Scalable Windows Server File Serving Clusters Using Sanbolic's Melio File System and DFS

(A step-by-step guide)

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Software to Simplify and Share SAN Storage

Introduction

Viewed by many as an effective small NAS solution, Windows 2008 Servers are frequently deployed as file servers within small to midsize environments. However, once file-serving needs begin surpassing the capacity of a single Windows Server, larger, proprietary file-serving appliances are often considered to ensure continuous access to critical data. And while file-serving appliance-based solutions can help to address this need, they typically introduce a significant expense along with the added complexity of managing a proprietary island storage system.

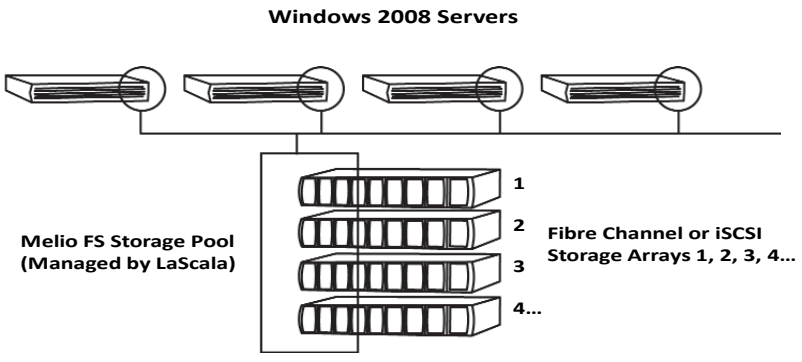
This paper describes how to achieve a highly scalable and highly available file-serving cluster solution without the additional costs and complexities introduced by proprietary hardware-based file-serving appliances.

Scalable File Serving Clusters Using Windows 2008 Server, Sanbolic's Melio FS and SAN Storage

Using Sanbolic's Melio FS clustered file system, multiple Microsoft Windows 2008 Servers running on industry-standard hardware can be clustered into a common file system on external SAN storage. With all servers having concurrent block-level (iSCSI or Fibre Channel) read/write access to the shared storage, a request for a specific file can be processed by any of the servers accessing the shared volume on the SAN, allowing for a very flexible and scalable file-serving architecture.

Additional servers and/or storage arrays can be added dynamically to the cluster to expand I/O performance and storage capacity without I/O interruption as client systems access data. I/O performance scales linearly as additional Microsoft Windows 2008 Servers are added to the cluster. When sufficient performance exists within a SAN, a large cluster offers aggregate throughput of multiple gigabytes per second. Since Melio FS is a 64 bit file system, it supports very large volume and file system sizes, rendering the 2 terabyte volume size restriction obsolete.

Scalable clusters of Windows 2008 Servers using Melio FS and external SAN storage provide a cost effective file-serving solution that allows storage administrators to add I/O performance and storage capacity as needed while continuing to use their Windows tools to manage their file-serving solution.



Multiple servers accessing "one pool" of scalable storage

Using DFS Namespaces with Scalable File Serving Clusters

Microsoft DFS can be used to fail over, load balance, and distribute CIFS file calls among multiple 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. Since DFS is a standard component of the Microsoft Windows Server 2008 license, this paper describes the configuration of DFS to achieve a scalable file-serving solution using two Windows 2008 Servers with shared access to a Melio-formatted volume on external SAN storage.

Although DFS is used to provide a single "namespace," it is important to note that in file server clusters using Melio FS, a client can access a ***common volume*** on a SAN through ***any*** of the file servers in the cluster. Hence, I/O performance available from the volume can be much greater than the throughput of a single file server.

Note: Actual I/O performance is dependent on the number of file servers in the cluster and the performance of the SAN storage hardware.

In addition to enhanced I/O performance, if any of file servers were to fail, the data on the common volume would remain accessible to clients through any of the remaining file servers, making the data highly available. The DFS namespace allows the clients to see the common volume as a single share, even though it can be accessed through any of the servers in the cluster.

By implementing DFS and Melio FS on Windows 2008 Servers, both I/O scalability and fault-tolerance/high availability for network clients can be achieved.

