

Special Advertising Section

June 2004

Windows Storage Solutions

Windows Meets the SAN

The technology behind new
storage tools from Microsoft and
its SAN and NAS partners

**iSCSI: Wave
of the Future**

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The Next-Generation
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Windows Power Tools Charge Up SAN and NAS

Companies have a growing number of options available for managing their SAN and NAS systems. Among them: high-end storage tools at new, low-end prices.

With Microsoft® Windows® servers playing an increasingly critical role in both large and smaller companies, customers have asked for equally robust tools to access and manage their corporate storage resources.

Microsoft and its storage partners have been listening. With the release last year of Microsoft® Windows® Server 2003 and Microsoft® Windows® Storage Server 2003, Microsoft provided storage managers with powerful new capabilities. They can now back up and restore regardless of where a storage device is located—whether it's attached directly to the server, is connected to a storage area network (SAN) or is a network-attached storage (NAS) appliance.

Besides providing storage administrators with a bevy of new

tools, Microsoft's latest storage platforms give Microsoft partners a foundation for building everything from self-managing SANs to graphical tools for discovering and managing the components in Fibre Channel storage area networks. Microsoft hardware and software partners have been hard at work leveraging this base, with an increasing number of products entering the market.

The common goal is "making high-end, resilient, storage solutions easy for our customers, whether they choose to use Fibre Channel or iSCSI," says Claude Lorenson, technical product manager for Windows Storage Technologies at Microsoft. Together with its partners, Microsoft is intent on making these capabilities—once found only on high-end storage hardware—avail-

able to even small and medium-sized businesses (SMBs). All told, the new storage features in Windows Server 2003 add up to the greatest advance in Windows storage since the introduction of Windows NT in 1996, according to Microsoft and developers.

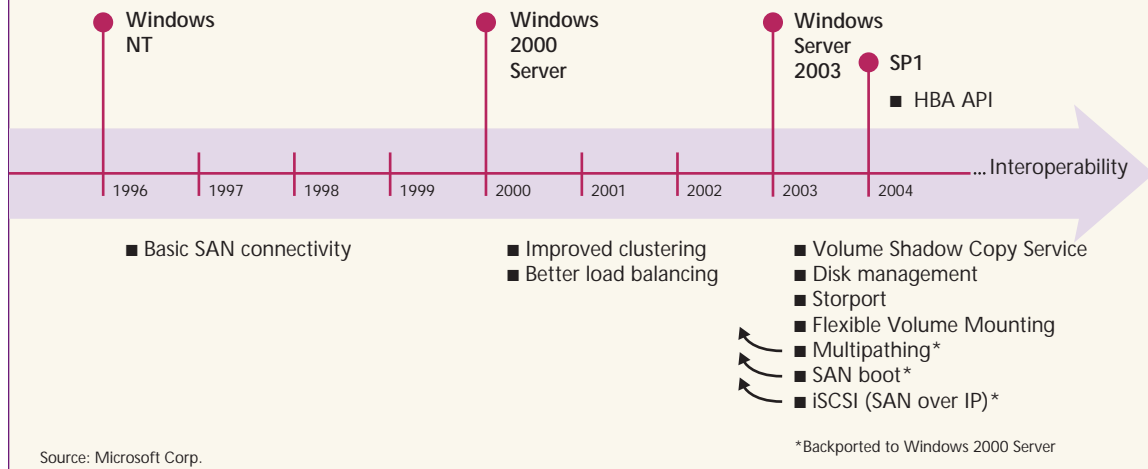
Building Bridges

Microsoft aims to be the software platform of choice regardless of a customer's networked storage topology: SAN or NAS.

SANs are storage devices linked by a dedicated network to facilitate the sharing of storage resources by multiple applications and multiple servers. NAS devices consist of a dedicated file and print server connected to the corporate network. Because they are typically less expensive (and somewhat easier to

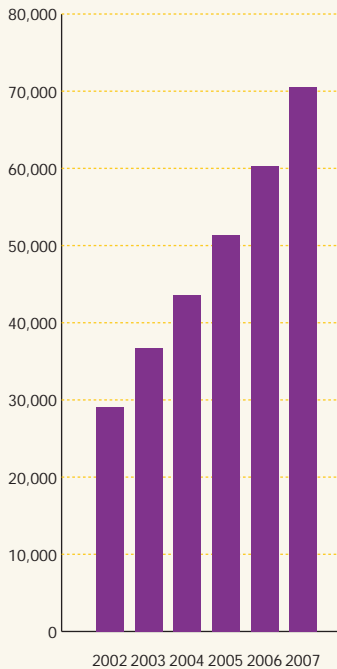
Evolution of Storage Support in Windows Servers

Microsoft has steadily advanced high-end Windows storage since 1996. Today's Windows Server 2003 adds new performance, manageability and interoperability capabilities.



