Maximizing Your Investment in Citrix® XenDesktop® With Sanbolic® Melio™

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Introduction

This white paper explains how organizations around the world are using *Sanbolic® Melio™* to maximize their investments in *Citrix® XenDesktop®* by realizing all the benefits virtual desktops have to offer -- in less time, with less effort, and with lower upfront cost.

With its unique capabilities and rich feature-set, Sanbolic Melio offers an easy-to-use data/storage management platform that bridges the gap between applications and storage, allowing Citrix customers to avoid the pitfalls associated with the disconnect between today's data-intensive applications and modern storage systems/architectures.

About Citrix® XenDesktop®

Citrix® XenDesktop® is a market-leading virtual desktop infrastructure (VDI) solution that allows organizations to simplify desktop management and maintenance, reduce risk associated with operating system and application migrations and upgrades, and save on the costs of cyclical desktop refreshes.

In XenDesktop 5.0, the latest major release of XenDesktop, Citrix offers customers a new method for creating and deploying virtual machines to host virtual desktops. This new method entails the use of a new set of services called *Machine Creation Services* or *MCS* for short, which enables "quick deployment" of virtual desktops for VDI POCs.

About Machine Creation Services (MCS)

The process of creating and deploying virtual desktops with MCS begins with the creation of an initial virtual machine (VM) image known as the "master" VM image, which contains a desktop operating system, applications, the XenDesktop Virtual Desktop Agent (VDA) and any necessary virtual machine tools (i.e., VMtools, Xentools, etc.), on the hypervisor that will be used to host the XenDesktop virtual desktop infrastructure. Next, the disk containing the master VM image is set to "read-only" mode to prevent corruption while multiple VMs access it. Additional VMs are then thin-provisioned from the master VM image (or from a snapshot of the VM); and finally, two additional disks are configured for each VM: an "Identity (ID) Disk," which is used to store a VM's persistent identity, and a "Differential (Diff) Disk," which stores any changes made to a VM (i.e., temporary files) during its use. Once all the VMs are created, the XenDesktop administrator starts them up so they are online and available when users want to connect to virtual desktops.

Although MCS can help customers get started with VDI POCs fairly quickly, it's the initial transition from POC to production as well as the imminent scale-out of the virtual desktop infrastructure that can prove rather difficult for customers looking to realize the full potential VDI has to offer.

You see, with MCS all disk-reads initiated by the virtual machines during boot go directly to the backend storage system that contains the desktop image files. For some XenDesktop customers that Sanbolic has worked with in the past, adding more virtual machines to host more desktops resulted in a dramatic increase in I/O that placed significant strain on their storage systems, which ultimately hindered their ability to provide a rich desktop experience for users working on virtual desktops. For other customers, adding more virtual machines not only took a tremendous amount of time, it also required additional storage resources (i.e., more disks or more expensive, high-performance disks), which led to increases in cost and/or storage management.

Regardless of which of these "challenges" customers faced while attempting to build out their virtual desktop infrastructures, the end result was the same – they either had a very tough time doing so or were simply not able to do so at all, thus preventing them from achieving the greatest return on their investment in XenDesktop.

It should be noted that customers using XenDesktop 5.0 Service Pack 1 can take advantage of the new "IntelliCache™" feature introduced in Citrix XenServer™ 5.6 Service Pack 2 to address some of the challenges of MCS that organizations have encountered in the past, and thereby improve virtual machine performance.

Using IntelliCache, a desktop image is cached on the local storage of the XenServer hosting the first virtual machine booting off the image file, allowing subsequent virtual machines booting and working off the same image file to retrieve the contents of the cached image file directly from the XenServer host instead of from backend storage.

Customers also have the option to store the write cache files for virtual machines on the local storage of the XenServer host to further improve virtual machine performance. Of course with this configuration, the virtual machines would not be highly available (unless the storage for the write cache files was accessible by at least one other XenServer host) since any failure on the XenServer host machine that prevents the virtual machines from accessing their write cache files on the XenServer host's local storage would render the virtual machines unusable until they could regain access to their write cache files.