Example of a Small File Serving Cluster Configured with DFS

The following example describes two servers running Microsoft Windows 2008 Server and Melio FS named *Y-2-2k8x64* and *Y-6-2k8*. A shared LUN is presented to each server from the storage array through a fibre channel or iSCSI switch fabric. The LUN is then managed using Sanbolic's LaScala Volume Manager and formatted with Melio FS. Both servers can then read and write to the shared volume concurrently over fibre channel or iSCSI. The clients in this example are running Windows Vista and are connected to the servers through a LAN.

Note: Although this example uses two Windows 2008 Servers to describe the configuration, a cluster can easily be configured to include several dozen servers.

Note: This paper does *not* describe in detail the installation of Melio FS and LaScala on Windows 2008 Servers nor does it explain how to configure a shared volume. Please refer to your SAN storage vendor's documentation to provision a shared LUN. Once the hardware is up and running, installing and configuring Melio FS and LaScala takes only a few minutes.

For details regarding installing and configuring Melio FS and LaScala, click on the following links:

http://www.sanbolic.com/pdfs/LaScala_manual.pdf
http://www.sanbolic.com/pdfs/MelioFS_Installation_Guide.pdf

Requirements for Configuring DFS in a Scalable File Serving Cluster

- The Namespace servers should be running Microsoft Windows Server 2008 x86 or x64 builds (backward compatibility exists with Windows Storage Server 2003 R2 or Windows Server 2003 R2).
- Melio FS and LaScala volume manager must be installed on each server.
- A shared LUN on the external SAN storage must be formatted with Melio and mounted on the Namespace servers.

The Distributed File System service must be running on all DFS root servers and domain controllers so that DFS can work properly. This service depends on the following services:

- The Server service, Workstation service, and Security Accounts Manager (SAM) service is running on DFS root servers.
- The Distributed File System service also requires an NTFS volume to store the physical components of DFS on root servers.
- The Server service and Workstation service is running on domain controllers.
- The clients should be running Windows XP and above.

Steps for Configuring DFS

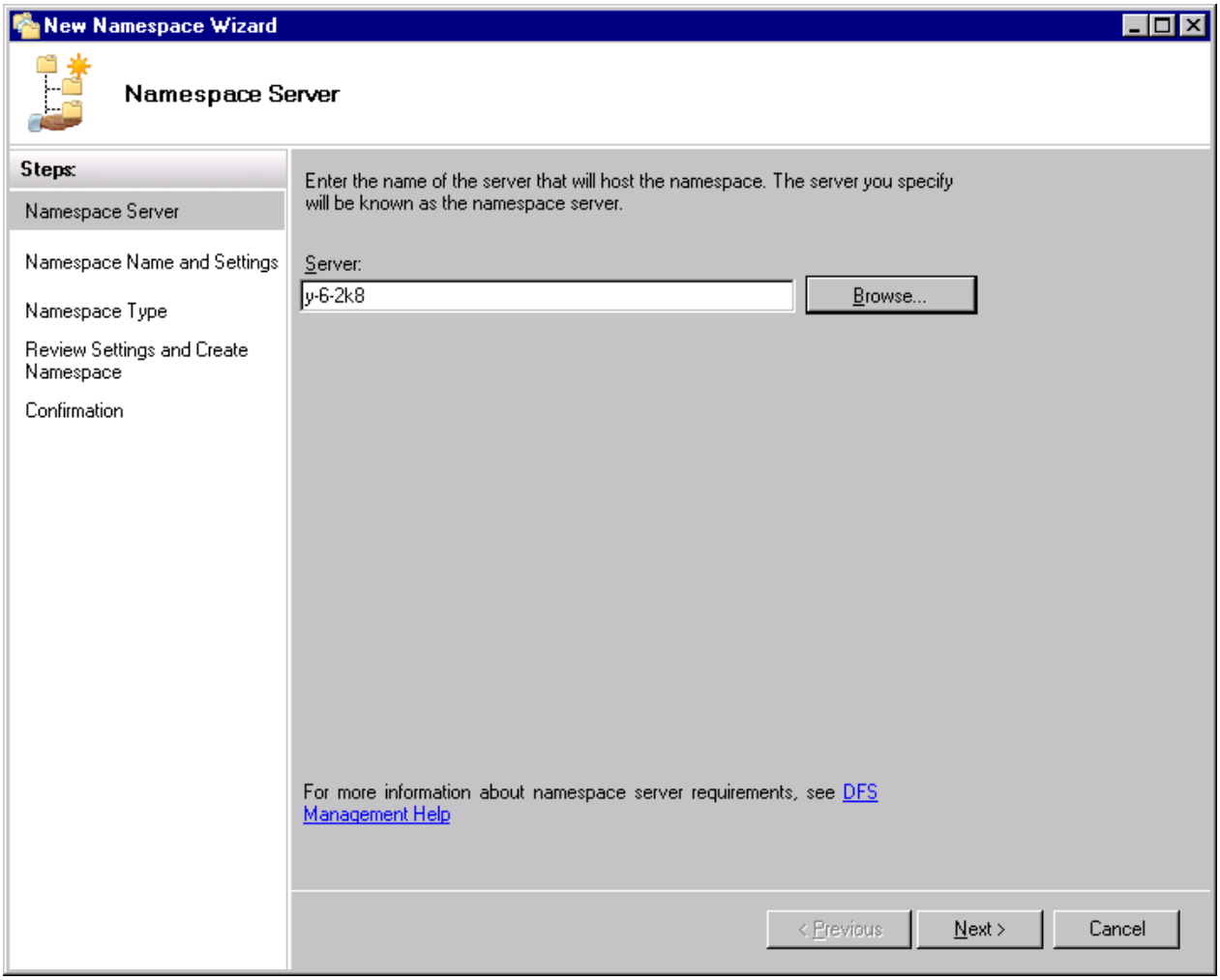
Create a Melio-formatted shared volume on the SAN, which is mounted as Drive X. A detailed description of this process is described in the Melio and LaScala manuals, accessible at the links provided above.