Windows NAS Systems Step Up

Worldwide unit shipments of Windows-based NAS systems



Source: Gartner Dataquest, April 2004

configure and manage) than SANs, total NAS product shipments (including both Windows and non-Windows platforms) are expected to grow from 81,998 units in 2003 to 122,619 in 2007, according to market researcher Gartner Dataquest.

The new storage technologies from Microsoft are designed to make data easier to access, whether from a Windows general-purpose application server (with Windows Server 2003) or through a NAS appliance (with Windows Storage Server 2003). These new technologies consist of new storage APIs (application programming interfaces) and Device Driver Kits (DDKs) as well as Microsoft's support for the iSCSI storage protocol,

which allows customers to manage their storage networks with the same IP protocol they use to manage their local area networks.

Advances such as these are getting an enthusiastic reception from customers. According to Harry Baeverstad, director of network attached storage business at Hewlett-Packard Co., this has sparked "explosive growth" in the use of NAS appliances serving as front ends to SANs. Gartner predicts that shipments of NAS products so configured will skyrocket at a CAGR of 29 percent from 2003 through 2007, compared to 13 percent for standalone NAS devices.

Windows Storage Server 2003, a dedicated file and print serving operating system designed for network-attached storage devices, already sits at the heart of many NAS gateways. Such gateways provide file-level access to the block-level storage found in Fibre Channel or iSCSI SANs that store the data for many mission-critical applications. Meanwhile, Windows Server 2003 boasts new features that make it easier than ever to link to and manage SANs.

New Servers, New Features

Although their names are similar (and they use much of the same code), Windows Server 2003 and Windows Storage Server 2003 are different products serving different purposes and reaching customers in different ways.

Windows Server 2003 is primarily an application server designed to run mainstream business applications based on databases, Web sites and e-mail and messaging platforms like Microsoft Exchange. But compared to earlier versions of Windows, Windows Server 2003 ships with new features designed to provide easier attachment to—and management of—Fibre Channel and IP SANs. It is available through many OEMs and resellers.

Some of the most important new storage functions provided in Windows Server 2003 are storage management APIs and DDKs that Microsoft has made available to its hardware and software partners. The following three functions are particularly important:

1. **Volume Shadow Copy Service (VSS);**
2. **Virtual Disk Service (VDS); and**
3. **Support for MPIO (Multipath Input/Output).**

(See chart on page S6, "The Big Three: Microsoft's Key Storage Technologies.")

"VSS is integral to being able to effectively protect data; VDS helps users more easily manage storage; and MPIO makes sure the data path is always available," says Nancy Marrone-Hurley, senior analyst with the Enterprise Storage Group. She adds, "These are enterprise-class functions that Microsoft is making available to the masses, thereby making storage networking viable for most every user."

Windows Server 2003 also ships with a number of new, ready-to-run management tools (see story on page S10, "Storage Management: Windows Takes Control") that "are aimed at making it easier to configure, manage and troubleshoot SANs with Microsoft-attached servers," says Marrone-Hurley. The Flexible Volume Mounting feature ensures that access to shared disks in a storage array is restricted to the server that owns them. This eliminates problems associated with earlier Windows versions that would automatically overwrite and corrupt data on storage volumes they detected on the network.

Windows Storage Server 2003, on the other hand, is designed to provide file services in a NAS environment. Because of this, it likely has "much better performance and scalability versus standard servers that may be used for file and print

servicing," adds Marrone-Hurley.

Formerly known as Windows Powered Network Attached Storage, Windows Storage Server 2003 is sold only in storage products from OEMs. Examples include the NetWin 200 from EMC Corp. and Hewlett-Packard's StorageWorks NAS 2000s. Such NAS appliances can typically access anywhere from several hundred gigabytes to several terabytes of storage, far more than what is usually accessible from a Windows Server 2003 device.

Windows Storage Server 2003 makes possible simple and effective file sharing across heterogeneous environments, including Windows, UNIX, Novell and Macintosh platforms. This means that users on different platforms can access the same files without additional interventions. Windows Storage Server 2003 also includes the same advancements found in storage management as Windows Server 2003, including:

- Support for VSS, VDS and MPIO;
 - A new, Web-based storage-management tool;
 - Native support for the NFS file shares; and
 - A quota-management tool.
- This spring (April 2004), Microsoft

announced a new feature pack that allows Windows Storage Server customers to easily consolidate data from Microsoft Exchange Server 2003.

