place at the Internet data centers," says Adam Couture, senior analyst, Gartner/Dataquest. Internet businesses, which aren't saddled with investments in legacy data centers and storage, use managed storage services from day one right alongside other outsourced services. In fact, various managed services like storage increasingly reside at the same third-party Internet data centers.

The corporate IT world, on the other hand, will take longer to outsource storage. "IT managers are more concerned about things like security and control," says Couture. They also have legacy storage investments and trained staff that they won't readily abandon.

Outside Help

Worldwide storage management/outsourcing revenues (in billions)



SOURCE: INTERNATIONAL DATA CORP.

The.Com Group, Reston, Va., typifies the early adopter of managed storage services. The company works with Internet sites, monitoring and analyzing user behavior to improve Web site performance. The company captures and analyzes enormous volumes of clickstream data in a data warehouse that resides at an Exodus Communications Internet data center. The data is stored and managed at the same Exodus facility by a managed storage service provider.

"It is really a classic build or buy decision," says Simon Rakoff, CEO of The.Com Group. "We would have had to spend about $1 million on storage hardware and hire skilled storage staff." Instead, The.Com Group pays $50 per managed gigabyte of storage, which is the typical price, notes Couture.

The company currently uses about a terabyte of storage. A year from now, Rakoff anticipates needing 50TB of storage, but he isn't worrying where it will come from: "With storage outsourcing, you can start small and grow."

Radding is a freelance technology writer in Newton, Mass.

FREEDOM THROUGH SAN Standards

ROBERT NEUBECKER

Emerging standards will free users to purchase without fear of incompatibility.

By Charles T. Clark

HISTORICALLY, in the computer industry, the best of technical ideas can fizzle amid the chaos that reigns until standards are established. Unix and local area networks (LANs), are two cases that immediately come to mind.

In the case of Unix, applications written under a Unix operating system from one company could not run under Unix developed by another company. Once a Unix standard was ratified, software applications became portable; that is, applications could move from one Unix platform to another without modification. Similarly, departments within an enterprise that had LANs manufactured by one vendor could not communicate with other departments that had LANs from a different vendor until standards were developed and implemented by all LAN vendors.

A similar situation exists today with storage area networks (SANs).

Conceptually, the SAN is the answer to the storage problems that have arisen with the advent of e-business and its attendant needs for 24x7 availability, quick response to user demands, 99.999 percent uptime, and rapid nondisruptive backup of data.

However, the lack of standards has resulted in incompatibility problems that have delayed the acceptance of SANs. But that is about to change. Industry organizations have been working diligently to develop such standards and their efforts are about to come to fruition.

In the past, the SAN standards

effort has been chaotic, to say the least. To prevent this chaos from continuing into the future, the Fibre Channel Industry Alliance (FCIA) and the Storage Networking Industry Association (SNIA)—the two leading storage networking industry groups—have organized working groups to work on standards in their areas of expertise. The FCIA consists of several working groups developing Fibre Channel standards, and the SNIA working groups are developing standards for areas such as SAN management and SAN security.

Both organizations keep abreast of what the other is doing and have specific members that act as liaisons with the other organization. These changes should eliminate the delays that have occurred in the past, when formal processes were nonexistent and ad hoc bodies were needed to kick-start the standards process. Once the working groups in these two organizations have developed a proposal for a standard, they will submit it to the appropriate standards body for ratification, or formal acceptance.

There are two major standards bodies involved with SANs: the American National Standards Institute (ANSI) Technical Committee T11, which defines all of the protocols for Fibre Channel technology; and the Internet Engineering Task Force (IETF), which defines the management standards for SANs. Once the standards have been ratified by one of these bodies, they are circulated to the Fibre Channel vendors and implemented in those vendors' Fibre Channel devices or management software.

FIBRE CHANNEL STANDARD

Today, two major standards are imminent: a Fibre Channel standard called FC-SW2 that will ensure compatibility among Fibre Channel switches, and a management information base (MIB) management standard that will permit Fibre Channel devices such as switches to be managed by any vendor's software that uses the Simple Network Management Protocol (SNMP).

An ad hoc committee called the Open Switch Fabric Initiative (OSFI) developed the FC-SW2 standard over a two-year period. Five major switch vendors—Ancor, Brocade, Gadzoox, McData, and Vixel formed the OSFI—contributed ideas and, in some cases, intellectual property to the standard. The OSFI worked closely with the SNIA and the FCIA; they reviewed and provided

input to the standard.