Using the Server Management console in Server 2008, add a new role "File Services" and within it select the "Distributed File System" subsidiary. In the "Add a Role Wizard" select the option "Create a Namespace later" and complete the remaining steps to install the DFS role.

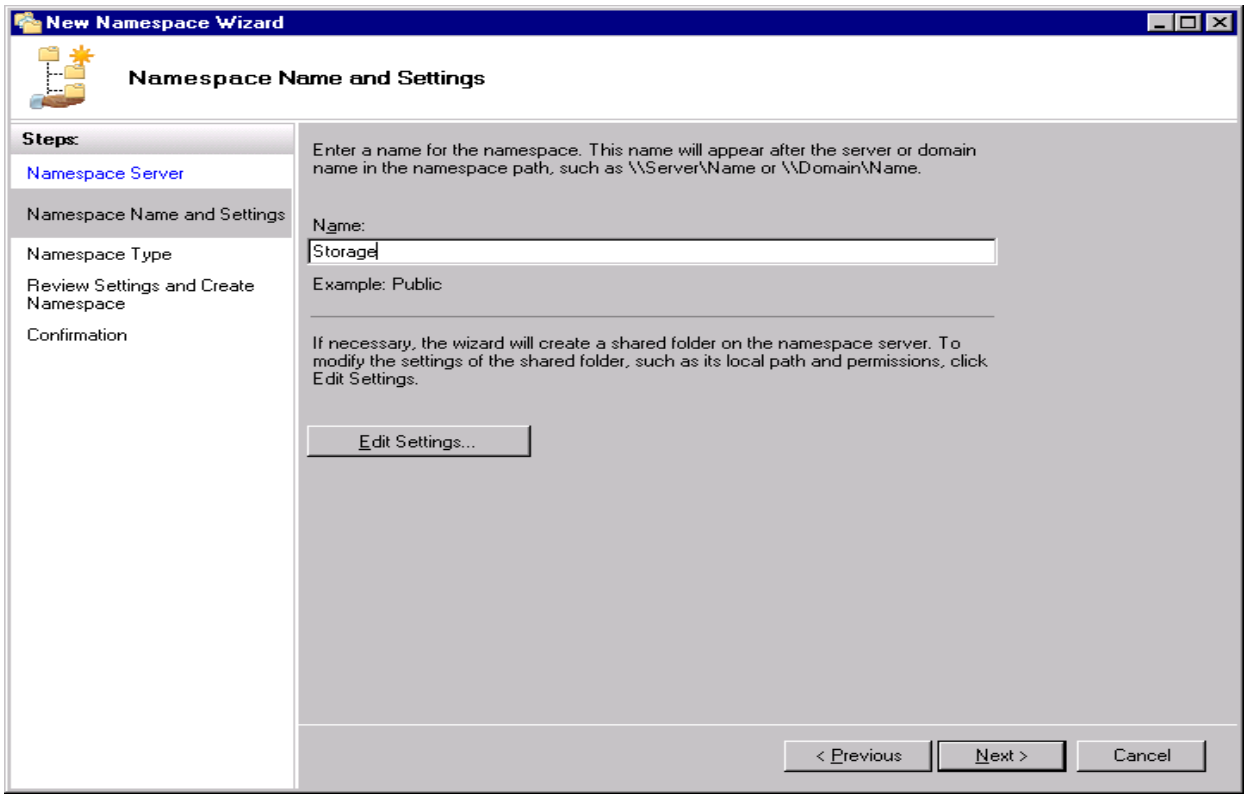
From *Administrative Tools* run the *DFS Management* snap-in. Select "Namespaces" in the left window of the *DFS Management* snap-in.

