

Synergy, Service Levels, and Savings – Microsoft Embraces Storage

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Management Summary

There are a lot of decisions to make when choosing a wine – red or white, California or French, merlot or cabernet, dry or sweet, and the list goes on. Variety is good, and the final choice is often a matter of taste and budget. But there is another factor to consider. *How well does the wine go with the dish being served?* A good combination adds to the enjoyment of a meal, and an awkward match can detract. **It is not just the qualities of the wine make a difference, but how the qualities integrate with the whole meal.**

In a similar vein, **choosing a server platform involves more than looking at core features and price. How well it integrates with the rest of the environment also matters.** The platform is a piece of a larger IT puzzle, and the puzzle itself is a tool for serving the business. No component is an island. This is why Microsoft has gone to such lengths to make its Windows platform “storage-friendly.” It must work closely with the storage infrastructure, and a fluid linkage simplifies deployment and management, and help lower costs. **Thus, the level of integration between the server platform and storage contributes to how well IT serves the business.**

Microsoft’s storage-related features for *Windows Server 2003*, which apply to networked and direct-attached storage configurations, include:

- *Volume Shadow Copy Service (VSS)* for point-in-time copies,
- *Virtual Disk Service (VDS)* for managing storage resources, including multi-vendor environments,
- *Multi-Path I/O (MPIO)* for path load balancing and failover,
- *iSCSI initiator* for block storage over IP,
- *Distributed File System* for a global namespace,
- *Storport* for better I/O management and performance, and
- *Basic SAN management tools.*

In addition, Microsoft *Windows Storage Server 2003* is the foundation of a myriad of third-party NAS products. Sum it up, and you can see how the Windows platform is directly embracing storage. Read on for details about what this means for enterprise IT.

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No Component an Island

There is an increasing trend to view and manage IT as a cohesive whole rather than a series of discrete parts.¹ After all, what matters is the output to the business, which is a function of the individual parts *and* how well they work together. Integration and interoperability – or playing well with others – are major factors in this equation. No component is an island.

The intersection between servers and storage is a key interoperability point since both are major IT components. The degree of synergy between them contributes significantly to the manageability, performance, and resiliency of the overall environment. **A good server/storage interface can simultaneously enhance IT's cost-effectiveness and output to the business.**

Storage Features of Windows Server 2003

Microsoft Windows Server 2003 is a server platform for enterprises. As such, it provides a common set of services for applications and the broader IT environment. Part of the platform's role is to interface with storage, which can be attached directly (DAS) or a shared over network (SAN and NAS)². **Seizing an opportunity to increase the value of its server platform, Microsoft has built a number of storage-friendly features into Windows Server 2003.**

VSS

Volume Shadow Copy Service (VSS) facilitates the creation and use of point-in-time (PIT) copies. (See sidebar on the right.) A PIT copy is the data equivalent of a still photo. While time and motion carry on in the present, a copy provides a view of data at a point in time in the past. This feature is useful for fast restore in case of data corruption or deletion, non-disruptive backup and data warehouse loading, and expedited application development and

¹ See *Shining the Light on Utility Computing – A Business Perspective* in **The Clipper Group Explorer** dated October 31, 2003, available at <http://www.clipper.com/research/TCG2003057.pdf>.

² For more information, see *Networked Storage – A Buyer's Guide to Pain Relief* in **The Clipper Group Explorer** dated April 25, 2003, available at <http://www.clipper.com/research/TCG2003017.pdf>.

Clone and Differential Copy

Point-in-time copy takes a “snapshot” of data on disk at an instance in time. The copy can be an exact replica of a volume, which is also known as a *clone*. Alternatively, it can be a copy of an index of data locations, which is called a *differential copy*. As the original data is overwritten, a differential copy makes a copy of the modifications to preserve the integrity of the original (i.e., copy-on-write). A clone offers greater flexibility and performance for reading and writing, while a differential copy conserves disk space, as long as data does not change too much for the duration of the copy.

testing.