First Look: Products from Partners

A number of third-party hardware and software companies are building on the Microsoft APIs and DDKs to provide faster backups and restores, remote replication, and lower storage-management costs to customers of all sizes.

For example, by leveraging VSS and VDS in its Magnitude 3D disk array, Xiotech Corp. "can restore Exchange databases in mere minutes," maintains Rob Peglar, chief architect at Xiotech. The company calls on VSS to point the server to the shadow copy rather than actually moving the data that needs to be restored. VSS quiesces (halts) Exchange (or whatever VSS-aware application the data is being backed up from) for several seconds while the shadow copy is made.

Because this time interval is so short, VSS imposes "a very small penalty on performance," says Microsoft's Lorenson. "It's not noticeable even if you have an extremely large database open."

Adds Xiotech's Peglar: "The shadow copy can be copied and

mounted to the original Windows server, literally, in a few seconds, and you can activate that shadow copy whenever you like. It can also be created as transportable, so different servers can mount it in case of a disaster."

Xiotech's speedy restores are also enabled by VDS. This Microsoft API allows the Magnitude 3D to dynamically create and expand new volumes on remote arrays as needed. The MPIO driver development kit allows Windows to create and manage multiple data paths to volumes on the Magnitude 3D.

HP is another vendor supporting MPIO, leveraging the DDK in its StorageWorks NAS 2000 gateways to provide clustering and high availability.

"Microsoft takes care of the plumbing. This lets us provide benefits to customers such as hardware-independent storage provisioning, as well as backup management within an SMB or across the enterprise," says James Geronaitis, vice president of product marketing for Computer Associates International Inc.

With NAS appliances playing an increasingly important role in departments and divisions, Windows Storage Server's debut was espe-

The Big Three: Microsoft's Key Storage Technologies

VDS
(Virtual Disk Service)

What It Does
Provides vendors with a common interface for exposing common management functions, including assigning drive letters and dynamically creating and formatting disks

Customer Benefits

- ☑ Gives storage administrators applications for managing direct-attached storage, or storage on a SAN, enabling easy LUN mounting and management

VSS
(Volume Shadow Copy Service)

What It Does
Allows for point-in-time shadow copies (also known as "snapshots" and/or "clones") of data

Customer Benefits

- ☑ Enables backup and replication services without slowing down or stopping a production server; making it easier to recover individual files and share data among servers
- ☑ VSS-based writers for major applications (e.g., SQL Server, Exchange, Active Directory) ensure that data remains consistent even when an application is running during a shadow copy process
- ☑ Improves on ad-hoc shadow copy methods

MPIO
(Multipath Input/Output) Support

What It Does
Provides multiple paths for data between servers and storage devices

Customer Benefits

- ☑ Support for failover for higher availability
- ☑ Support for load balancing for better performance
- ☑ Increases reliability and availability

Source: Microsoft Corp.

cially well received in the remote backup and restore market sector. EMC's Legato division is a good example. A recently released version of its RepliStor replication software was written specifically for Windows Storage Server 2003. According to Tom Joyce, EMC's senior director of NAS product marketing, the software facilitates the use of EMC's NetWin NAS appliance in a branch office filled with Windows servers, allowing it to automatically update information to a larger data center.

What's Driving the SMB Market?

A study released last year by New-York-based AMI Partners found that the number of SMB customers deploying SAN or NAS products rose 36 percent from 2002 to 2003, driven by the drop in SAN/NAS prices and enhancements in IP-based SAN solutions. AMI expects these factors, as well as new regulatory-driven storage requirements, will encourage SMB customers to boost spending on storage by 18 percent to 20 percent over the next few years.

Xiotech's Peglar says some SMB customers are finding features such as remote replication (which used to be required only by large enterprises) is more than just a good idea. "In some cases, it's the law," he says, citing new regulations requiring companies to store data for longer periods of time. Some companies are choosing automatic remote replication as an alternative to slower, tape-based backup that requires support staff "to come in at two in the morning" when production applications can be safely shut down for backup, adds Peglar.

Ease of use, and of installation, are critical to SMB customers who cannot afford large technical staffs and who lack extensive experience with Fibre Channel SANs. That's why EqualLogic Inc. has simplified

iSCSI: Wave of the Future?