Note: When the *DFS Management* snap-in is run for the first time, there are no available "Namespaces" in the middle window.

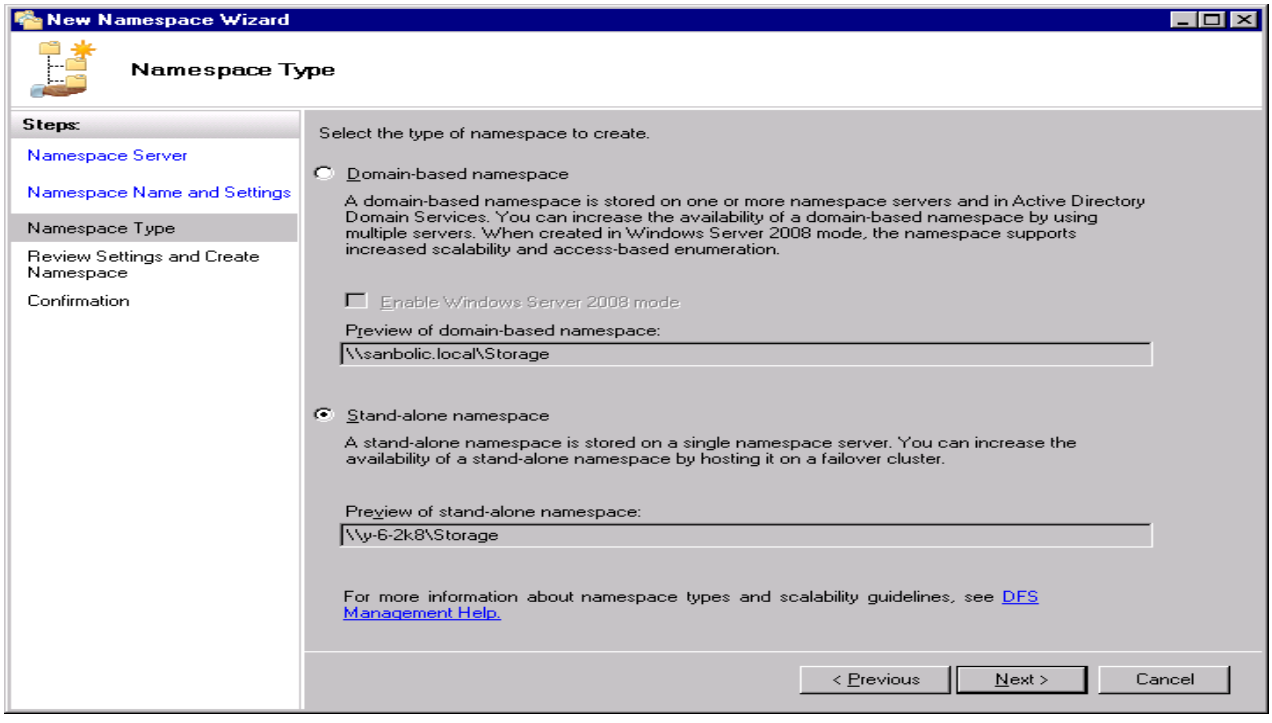
In the right window select "New Namespace" to start the *New Namespace Wizard*. The *New Namespace Wizard* starts and requests that the server hosting the namespace be specified. In this example it will be *y-6-2k8*. After choosing the server, the wizard will prompt to start the DFS service (if it is not already running).