According to Kumar Malavilli, chairman of ANSI's Technical Committee T11, the FC-SW2 interoperability standard should be ratified soon. "We are planning to have a letter ballot in October 2000, and when it goes out to letter ballot you don't usually get too many technical comments. After we finish that step, we will submit it for review and that's when it becomes a standard," says Malavilli.

The switches made by the Fibre Channel vendors that implement the standard will be able to communicate and interoperate with those made by other vendors that also implement the standard. Users will no longer have to be concerned about being locked into one switch vendor; they can now feel free to change vendors to take advantage of lower prices and new technology without the fear of interoperability issues.

MIB STANDARD

The other important standard that is close to ratification is the management MIB. This standard has been developed and proposed to the IETF by another ad hoc group called the Fibre Alliance, which was formed under the leadership of EMC Corp. and consists of 50 storage networking vendors. According to Dr. Jim Rothnie, senior vice president of product marketing at EMC, the standard is presently being reviewed by the IETF, and should be ratified by that body very soon.

The goal of these SAN standards is to assure users that they can take advantage of new technological developments or lower prices by switching from one vendor's product to another without being concerned about interoperability problems. As it stands today, users must purchase SANs that are pretested and preconfigured to be assured that their SANs are free from interoperability problems. This situation keeps prices high and slows the acceptance of the technology because potential users fear they will become locked into a particular vendor if they purchase a SAN that is not built to an industry standard.

Once the standards are implemented, users will be free to purchase without fear and vendors will be free to enjoy the fruits of their labor.

Clark is a freelance technology writer based in Haverhill, Mass.

THE REAL WORLD

Sony and Lycos illustrate the changing nature of storage demands and implementation at major organizations. By Mary Ryan Garcia

WHEN ORGANIZATIONS consider storage requirements, thoughts often go beyond static server-based solutions to storage area networks (SANs). Companies must grapple with issues such as compatibility with existing IT infrastructure, data access, scale and management concerns, and overall management of the network storage environment. It's no wonder, then, that companies frequently outsource all or portions of these tasks to storage specialists, while still retaining control at the corporate IT helm.

ALAN LEVENSON

Don Eklund, *vice president of engineering, Sony Pictures Digital Video Disk Center in Culver City, Calif.*

SONY MASTERS DVD PRODUCTION

"We have a somewhat unusual requirement for storage in that we do not use a file system of any kind," says Don Eklund, vice president of engineering at Sony Pictures Digital Video Disk (DVD) Center in Culver City, Calif. "Even so, we still require cross-connectivity between 19 different computers and compression devices to our storage devices."

The center, which works along with Sony Pictures' High Definition Center, manages the DVD mastering process, from film to tape and audio transfers through disk mastering. The Center produces over 100 versions of DVD titles each month, and mass storage is of paramount importance since a typical DVD requires 10GB of storage, and more complex titles require up to 15GB.

Eklund says Sony achieved some flexibility in a pure SCSI environment using SCSI switches, but found it to be an impractical solution due to the large-scale environment at Sony. Until recently, Sony's DVD mastering system consisted of 26 clients—three audio encoders, four video encoders, one management station, and 18 workstations—connected through SCSI switches to six RAID arrays, with storage capacity up to 760GB. The workstations were divided into six workgroups, each linked to a single storage array.

However, Sony needed greater storage scalability, as well as the ability to add workstations and share storage between workgroups, so as not to inhibit the faster production of DVDs. "Fibre Channel was the obvious

choice," Eklund says, "the only question being the ability to have a solution that would be as reliable as SCSI."

Sony turned to SAN Solutions Inc., Incline Village, Nev., for help. One top concern for Sony was port isolation, for uninterrupted data flow. "Anything one workstation does won't affect another workstation with respect to data flow," says Harry Aine, SAN Solutions' president. "If one were to power off or reboot, it wouldn't affect any workstations or projects in progress." Another challenge was bridging video encoders (which were legacy SCSI initiators) to interface with Fibre Channel fabric.

