New Features in Windows Storage Server 2003

The following are some of the new features* in Windows Storage Server 2003.

- Volume Shadow Copy Service
- Virtual Disk Service
- MPIO
- DFS

Volume Shadow Copy Service (VSS)

The Volume Shadow Copy Service (VSS) is an infrastructure that makes possible enhanced data protection though high fidelity backups, rapid data restores, and data transport.

VSS is a component of the operating system, and as such, is not directly accessed by users. Instead the Volume Shadow Copy Service coordinates with user applications, backup applications and storage hardware to enable the creation of point-in-time shadow copies of data on single or multiple volumes without significantly impacting performance.

High Fidelity Backups

Shadow copy creation is a highly effective means of protecting data with several advantages over traditional tape backups when the goal is not long-term archiving. Tape-based technologies are time-intensive to run, impose a considerable bandwidth burden on the local network, and can have data inconsistency issues if applications are open during the backup process. As a consequence, tape backups tend to be scheduled relatively infrequently and at times when applications are not in use (such as nights or weekends)-a strategy that can work reasonably well for companies that do not require 24x7 operations. In contrast, shadow copies can be created in seconds, without the impact on network traffic that tape backups impose. Additionally, because the shadow copy process allows open files to be backed up without data inconsistency issues, they can be scheduled at any time, and much more frequently than tape backups.

Fast Restores

In the event of data loss, shadow copy restoration offers significant advantage over tape restores. Because the shadow copies can be saved on storage arrays on site, they can be accessed directly, without the need to travel offsite to a tape data vault, locate and bring back a tape. Even more significantly, shadow copy restores takes only minutes to complete, while tape restores, depending on the type of backup (full, differential or incremental) and the amount of data, can take hours or even days to do correctly.

Shadow Copies for Share Folders

System administrators are not the only people to benefit from the fast restore functionality enabled by VSS. System administrators can activate Shadow Copy for Shared Folders, thereby enabling end users who overwrite or accidentally delete a file to restore a previous version of a file for themselves, rather than having to recreate the file or request that a system administrator do a high cost single file restore from tape.

Shadow Copy Transport

All of the functionality discussed above is provided with the in-box shadow copy technology on the operating system. The exception to this is shadow copy transport among systems-whether for backup, data mining, testing or fast restores-which requires a hardware provider on the SAN. In a direct attached storage configuration, this data transport between servers is physical. In a NAS-SAN configuration with pooled storage, data on the SAN can be accessed (through masking and unmasking) between servers. Although access to the storage pool is shared, each server can only access the specific LUNs (Logical Unit Number) assigned to it (since two servers cannot both write to the same volume without potentially causing data corruption). But using the hardware provider on the SAN, a point-in-time shadow copy can be virtually “transported” to another server for use, through the process of masking and unmasking.

Virtual Disk Service (VDS)

In order for a server to use new storage disks, they must first be made accessible to the server and then formatted for use. Virtual Disk Service (VDS) controls the process of making storage accessible to systems that need it. While it is irrelevant to application (or the user) how the data is stored-whether it is on a single physical disk or spanned across several disks (a logical unit), in terms of data protection and performance, the impact of how the data is stored is significant. Thus VDS can either present a physical disk or a logical disk to a server. Physical disks do not require the first two steps.

1. Create logical units, assign number ids (these are now referred to as LUNs)
2. Unmask LUNs to server
3. Create partitions and volumes
4. Format the file system

- Basic Disks. VDS is used to partition[1] each physical disk and to create the volumes that can be mapped to drive letters for use. These volumes are known as “simple volumes” and do not span multiple disks. Basic disks are the legacy disks, predating Windows 2000 capabilities. They do not offer the same performance and data protection that dynamic disks offer.
- Dynamic Disks. VDS can be employed to create dynamic disks which can consist of either simple volumes or multi-partition volumes[2]. Multi-partition volumes physically span more than a single disk but nevertheless are logically considered a single volume. Dynamic disks can be spanned, striped (RAID-0), mirrored (RAID-1) or stripped with parity (RAID-5), depending on the level of performance and data protection desired. VDS can be used to expand dynamic disks to make more space available to a volume.

Although many vendors provide NAS appliances preconfigured with RAID, system administrators might want to use VDS to customize the storage solution to meet specific data storage needs, whether relating to capacity, performance or data protection.

VDS can also be used to attach a NAS device to a back-end SAN. These NAS “heads” contain only the file serving capabilities; for highly scaleable and highly available pooled storage, they plug into a Fibre Channel SAN. Each storage unit on the SAN must have its storage configured and made accessible to the appropriate servers only. Since it is common for storage on the SAN to be from multiple hardware vendors, prior to Windows Server 2003 and Windows Storage Server 2003 it was necessary for the system administrator to configure each device using a vendor-specific storage management application. Not only did this mean using hardware-specific management utilities, it frequently meant that the system administrator had to physically go to each storage device to do each configuration.

Windows Storage Server 2003’s Virtual Disk Service helps alleviate these administration complexities in a NAS backend SAN configuration by providing a single management interface for multivendor storage devices. The system administrator can manage all storage devices directly from a single management console, and query and configuration operations are common across all managed devices.

In this scenario, VDS functionality is enabled through hardware vendor support. Each hardware vendor must supply a VDS “provider” for the storage hardware. The hardware provider translates the VDS standard APIs (application programming interface) into instructions specific to the storage device. With communication enabled between the Virtual Disk service and the storage hardware, the system administrator can now use a single storage management interface to communicate with multivendor storage devices.

Multipath I/O (MPIO)

Multiple or redundant paths between storage devices and the systems that use them enable persistent data availability and high I/O performance. In essence, these technologies provide for an alternate connection in case of failure of the primary I/O path, and, optionally, multiple paths to improve performance or balance loads.

MPIO software included in Windows Storage Server 2003 is not a feature of the operating system, but is supported through the Driver Development Kit (DDK). Multipathing allows a host to have up to 32 paths to access an external storage device, which facilitates failover and load balancing. Multipathing technology is critical in ensuring highly available data to businesses. In the past, multipathing was a solution only available to large scale enterprises; now this high availability solution is available to any organization using only Windows Storage Server 2003 (and Windows Server 2003) technologies.

Microsoft's MPIO delivers a standard and interoperable path for communication between storage products and Windows Server. With a platform upon which multiple third-party storage systems can reliably interoperate, businesses have greater choice when building a high-quality, highly available network storage system, and system administrators will have the flexibility to incorporate products from multiple vendors into a single, interoperable and highly available storage infrastructure.

Distributed File System (DFS)

The Distributed File System enables the system administrator to create single hierarchical mapping of all systems and shares on the network. By uniting files on different computers into a single namespace, users do not have to sort through a network of dozens of servers, each with their own separate directory structure, but instead see the files as if they resided on a single computer.

With the latest version of the server operating system, DFS has been enhanced to allow multiple DFS roots on a single server, thus reducing administrative and hardware costs of managing multiple namespaces and multiple replicated namespaces. In addition, DFS now delivers more reliable load-balancing, better file replication between DFS sites and servers, and closest-site selection for users accessing the network. Closest-site selection ensures that in the event of server failure or scheduled maintenance, users are automatically routed to another server on the network that has a replica of the data. For best performance and lowest cost, clients are rerouted to the site closest to them.

* check with your OEM for specific configuration

[1] Physical disks are divided into sectors; contiguous sectors are partitions. In the case of basic disks, the volumes are created within partitions, and are thus restricted to a single disk.

[2] Volumes can span one or more partitions on the same or multiple disks. Dynamic disk types include RAID configurations, and can offer better performance and reliability than basic disks.