Next, specify a name for the namespace. In this example the name is "Storage". The wizard automatically creates a "Storage" share on the target server.



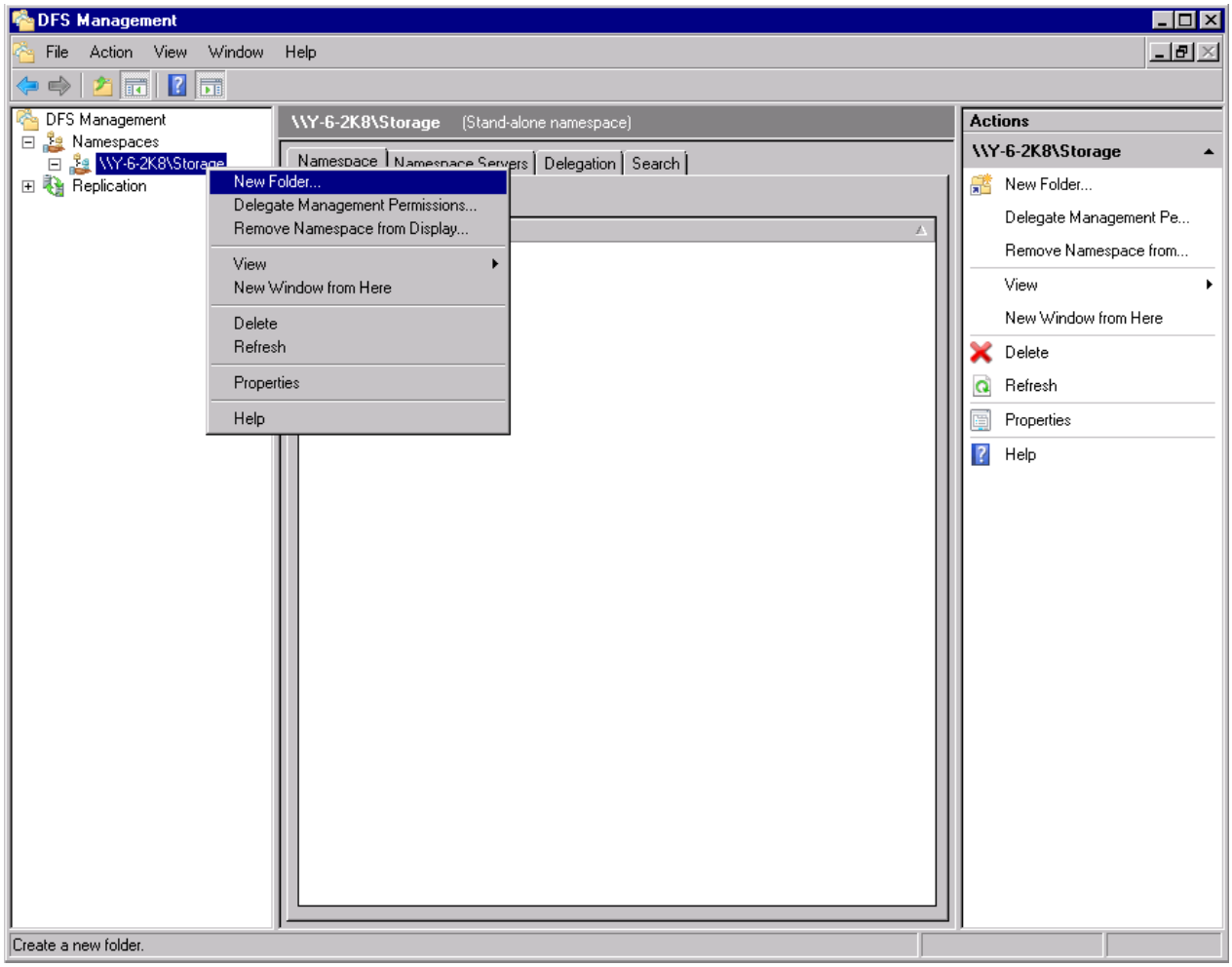
Clicking "Next" brings up the *Namespace Type* page where one can choose a *domain-based* or *standalone* namespace. A domain-based namespace is stored on both the namespace server and in Active Directory. In addition to being easier to search for within a domain based networking environment, a domain-based namespace can be hosted on multiple namespace servers, providing fault tolerance. Large clustered server environments should typically be configured using a domain-based namespace. A standalone namespace is stored on namespace servers only and not within Active Directory.