A third issue was persistent binding SCSI Identifications, which Fibre Channel addresses. "This is an issue for disk drive addresses when workstations are brought up or down and storage is added or deleted," says Aine. "This enables Sony to add additional storage without changing the identity of the disk drive [storage device]. This is crucial because Sony would start a project and if storage was removed, it would have a different address and they'd be working on a different project than they thought, in terms of processing movies to DVD format."

Eklund settled upon a Fibre Channel switch solution, combined with network interface cards. "The storage is being used in a 'just a bunch of disks' [JBOD] configuration, which is ideal for the way DVD projects are managed," says Eklund. "At a current capacity of 2TB we should not require further expansion very soon, but when we do, it should be simple enough to add another switch and storage chassis."

Eklund is more than satisfied with this solution, for which Sony spent about $250,000. "I'm pleased not to have the 'not enough storage' coming up in our meetings. Connectivity to storage is no longer a problem. We run essentially a 7-day operation, so being able to add capacity without a major rework of the storage system is essential. It can't get much easier to add additional capacity without interrupting operations."

OUTSOURCING LETS LYCOS MOVE FASTER

Other organizations grappling with storage demands find that outsourcing becomes a clear alternative. One example is Lycos Inc., Waltham, Mass., a network of globally branded media properties and aggregated content distributed mainly through the Web. The Lycos Network is a unified set of Web sites that offer a variety of services, including Web search and navigation services; Web community and communications services; and entertainment, financial, and educational content.

Lycos earlier this year announced that its electronic business infrastructure will be based on the Global Data Storage Network (GDSN) from StorageNetworks Inc., Waltham, Mass. Lycos will implement StorageNetworks' DataPACS data-on-demand service and BackPACS backup and restore service to support its network of online destinations. The DataPACS and BackPACS services are incorporated with StorageNetworks' GDSN. Lycos accesses the GDSN by plugging into the StorageNetworks StoragePort Access Channel.

Once connected, Lycos utilizes the StorageNetworks private high-speed fibre network, connecting it to the StorageNetworks Storage Point-of-Presence (StoragePOPS or S-POP) data center, which features storage hardware, software, and networking technologies. Lycos monitors and manages its storage resources residing in the StoragePOP data centers via the StorageNetworks Virtual Storage Portal (VSP) Web-based software application.

The storage service provider "offered more efficient storage to us at a better variable cost than what we could do ourselves."

Timothy Wright, CIO, Lycos Inc.

"A significant portion of Lycos' technology investments went to storage," says Timothy Wright, Lycos' CIO. "We were spending a lot of time investigating new technology. Outsourcing is a tool, which if used wisely, has benefits. Storage is not a core expertise of Lycos, and StorageNetworks offered more efficient storage to us at a better variable cost than what we could do ourselves."

Wright also notes that Lycos is moving from a Digital Unix environment to one based on Compaq AlphaServers running Tru64 Unix.

It's up to Wright to keep expenses down in the IT realm. "We don't have the money to invest in our own storage infrastructure," he says. "With StorageNetworks, we get access to the tools we need. Another catalyst for us is that some of our devices were coming up on lease renewal. We could get more 'bang for our buck' with the StorageNetworks technology."

For instance, the Lycos personal home page offering, Tripod, will soon be completely housed on the StorageNetworks platform. The storage-intensive Tripod offers customers tools to build custom Web sites, including the capability to upload video. "The best thing that StorageNetworks gave Lycos is the ability to move faster," says Wright.

Afterall, in the fast-paced world of storage technology, the game is all about staying ahead of the IT pack.

Garcia is a Coram, N.Y.-based freelance technology journalist.

Starting Blocks

RICHARD MUNTZ, chairman of the computer science department at UCLA, is looking forward to the day when he can move his blocks of storage data across his Gigabit Ethernet network quickly and efficiently. So is Scott Deakin, a network analyst for a stockbroker in Loughborough, England.

Ask any number of users if they want to put in a separate data network from their existing network, and their resounding answer will be "No." The answer you'll hear most often is: "We're used to Gigabit Ethernet. We like it. We don't see why we need to put in a separate network just for our storage data."

Until now, IP-based networks have not been able to move large blocks of data quickly and efficiently. They've been able to send data as small, individual files across the network, but not as the blocks of data transferred in SCSI-based storage. SCSI, while a fast transport method, is limited to use by a restricted number of devices that are located close to each other.