At this point, the potential advantages offered by the iSCSI (SAN over IP) protocol are well known: Companies gain the storage advantages of a SAN (including the ability to share "pools" of storage among multiple servers) while network administrators enjoy leveraging the same IP skills they mastered long ago on their local area networks.

But how does iSCSI figure into the storage plans for Microsoft and its partners? The answer, not surprisingly, is prominently.

In June 2003, for example, Microsoft promoted the use of the IP protocol in SANs through its release of an iSCSI initiator service for Microsoft clients and servers, including Windows Server 2003 and Windows Storage Server 2003. Both operating systems can now dynamically discover target storage devices on an IP SAN.

Meanwhile, EMC Corp. is committed to supporting iSCSI on all of its storage platforms, says Tom Joyce, EMC's senior director of NAS product marketing. John Joseph, vice president of marketing for IP SAN vendor EqualLogic Inc., sees iSCSI as a popular option for customers who are consolidating their servers to reduce management and hardware costs, while at the same time upgrading to the new features in Windows Server 2003.

Many of the early adopters choosing iSCSI are smaller businesses with as few as five or six servers, adds Microsoft's Claude Lorenson. Among these companies, many are new to SANs and are choosing iSCSI as part of an overall storage upgrade and server consolidation project.

However, "iSCSI is really still in the early adoption stage," notes Phil Goodwin, a senior program director at market researcher Meta Group Inc., although he predicts "it certainly will play an important role in the SMB space as volumes go up and prices come down."

its installation processes for its IP SAN customers. They can "get a PeerStorage Array up and running, with ready-to-mount volumes, in under 20 minutes," says Vice President of Marketing John Joseph.

Also acknowledging the importance of ease of use, QLogic Corp. claims that replacing the old command-line interfaces with wizards allows some customers to install and configure their storage network switches in as few as four minutes. "The only command the system administrator wants to know is 'Next,'" says Frank Berry, vice president of marketing at QLogic.

Emulex Corp. has also built a wizard-like AutoPilot-Installer into its LP101 Host Bus Adapter. Aimed squarely at the SMB market, the LP101 connects Windows 2000 and Windows Server 2003 servers

to SANs. Emulex is a member of Microsoft's Systems Architecture program that tests combinations of storage hardware and software to ensure they work together. According to Director of Product Marketing Mike Kane, such testing is especially valuable because it simplifies the end user experience for those who are new to networked storage.

The Next 12 Months

In the upcoming year, says Microsoft's Lorenson, "We're going to have new feature releases that will provide some added functionality in terms of upgrades, in terms of storage management, in terms of deployment issues and ease of deployment."

Microsoft is also working to strengthen the security of SANs through the use of RADIUS (Re-

mote Authentication Dial-In User Service), a widely used protocol for authenticating dial-up users that is also used (in conjunction with Active Directory) to control access to local area networks in Windows Server 2003. Storage vendors are working with Microsoft to use RADIUS to provide centralized user authentication and access control to SANs.

At the high end of the market, Microsoft and its partners will continue to develop closer links between Windows and high-end storage platforms such as SANs, while making both SAN and NAS easier to use for smaller customers.

"We're seeing Windows breaking into what traditionally used to be the UNIX space," says EqualLogic's Joseph, because of the "seamless relationship" Microsoft is creating between its server operating systems and networked storage systems.

At the same time, storage infrastructure HBA vendor QLogic is seeing rapid growth in SAN adoption among SMB customers. "SMB customers have understood the promise and the benefits of SANs for a long time," says Berry, "but they haven't believed they're simple and affordable enough for them. But prices are dropping rapidly, the complexities are fading away rapidly and product interoperability is increasingly just as fast."

Driven by advances such as those made possible by Microsoft and its partners, SAN technology is already, he says, "more affordable and easier to use than the average SMB customer thinks."

At the end of the day, the end user doesn't want to spend a lot of cycles "trying to figure out if they want to deploy iSCSI or Fibre Channel," says Emulex's Kane. "Our job is to convince them that this stuff isn't so hard, and that they can easily install it and use it on a day-to-day basis without a degree in storage management." ■

Storage Management: Windows Takes Control

If there's one thing storage managers want, it's simple, easy-to-use management tools—especially if they're in the fast-growing small and medium business (SMB) portion of the market. Any shortages there in time or talent can hit home the hardest.

Microsoft and its partners are aiming to meet those needs with new storage management capabilities in both Windows Server 2003 and Windows Storage Server 2003.

