



Scalable NAS and SAN storage systems using Melio Cluster File System with Microsoft Windows Storage Server 2003 R2

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Microsoft Windows Storage Server 2003 R2 has evolved into a very flexible solution for both file serving and block storage applications. It combines the familiarity of the Windows operating system, file serving using CIFS or NFS, and now iSCSI storage for applications requiring block storage access. A Windows-based Storage server can utilize its internal disk drives, or connect to an external storage array, which provides more flexibility for expansion and allows file services to be integrated into an existing SAN.

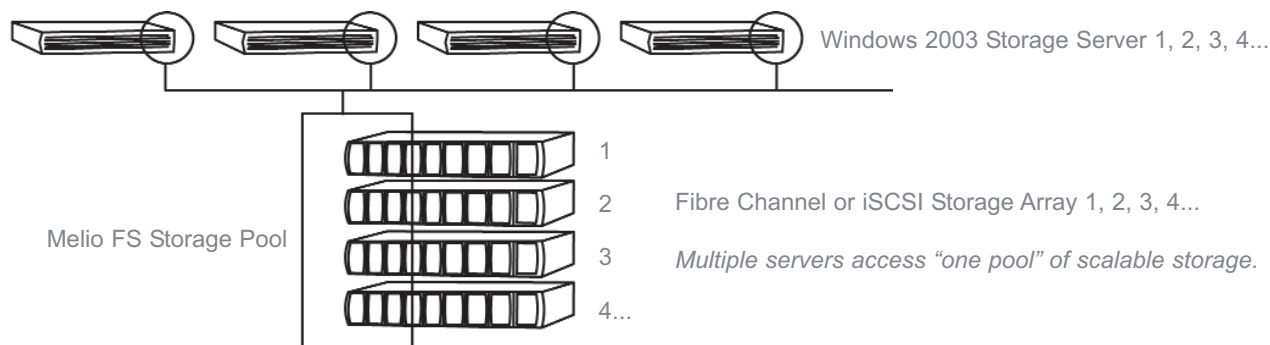
Microsoft Windows Storage Server 2003 is frequently deployed in small or midsize applications. I/O performance is determined by the disk drive configuration and the server hardware, typically an industry standard Intel-or AMD-based server. Many customers have viewed Windows Storage Server as an excellent small NAS solution, but have moved to larger, proprietary file server appliances when their needs expand beyond the capacity of a single Window Storage Server. This approach typically adds considerable expense and the complexity of introducing a new proprietary island system to manage.

With the introduction of the enhancements in Windows Storage Server 2003 R2, more capable multi-core industry standard servers, and Sanbolic's Melio clustered file system (Melio FS), customers now have the option of expanding their Windows Storage Server 2003 -based file serving system dynamically as needed, to meet the needs of applications requiring petabytes of storage capacity and gigabytes/sec of throughput. These clustered systems using cost effective industry standard hardware have inherent redundancy and provide a single name space, as all Storage Servers in the cluster access a common file system. The solution allows administrators to continue to use all the Windows management tools, as Active Directory, DFS, Windows Security and other Windows tools are fully supported.

Scalable File Serving Using External Storage

Using Melio file system, multiple Windows Storage Server 2003 file servers can be clustered into a common file system on external SAN storage. All storage servers have concurrent read and write access to the shared storage using Sanbolic's clustered file system, so a file call can be processed by any of the Storage Servers. Microsoft DFS can be used to fail over, load balance, and distribute CIFS file calls among the Storage Servers and provide a single network address to clients on the network. Alternatively, a hardware load balancer can be used to balance both NFS and CIFS network calls in environments where multiple client operating systems are used. Additional servers and additional storage arrays can be added dynamically to the cluster to expand I/O performance or storage capacity without I/O interruption while client systems continue to access data.

Scalable File System using External Storage



I/O performance scales linearly as additional Windows Storage Server 2003 machines are added to the cluster. Clusters of up to 64 machines have been demonstrated, and larger clusters are possible. The system can provide aggregate throughput of several gigabytes per second. Melio FS is a 64 bit file system, which provides support for volume sizes up to 18 million terabytes.

The external storage connected to the Windows Storage server cluster can incorporate multiple tiers of disk arrays. Sanbolic's file management product, SILM, can migrate or copy files across storage tiers based on administrative based policy settings.

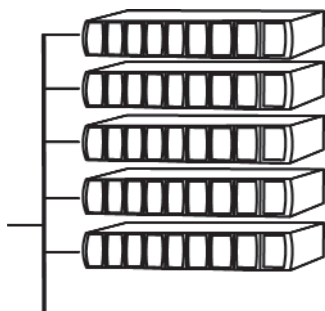
Scalable File Serving Using Internal Storage

Windows Storage Server 2003 R2 introduces the capability to present internal and external storage as an iSCSI target. Using this feature, Melio FS and LaScala volume manager allow the internal disk drives of multiple Windows Storage Server 2003 machines to be clustered into one large storage pool. The storage pool then can be made accessible to clients using CIFS or NFS through the Windows Storage Servers, or to application servers using block-level iSCSI access.

Industry standard servers with multiple internal drives running Windows Storage Server 2003 R2 can be used as modular "building blocks" in creating a scalable storage system that can support hundreds of terabytes of storage. I/O and storage capacity can be added modularly to the active cluster. The cluster has a single file system and hence a single namespace for file serving, and it is administered using familiar Windows Server tools.

The large storage pool can also be accessed by application servers over iSCSI. If the application servers are running Sanbolic's Melio File System and LaScala volume manager, the block storage pool can be centrally configured and assigned to application servers, and application servers can have shared read/write access to data in the storage pool over the iSCSI connection.

Scalable File serving Using Internal Storage



Industry standard servers 1,2,3,4,5,6.....

Each server is running Microsoft Windows Storage Server 2003 R2 and Sanbolic's Melio clustered file system and LaScala volume manager.

Servers have multiple internal disk drives.

- Melio and LaScala aggregate internal drives into a single storage pool
- Mirroring provides data protection
- All Storage Servers can provide access to the storage pool using CIFS or NFS
- Application servers can have shared block access to the storage pool using iSCSI

Summary of Features

The modular scalability of storage systems utilizing Sanbolic's Melio clustered file system and Microsoft Windows Storage Server 2003 R2 provides customer with the flexibility to use internal or external storage to grow storage capacity, while using industry standard server hardware to modularly grow I/O performance. Both storage capacity and I/O performance can be expanded dynamically as data is being accessed. Customers are free to use their preferred hardware vendor, and can rapidly incorporate performance enhancements in processors, disk drives and network. Microsoft sells Windows Storage Server 2003 R2 through selected hardware partners.

The result is a flexible, fully featured, highly available storage system without introducing a new proprietary and expensive hardware-based solution.

- Built on industry standard servers using Windows Storage Server 2003 R2---no need to introduce proprietary hardware and management tools
- Sanbolic's Melio FS turns Windows Storage Server 2003 into a high-end solution—allows users to modularly scale systems to petabytes of storage
- Melio FS is a 64 bit file system--which supports a maximum volume size of 18 million terabytes, effectively removing size limitations
- Familiar Windows based system reduces operational expenses
- No single point of failure--inherent system redundancy
- Any server can handle any file request, eliminating the need for passive fail-over servers. Microsoft Clustering Services can be implemented for additional resiliency and availability
- Reduces initial purchase price and total cost of NAS ownership versus proprietary appliance solutions
- Easily add storage and I/O capacity as needed
- Easy to install, deploy, and manage

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