Fibre Channel, the protocol used in storage area networks (SANs), while based on the serial I/O characteristics of SCSI, is far more scalable and works over greater distances. It is, however, more expensive than Gigabit Ethernet, lacks interoperability standards, and is a less familiar environment to install, maintain, and troubleshoot.

ROBERT NEUBECKER

While standards are still lacking, there are several proposals on the table for transporting blocks of storage data across networks using SCSI over TCP/IP or Fibre Channel over IP.

By Deni Connor

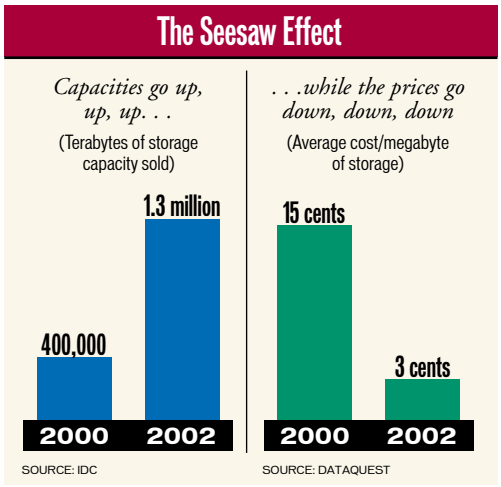
LOOKING FOR CONSENSUS

Lack of standards is hindering SCSI or Fibre Channel from running over IP-based Gigabit Ethernet LANs, WANs, or MANs (metropolitan area networks). Numerous network infrastructure companies and storage vendors are submitting proposals to the standards bodies in an effort to get their methods adopted as standards. The number of proposed ways to transport blocks of storage data across networks using SCSI over TCP/IP or Fibre Channel over IP grows each day on its way to reaching a consensus that will please users.

Some vendors are already shipping devices that bridge geographically distant SANs over optical networks. In these instances, the customer uses a LAN, WAN, or MAN to transport Fibre Channel data from one SAN to another over high-bandwidth, dense wave division multiplexors (DWDM). This technology is viewed by industry observers and vendors as an intermediate step until standards arrive. It takes existing DWDM edge devices and routes Fibre Channel through them from a SAN on one side to a SAN on the other side. For instance, CNT of Minneapolis has

developed a transport protocol that combines IP transport, as well as data compression, load balancing, and flow control to move data from one geographically distant location to another. CNT and Nortel Networks, Ontario, will work toward standardization of this method with either the Internet Engineering Task Force (IETF) or the American National Standards Institute (ANSI).

"One of our sites wants to join in the fun and we are now looking at Fibre Channel over IP bridges to send the data over an 8Gbit link we have between two SANs," says Deakin. Deakin has several ATM channels and a variety of Novell NetWare, Windows NT, and Sun Solaris servers.



At least one analyst also believes that being able to join Fibre Channel with IP is essential. "A revolution is quietly underway," says Michael Peterson, an analyst with Strategic Research Corp., Santa Barbara, Calif. "At last the economics have intersected the availability of bandwidth and technology to enable efficient, easy, low-cost off-site storage services. Fibre over IP promises services such as centralized backup, disaster recovery, remote data mirroring or disaster tolerance, and even site-level replication and synchronization."

Other companies are sending Fibre Channel over IP networks using proprietary protocols, for which they will seek standardization. Still other vendors are busy preparing products for shipment this fall that, hopefully, will bear a resemblance to what they envision the standard will look like. They say that you should go ahead and buy these products, as they will be software-upgradeable or ready to be replaced by the time standards appear in late 2001.

CONCENTRATED DATA EFFORT

A slew of proposals has been submitted to the IETF and ANSI. Among them are one proposal for bridging SANs over LANs, MANs, and WANs by sending Fibre Channel encapsulated in IP frames over Gigabit Ethernet networks, and two proposals for sending SCSI data over IP networks. The IETF is responsible for the SCSI protocol; ANSI handles the Fibre Channel Protocol (FCP).

The first proposal specifies a standard means of taking Fibre Channel data and encapsulating it in IP frames for transfer over IP networks. These IP frames are transported to the SAN on the other side of the connection where the IP encapsulation envelope is removed and Fibre Channel data is handed to the SAN for processing. This method relies on the network to provide the connectivity but does not specify the link transport protocol that will be used. The transport protocol could be Gigabit Ethernet, SONET, Asynchronous Transfer Mode (ATM), or DWDM. In a bridged Fibre Channel to IP configuration, a storage array in Boston could attach to the IP-based Internet and vault or backup data to a similarly configured array in Los Angeles, preserving the integrity of the originating SAN and vice versa.