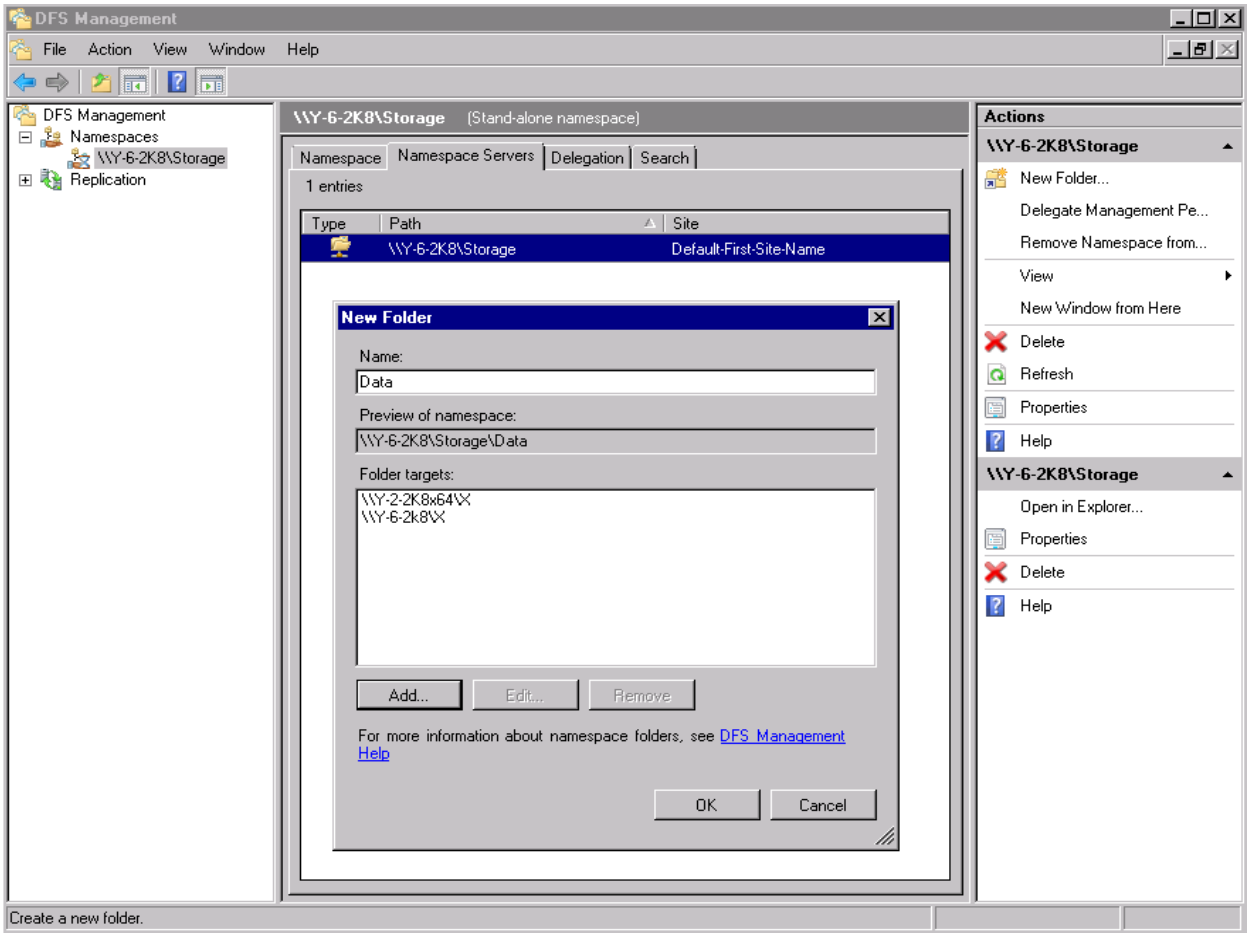
For simplicity in this example, a standalone namespace is used. Click “Next” and then click “Create” to create a new namespace called “Storage”.