Coordination is needed to create a good PIT copy, and this is what VSS does in Windows environments. It coordinates with the application to ensure the copy is consistent and usable – and with virtually no downtime. It coordinates with the copy service itself, which may reside on a storage array, network-resident platform, or server. It also provides a requestor for applications or scripts to trigger copies.

The benefit is simplification in heterogeneous environments. It is like a train station that provides a common connectivity point for multiple lines. Once an application, copy service, or requestor supports VSS, it automatically interoperates with other VSS-enabled solutions. Due to the large market presence and influence of Windows, this VSS community is sizable. As a result, enterprises have greater choice and ease of use in PIT copy technology.

Furthermore, *Shadow Copy of Shared Folders (SCSF)* is a related feature that allows users to retrieve files from VSS copies without involving the IT department or backup system. Accidental file deletion or overwriting is now easily remedied, saving time and expense.

VDS

VDS (Virtual Disk Service) is the “universal remote” for Windows disk management. It provides a common user interface for managing multi-vendor storage arrays at the block level

(i.e., LUNs and volumes), which simplifies management and helps lower operating costs. Administrators use a single Windows console for viewing and managing attached storage, whether DAS, SAN, or NAS. They do not have to learn and use a different device manager for each vendor's array. VDS capabilities include resource discovery, LUN configuration and masking, assigning drive letters, volume expansion, and monitoring array status and performance.

As in the VSS feature, it is incumbent on storage vendors to create VDS "providers" for their storage arrays, and most major players now have them. Providers translate between the Windows interface and specific storage devices. The depth of functional support depends on the level of integration in each provider.

MPIO

Multipath I/O (MPIO) is the Windows equivalent of a real-time traffic routing system. Imagine a system that could tell you which of several routes to work would be the shortest at any given point in time. If one route was slow due to congestion or closed due to an accident, the system would send you down a different one. It would minimize commuting time and avoid frustrating traffic jams. MPIO performs a similar function for data traveling between a Windows server and its associated storage over multiple, redundant paths. If a link fails, it sends data down an alternate path. It also executes a load-balancing algorithm to effectively use the bandwidth of all paths. The benefit is high availability and optimized performance among up to 32 paths per server. This is especially beneficial in a SAN, where network bandwidth is shared (i.e., potential for congestion) and multiple points of path failure exist (HBAs, cables, switch ports, storage ports). It also lets enterprises deploy a solution that is independent of specific HBAs or storage arrays.

Like the previous features, each vendor must supply a device-specific module for its storage arrays to support MPIO, so check with them. MPIO currently supports Fibre Channel and parallel SCSI connections. Generic iSCSI support is scheduled for a future release.

iSCSI initiator

iSCSI is like the light beer of storage networking protocols – a "less-filling" alternative to Fibre Channel. While Fibre Channel is the de facto standard, high-performance interconnect for data center SANs³, iSCSI is an up-and-coming protocol that lets servers connect to block storage over ubiquitous IP networks. IP tends to be less costly than specialized Fibre Channel fabrics. It is also more mature in terms of interoperability and ease of deployment, and technical skills and tools are more readily available. iSCSI is beginning to gain traction in the market, both as a basis for standalone SANs and as a complement to Fibre Channel for tying in distributed and workgroup servers as well as moving data over long distances.

The adoption of iSCSI is in no small part due to Microsoft having offered a free iSCSI driver on its Windows Server platform. With an iSCSI target storage device on the network, Windows servers can access it using a simple network-interface card (NIC). If performance is a concern, specialized adapters are available that offload TCP and/or iSCSI protocol processing.