Several storage startups are adopting this proposal, as it lets them deliver wire-speed products and break down the distance, performance, and connectivity barriers of SCSI and Fibre Channel.

Another proposal, which is perhaps the most promising and furthest along toward standardization, involves transporting SCSI over TCP/IP. "This [proposal] would seem interesting in the fact that it should be more efficient than standard network-attached storage for sending large amounts of data over IP," says a storage resource manager for a large retailer in Texas. "We don't want to put in multiple separate networks. We are concerned about interoperability as we want to achieve plug-and-play and the Fibre Channel world is not yet there."

Another user who is using a beta gateway product that lets SCSI run over standard Gigabit Ethernet networks agrees. "[SCSI over TCP/IP] is flexible, easy to manage, and requires no or little change to our system," says UCLA's Muntz. "The Gigabit Ethernet network is self-configured, little setup work has to be done, and most servers already have SCSI controllers in place. We simply need to connect the servers with the [SCSI to TCP] matrix gateway using regular SCSI cables and it is ready to go. There are no changes to existing software and no new software."

One last effort, proposed by Adaptec of Milpitas, Calif., is called the SCSI Encapsulation Protocol. Here, SCSI blocks of data are divided, encapsulated in IP frames for transport across the network, and reassembled on the other side. This method will support the final IETF standard, whatever it is, claims Adaptec.

Whichever method wins, users will be ready—they've accomplished most of the effort of putting in Gigabit Ethernet networks already.

Connor is senior editor at NetworkWorld.

SAN Security CHECKLIST

Businesses can expect improved SAN capabilities by the time most are ready to deploy enterprise-wide SANs, but there are some precautions to take in the meantime.

By Alan Radding

ROBERT NEUBECKER

Now that organizations are beginning to adopt storage area networks (SANs) as the central storage repository for corporate information assets, it is time to think about SAN security. SANs are safe for today's small-scale initial implementations, industry analysts and observers agree. However, as organizations expand their use of SANs and increasingly store key production data, and valuable and highly sensitive information, it is not too early to consider the security ramifications.

As organizations in the future build upon the success of their initial SAN implementations, the security threat is sure to increase. Given that the ultimate SAN objective is to create enterprise SANs capable of handling all of the organization's information assets, the organization must throw open the SAN to the entire enterprise and beyond. When this happens, good fundamental security practice alone requires that managers plan specific security measures.

AT HEART, A NETWORK

Since the SAN is, at the heart, a network, SAN security issues mirror that of any network of file servers. In the case of the SAN, corporate application servers directly access the storage devices across the separate storage network. These application servers also attach to the corporate network, opening the security vulnerability.

Fortunately, unlike the typical NFS server, there is no direct desktop access to the SAN. Attackers do not have their usual avenue into the system. Instead, their only option is to penetrate the SAN by compromising a corporate application server that

has direct SAN access.

SANs today don't really offer much security protection of their own. Rather, they rely on the security of the attached application servers. If the security of one of those servers is breached, the SAN cannot contain the problem. SANs to date have shown themselves to be secure: There have been no reports of SANs being successfully attacked. But based on past experience, it is only a matter of time before SANs assume enough importance to become subjects of attack.

For example, analysts note that the ability of a SAN to connect many clients to a common pool of storage enables new data processing operations, which exploit that connectivity. Multiple clients organized as a cluster may share a set of storage volumes, or a server may create a snapshot of a storage volume and pass authorization to access the snapshot volume to a SAN appliance that performs backup. In such cases, the SAN must implement and enforce the assignment of specific storage resources to specific servers (called clients) and manage access rights and authorizations.

Based on past experience, it is only a matter of time before SANs assume enough importance to become subjects of attack.

APP SERVER DEPENDENCE

What SAN security has existed to this point has taken the form of application server security. The SAN and its contents are only as safe as the security of the application servers that connect to the SAN.

In practice, application server security probably isn't consistent, especially as organizations move to enterprise SANs supporting many different servers. The servers provide differing levels of inherent security and are managed by system managers of varying levels of security awareness, diligence, and integrity. As a result, SANs that rely solely on server security are only as safe, from a security standpoint, as the weakest and worst managed server connected to the SAN.