Included in Microsoft's new set of tools is support for the HBA API, the industry standard for managing Fibre Channel HBAs (Host Bus Adapters) and discovering resources on storage area networks (SANs). Support of industry standards such as this is good news for customers who have long struggled to manage multiple SAN devices made by different vendors, many with their own interpretation of the Fibre Channel standard.

Because Microsoft's support for the HBA API makes information about any component in the SAN available to Windows, storage administrators accustomed to familiar tools such as Microsoft's Systems Management Server or third-party tools such as HP OpenView can now manage storage wherever it resides: direct-attached to a Windows server, in a NAS device or on a SAN.

An important tool based on the HBA API in Microsoft's collection is the Fibre Channel Information

Tool. A command line interface utility that also supports scripting, this tool can dynamically gather information about HBAs and switches that support the HBA API as well as devices supporting Microsoft's own WMI (Windows Management Instrumentation). The information it gathers includes, among other things:

- Unique World Wide Names that identify devices in a SAN;
- Firmware and drivers revision;
- Visible nodes and port type/status/speed; and
- Information on components in the network topology such as switches, HBAs and drives.

Storage managers wielding the Fibre Channel Information Tool should be well equipped to hunt down interoperability problems caused by incompatible versions of firmware in HBAs and switches—a common challenge. The tool helps pinpoint problems by identifying the versions of drivers and firmware used in HBAs and switches throughout the SAN, empowering administrators to more easily find and update incompatible devices.

Where Partners Play

Microsoft's tools still leave software partners plenty of room to innovate. One example of how Microsoft has opened doors for its software partners is the VDS (Virtual Disk Service) API, which makes it possible to manage storage on multiple vendor storage arrays from a single application interface.

continued on page S12

Microsoft Management Tools Snapshot

Fibre Channel Information Tool

What It Does

Command line interface that constantly gathers information such as World Wide Names, versions of drivers and firmware present in HBAs and storage switches, conditions of storage links and information about zones in storage area network

Customer Benefits

- ☑ Provides a single console for storage administrators to monitor the status of network devices
- ☑ Determines if the network topology is working as designed and discovers when resources are added or deleted

Support for the Industry-Standard HBA (Host Bus Adapter) API

What It Does

Makes information about any component on a SAN available to Windows

Customer Benefits

- ☑ Helps administrators using common Windows tools to discover and monitor the condition of a Fibre Channel SAN

Storage Event Tracing Tool

What It Does

Consolidates various mechanisms for tracing and logging storage-related events on SANs

Customer Benefits

- ☑ Gives administrators information needed to monitor and troubleshoot multivendor environments

Source: Microsoft Corp.

“VDS opens up a lot of possibilities our partners can take advantage of to make their products even easier to plug and play in a SAN,” says Microsoft’s Claude Lorenson, technical product manager for Windows Storage Technologies.

Tools that utilize VDS and the suite of storage tools can help storage administrators to:

- Discover devices in their storage network;
- Track their status;
- Create and change the size of storage volumes;
- Troubleshoot problems; and
- Assign volumes to applications and servers.

What’s more, they can do all this “without the need to use four or five different utilities,” says James Geronaitis, vice president of product marketing for Computer Associates International Inc.

Take QLogic Corp., for example, which builds on the two command-line interfaces (diskraid and diskpart) of Microsoft’s VDS with its graphical SANsurfer VDS Manager Utility. This tool helps storage administrators to discover the existence of storage network components such as storage arrays and HBAs, as well as key information about them. It

also helps them manage complex functions such as LUN masking (making logical storage units invisible to servers or other network-storage components) across heterogeneous storage components from

multiple vendors.

The APIs in Windows Storage Server 2003 “enable EMC to integrate our storage array technology more fully with the Microsoft platform,” adds Tom Joyce, EMC’s

The Storport Driver Story

One of the bigger barriers responsible for limiting storage access on Windows servers has been the relatively slow data throughput and lack of manageability of the Windows SCSI port driver—that is, until now.

The original driver was developed for parallel SCSI interconnects used in direct-attached storage rather than the high-speed capabilities of Fibre Channel, so naturally it was not optimized for speed. The new Storport driver, supported in both Windows Server 2003 and Windows Storage Server 2003, is designed to deliver key improvement in data throughput compared to its SCSIport driver predecessor when used with modern Fibre Channel Host Bus Adapters. And unlike SCSIport, Storport can send and receive I/O (input/output) requests simultaneously. More importantly, Storport makes overall device management much easier, including the management of clusters.