The new namespace will be rooted in a shared folder on the Windows system drive under \DFSRoots\Storage. By default, the wizard gives *Everyone* read permissions on the root folder.

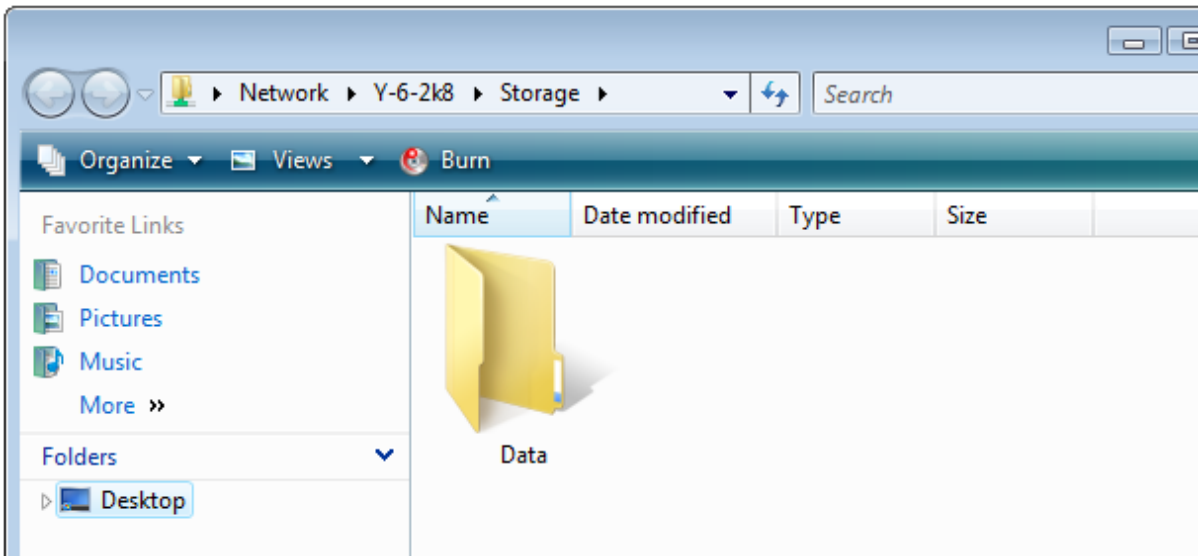
The next step is to create a folder in the namespace. To do this, select *New Folder* from the action plane or right-click the namespace and select *New Folder*. The new folder is given the name “Data”.



Targets can then be added to the folder. In this case, the targets are the Melio FS formatted volumes shared between the two servers. The path to the folder through each server is added as a target. If additional servers were added to the cluster, the paths to the shared folder through each additional server would be added as targets as well. Targets can then be added to the folder. In this case, the targets are the Melio FS formatted volumes shared between the two servers. The path to the folder through each server is added as a target. If additional servers were added to the cluster, the paths to the shared folder through each additional server would be added as targets as well.



Folders can also be added without targets to help organize the information in the storage. Click "OK" to create the folder.



To access the resources in the new namespace, log on as an ordinary user to a computer running any Windows OS from XP upwards. Click the Start button, click Run, type: \\Y-6-2k8\Storage and press Enter or click OK. This opens Explorer to the root of the namespace, providing access to the folder named "Data" and all information residing within the folder.

Summary

Windows 2008 Server is often used to provide file services within small to midsize environments. However, as data growth continues unabated, fueled by today's data-intensive mission and/or business-critical applications, organizations are looking to larger, more expensive proprietary file-serving appliances to ensure data is accessible to its users at all times.

With Windows scalable file-serving clusters comprised of Sanbolic's Melio FS clustered file system and SAN storage, organizations have the flexibility to utilize external storage to dynamically expand both I/O performance and storage capacity while ensuring continuous access to data. Running Microsoft Windows 2008 Servers on industry-standard server hardware allows storage administrators to increase I/O performance granularly through enhancements to processors, disk drives and network adapters; resulting in highly scalable and highly available file-serving clusters without the added expense and complexities characteristic of proprietary file-serving appliance-based solutions.

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