Complicating the security challenge is Fibre Channel itself. Fibre Channel, the link across which the data moves, relies on trust. Once a server connects, it can access any logical storage unit on the SAN. If an attacker has compromised an attached server, the SAN and its contents are wide open. Security techniques such as LUN (logical unit numbering) masking and switch zoning can counter attacks, but they can be circumvented by skilled programmers.

Fortunately, an effective SAN attack will require the writing of sophisticated driver-level code, which is beyond the abilities of the typical disgruntled employee or amateur hacker. However, it is only a matter of time before the SAN equivalent of attack tools such as Back Orifice appear, giving unskilled people the ability to cause SAN damage.

Take These Precautions

The Storage Network Industry Association (SNIA) already is addressing the SAN security issue. Managers can expect improved SAN capabilities by the time most organizations are ready to deploy enterprise-wide SANs. In the meantime, organizations deploying SANs can take the following steps:

✓ **Recognize** that the SAN raises new security issues. Do not automatically assume the SAN is a secure environment.

✓ **Take advantage** of LUN masking features provided by storage servers on the SAN. (LUN masking restricts access and visibility of logical volumes to a subset of the client systems on the SAN.)

✓ **Use partitioning** to segregate more sensitive data, such as financial data, from less sensitive data, such as widely disseminated engineering specifications.

✓ **Implement** port-based switch zoning, a feature of some Fibre Channel switches, whenever available. (Zoning allows the SAN manager to divide a single SAN into partitions called zones.)

✓ **Secure** SAN management agents by securing the servers that host the agents.

✓ **Enforce** a consistent level of security across all systems accessing the SAN.

✓ **Enforce** sound security discipline and good practices in hiring, promotion, and assignment of responsibility. Most SAN threats will come from internal attackers.

By planning for SAN security now, organizations can ensure they won't encounter SAN security problems later.

THE STATE OF SOLID STATE

Solid state disks and cache storage devices deliver better performance than rotating disk storage for time-critical applications.

By Deni Connor

THE need to eke even faster delivery of content and data from mission-critical, I/O-intensive applications, has spurred IT to seek technology that eliminates the latency and slow retrieval of data from rotating disk storage.

Solid state disks and cache storage devices promise to improve the performance of any time-critical application, such as online transaction processing, searches, e-mail, and all database operations.

Rotating disk technology is of less use in applications of this nature because it needs to mechanically move the read/write heads to the track of data it wants, and wait for the disk to rotate around so it can retrieve the block of data it needs. The mechanical delay or latency in a disk drive can be milliseconds too slow for time-critical data, which needs the microsecond response of solid state disks.

"We use solid state for our Usenet message boards, which require fast searches of database indexes," says Rich Turnquist, director of NNTP (Network News Transfer Protocol) Services at messaging company Critical Path in San Jose, Calif. "We warehouse 700GB to 800GB of data that is indexed on the solid state disks. The indexes constitute 20 percent of the disk operations and as a result, users get information faster."

Solid state disks use board after board of dynamic RAM (DRAM) or synchronous DRAM (SDRAM) chips to which data is written or read. They range from small flash memory disks for use in personal appliances to devices with over 34GB of data capacity for use with mission-critical applications.

THE I/O FACTOR

Solid state is less useful for applications where data is read in sequence and moved block after block on and off a drive, such as video/audio streaming or data warehousing applications. With these applications, there is less waiting and reliance on the manner in which data is retrieved. Applications that benefit from solid state disks are those that are I/O bound, random, and skewed. A small percentage of the data, which can be located anywhere on the disk, should generate most of the I/O traffic.

"Performance-robbing I/O waits may bring essential transaction-processing systems to their knees," says Dave Hill, research director, storage and storage management, with the Aberdeen Group in Boston.

Solid state disks work best with data that is frequently used for controlling and organizing the activity of the application—typically message queues, redo logs, or journals maintained for recovery purposes, database indexes, or temporary workspaces. That's data that may amount to only 1 percent of the application's data, but accounts for 50 percent of I/O operations, says Hill.

"While solid state disk has faster response and is more expensive [than rotating disk], it can handle thousands of requests per second, whereas 100 rotating disks lined up would be required to perform the same task," says Turnquist.