Distributed File System

Distributed File System (DFS) is a Windows technology that improves the manageability, robustness, and performance of file access in distributed environments (i.e., multiple file servers, possibly geographically dispersed). The foundation of DFS is a global namespace, which is like a phone book for file systems. With a phone book in hand, a person only needs to know the name of an individual to find the corresponding phone number and address. There is no need to know where everyone in town lives. Furthermore, as people move, the phone book is periodically revised to reflect the changes. In a similar fashion, a global namespace keeps track of file systems and shares so clients only need to know logical names. It eliminates the tangled web of physical mappings that normally must be revised anytime that changes occur, such as moving a share or adding/removing a file server. It makes these

³ See *Fibre Channel – The Defending Champion Has Staying Power* in **The Clipper Group Explorer** dated December 14, 2001, available at <http://www.clipper.com/research/TCG2001012.pdf>.

changes non-disruptive to clients, as well.

DFS delivers additional features behind the mask of a global namespace. Files can be replicated for redundancy and local access. DFS automatically routes clients to the nearest server, taking into the account the cost and bandwidth of links. It also load balance among multiple file replicas. If a file server becomes unavailable, DFS directs clients to an alternate location. In this way, DFS simplifies file management, helps maximize capacity utilization, and improves file access performance and availability.

Storport

Device drivers are essentially translators for communicating between computers and other devices. *Storport* is a revised Windows storage device driver that delivers a performance improvement over the previous driver for connecting to Fibre Channel SANs and RAID systems. It is able to duplex, or simultaneously transmit and receive, and reduces the CPU cycles consumed in the storage I/O process.

SAN Management Tools

The Windows-based *Fibre Channel Information Tool* is useful for setting up and troubleshooting multi-vendor Fibre Channel SANs. It gathers configuration data like firmware versions and port worldwide names through the industry-standard HBA API (host bus adapter application programming interface). Another feature called *Storage Tracing* monitors communication between servers and storage without taking the servers offline. These features help simplify SAN management in heterogeneous environments.

Windows Storage Server 2003

Microsoft also offers a specialized version of Windows dedicated to file and print services called *Windows Storage Server 2003*. It is sold exclusively through original equipment manufacturers (OEMs), which use it as the software foundation for NAS solutions. They package it with server, storage, and possibly third-party software to form a complete product for delivering file server consolidation. There are over 25 such OEMs worldwide, including major storage vendors like EMC, HP, and Dell. Windows-based NAS solutions have garnered over half the market in unit terms. Revenue

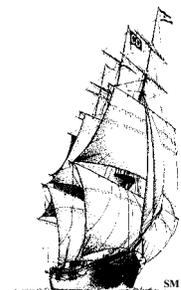
share is less because the solutions are predominantly entry-level and midrange. Microsoft has steadily bolstered its capabilities here in an effort to move up market. Recent additions include multi-node clustering, language localization, faster file system performance, and the Windows features listed above (e.g., VSS, VDS, and MPIO). In May 2004, Microsoft and its OEM partners also announced the availability of a feature pack for Windows Storage Server 2003 that enables it to store *Exchange Server 2003* database and log files.⁴ By combining Exchange data along with file and print serving on one platform, enterprises can further consolidate storage and increase the benefits of easier management, streamlined backup, and better capacity utilization.

Conclusion

Microsoft has developed an impressive set of storage-friendly features for the Windows platform. Their value includes:

- Enhanced I/O management and performance (MPIO, Storport),
- Improved availability (VSS, MPIO, DFS),
- Simplified management, especially in complex, multi-vendor environments (VSS, VDS, SAN Management Tools, DFS),
- IP-based SAN enablement (iSCSI initiator), and
- File and print server consolidation and business continuity (Windows Storage Server 2003).

In short, the synergy between the Windows Server, Storage Server, and storage overall translates into better IT service levels and economics. When considering Windows Server as an enterprise platform, do not forget to look at what it does at the edge – at the interface with other components like storage. The platform's value is at the edge as much as in its core features.



⁴ Microsoft recommends this storage configuration for environments of less than 1,500 mailboxes.

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