Multiprocessor servers can make use of this functionality to dramatically improve data transfer rates. What’s more, Storport allows easier access to the Windows registry, a database containing details about the configuration of components on a Windows server or other systems attached to it. This capability allows Storport to provide storage administrators information needed to determine conditions within the SAN fabric.

Vendors such as QLogic Corp. and Emulex Corp. have already rewritten their HBA drivers as Storport drivers, and more are expected to follow suit. EMC is also supporting the Storport driver from Emulex in order to simplify deployments for its Windows-based customers.

Partner Solutions Power Up Windows Storage

Partner	Solution	Capabilities	Windows Technologies Supported
Computer Associates International Inc.	BrightStor backup and storage management software	Automated backup/recovery; storage virtualization, management and optimization	<ul style="list-style-type: none"> ■ VSS ■ iSCSI
EMC Corp.	Net Win 200 NAS appliance; integration with existing storage management/ backup tools and operating systems; integration with storage arrays	Storage consolidation for branch offices; ability to manage EMC storage arrays from within Windows	<ul style="list-style-type: none"> ■ VDS ■ MPIO ■ HBA API ■ iSCSI
Emulex Corp.	LP101 Host Bus Adapters and drivers	Faster performance and improved manageability for SANs	<ul style="list-style-type: none"> ■ Storport ■ HBA API
EqualLogic Inc.	PeerStorage Array 100E	Self-managing IP SAN	<ul style="list-style-type: none"> ■ VSS ■ MPIO ■ iSCSI
Hewlett-Packard Co.	StorageWorks NAS and SAN disk arrays and storage backup and management software	Departmental-level storage consolidation; discovery and monitoring of HP arrays from within Windows; quick recovery of Exchange and SQL databases	<ul style="list-style-type: none"> ■ VSS ■ VDS
QLogic Corp.	HBAs and storage switches. SANSurfer VDS Manager Utility.	Faster performance and improved manageability for SANs; graphical tool for discovering and managing SAN components	<ul style="list-style-type: none"> ■ VDS ■ HBA API
Xiotech Corp.	Magnitude 3D disk array	Fast restore of Exchange databases	<ul style="list-style-type: none"> ■ VSS ■ MPIO ■ VDS

senior director of NAS product marketing. As a result, EMC NetWin users gain control over storage functions on EMC arrays that previously might have been out of reach. "This reduces the number of steps customers have to go through, and that is a dramatic step forward," he says.

Windows capabilities such as VDS and VSS help simplify the management of storage for both enterprise and SMB customers. Computer Associates, for example, supports VSS in its BrightStor ARC-Serve Backup and BrightStor Enterprise Backup software and plans to include VDS support within its BrightStor SAN Manager by the middle of this year, says Geronaitis. Using these tools, he says, customers can easily back up their

data, understand how their storage is utilized and allocate that storage more efficiently, which may allow them to postpone the purchase of additional storage.

EqualLogic Inc. uses the VSS capabilities of Windows Storage Server 2003 in conjunction with its PeerStorage Array 100E, a "self-managing" IP SAN to automatically manage snapshots and subsequent replication of data to maintain the highest levels of business continuity. PeerStorage arrays automatically virtualize 14 disk drives worth of data into a single group or pool of storage. When a new array is added to the group, the existing data volumes are automatically distributed across the two arrays, doubling capacity, perfor-

mance and network throughput with no effort required by storage administrators.

The company says each PeerStorage Array can scale seamlessly up to 112 terabytes of raw storage capacity. For a seven-terabyte implementation, EqualLogic further says it can reduce the total cost of ownership by more than 50 percent compared to other storage systems currently available.

What's Next for Microsoft

Looking forward, Microsoft's storage goals include improving the capabilities of VDS so that creating LUNs gets "easier and easier," says Lorenson. "We're adding to the capacity of VDS so it's very easy to provision LUNs for a small SAN," he notes. Administrators

can also expect Microsoft to include the Storage Event Tracing Tool (which was released separately earlier this year) in the next service pack of Windows Server 2003, later this fall. Moreover, Microsoft is planning to deliver new platform tools that make Fibre Channel easier to troubleshoot and debug.

The aim: "When the customer calls, instead of saying 'It's the switch vendor's fault or it's the HBA's fault,' they'll know which device needs to be focused on," Lorensen says. ■

Robert L. Scheier is a freelance writer based in Boylston, Mass. He is the former technology editor at *Computerworld*, and previously was a senior editor at *VARBusiness* and *PC Week*. In addition, he was an analyst for The Hurwitz Group specializing in databases and middleware.