THE TOP FIVE SAN Myths

By Alan Radding

Anyone considering a storage area network (SAN) quickly encounters a number of myths. Like most technology myths, SAN myths contain a grain of truth, but the reality is often quite different. The following are the top five common SAN myths:

1 THE FIBRE CHANNEL MYTH

When first conceived, SAN technology was specified on Fibre Channel as the preferred communications link. Fibre Channel was able to provide the speed and the distance SAN required. Today, the majority of SANs are being implemented with Fibre Channel, either arbitrated loop or switched topologies. However, the SAN is not locked into Fibre Channel. Rapid developments are occurring with SCSI over IP for use in SANs. "The Fibre Channel SAN will continue to have a place in the enterprise data center, but protocols using SCSI commands are emerging, and vendors will introduce SAN products using SCSI over the next few quarters," reports William Hurley, program manager, Yankee Group, Boston.

2 THE INTEROPERABILITY MYTH

Early SANs indeed suffered from a lack of interoperability among components from different vendors. However, "interoperability is improving, especially within the switch, hub, and host bus adapter market," says Hurley. Through a number of interoperability events, dubbed Plug Fests, competing vendors come together to iron out many of the interoperability issues. Observers expect any remaining interoperability issues to completely fade away within 12 months.

3 THE SKILLS BARRIER MYTH

Certainly SANs introduce new technologies into the enterprise storage world, particularly fibre and networking, which require new skills. IT storage experts groomed for directly attached SCSI storage now must learn new protocols and new configurations. Switched fibre SANs, in particular, require advanced networking skills. "There is no getting around it; SANs require an understanding of networking," says Hurley. However, new tools, new products, and new service offerings from the vendors are making SANs easier. And, service providers increasingly have a solid stable of trained people who can help any organization implement a SAN.

4 THE MANAGEMENT MYTH

Early SAN adopters complained that SANs were hard to manage and administer. And they were, due mainly to a lack of tools. Today, however, SAN administrators are finding a growing selection of tools to manage the SAN, perform backup, create virtual storage pools, monitor resources, manage the topology, and more. Storage vendors are responding with tools to manage the various SAN components, and more and better tools are in the pipeline.

5 THE COST MYTH

"SANs entail a large, initial capital outlay," admits Hurley, so SANs might seem expensive, "but the long-term benefits are significant." While it is cheaper initially to attach low-cost disk storage to a server, the cost of administering storage attached to multiple servers and the inefficiency that results from under-utilized pools of storage shift the overall total cost of ownership advantage clearly to the SAN. Recent studies suggest that half of all server-attached storage goes unused because it can't be shared. With a SAN, storage utilization increases to 70 percent and, ultimately, can hit 90 percent. And with a SAN, each administrator can manage far more storage.

The trouble with technology myths is that technology keeps changing. Even if a SAN myth was true once, it probably isn't today.

Network Storage Resources Guide

A sampler of the Web's best online help for storage and network professionals.

NetworkWorld Fusion

www.nwfusion.com—Type in keywords like "storage networks," hit go, and you'll find some of the most informative articles and information anywhere that target the storage interests of network professionals, and not just storage in general. The site is very easy to navigate, and it's quick, too.

Storage Networking Industry Association

www.snia.org—As represented, it is an industry organization, not a user-based group. However, there is a great deal of information on the membership, which is a Who's Who of the storage network business. You can not only read up on what these companies have in the offing, but also understand the standards process that is slowly but surely unfolding. In addition, the site has a decent dictionary of all the arcane terms the industry has promulgated.

Fibre Channel Industry Association

www.fibrechannel.com—Formed in the fall of 1999 as a result of a merger between the Fibre Channel Association (FCA) and the Fibre Channel Community, this is another industry group. There are excellent tutorials and explainers here, obviously dedicated to fibre channel technology, and the most comprehensive product listing service you'll find.

Storage Resource Cornucopia

www.bswd.com/cornucop.htm—Maintained by a software consultant, this site is a gem for those who need or want to burrow deeply into the geeky aspects of network storage, including detailed technology specifications. Dirty work, but someone in the organization's got to do it.

RAID Advisory Board

www.raid-advisory.com—Formed in 1992, the board's goal is to assist users to make more informed storage procurement decisions. Though the site isn't network-centric per se, the fact is that integration with traditional RAID systems is a key issue, and here's where some good information on the integration process can be had.