Another caveat – "IntelliCache" is exclusive to Citrix XenServer. Any organizations deploying XenDesktop on top of any other hypervisor, including VMware® vSphere™ or Microsoft® Hyper-V™, would not be able to leverage this feature.

About Provisioning Services™ (PVS™)

Using Provisioning Services™ (PVS™), a core component of XenDesktop, IT administrators can deliver workloads (including OS, core applications and configuration information) to virtual machines hosting virtual desktops on-demand from a centrally-managed platform, reducing total cost of ownership while improving desktop manageability and business agility.

For many organizations deploying XenDesktop, PVS affords them the ability to not only deploy virtual machines quickly and easily for VDI POCs (*there's even a PVS/XenDesktop Setup Wizard that makes creating virtual machines even easier!*), but also to improve virtual machine performance by leveraging the caching of the contents of a desktop image file (vDisk) in the RAM of the PVS Servers during the initial boot up of virtual machines. Even better, unlike MCS, PVS is designed from the ground up to enable the creation, deployment and management of a large number of virtual machines from a central console, making it much easier for organizations to scale out XenDesktop without experiencing the challenges presented by MCS.

To ensure business continuity, PVS includes a "High Availability" (HA) feature that allows virtual machines to access their vDisks through another Provisioning Server *automatically* when the initial server to which they were connected encounters a failure that prevents it from serving the virtual machines (i.e., Stream process stops, network connectivity is lost, hardware component fails, storage fails, etc.).

Another key benefit afforded by PVS HA is the ability to load-balance virtual machine I/O requests amongst all Provisioning Servers participating in a PVS Farm, providing significant improvements in overall system performance.

Offering high availability and load-balancing, PVS HA allows organizations to minimize system downtime and maximize user productivity.

Note: *To enable PVS HA for high availability of vDisks and load-balancing of virtual machine I/O requests, the vDisks* ***must*** *be accessible by at least two PVS Servers simultaneously. To achieve this, one of the following configurations must be employed:*

Replication: Multiple storage volumes must be provisioned and assigned to the PVS Servers (one volume per PVS Server) with a copy of each vDisk stored on each volume.

Shared storage: A single storage volume, which can be accessed (read-and-write) by multiple PVS Servers simultaneously, must be provisioned and assigned to the PVS Servers with a copy of each vDisk stored on the shared volume.

About Sanbolic® Melio™

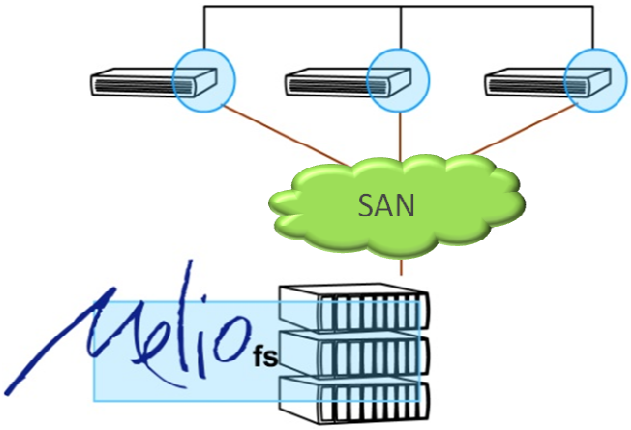
Sanbolic® offers an innovative, software-based product suite called ***Melio***™ that augments existing application, server and storage infrastructures to alleviate the unintended consequences of virtualization.

By extending the capabilities of modern storage systems and introducing application-awareness at the storage layer, Sanbolic's Melio software allows organizations to realize far greater returns on their investments in applications and solutions built on Windows® platforms.

Some of the key benefits attained through the use of Sanbolic Melio include:

- Data consolidation
- Infrastructure flexibility and agility
- Application clustering for enhanced availability and scalability
- Efficient storage utilization
- Reduced storage cost
- Enhanced storage performance
- Seamless infrastructure scale-out
- Simplified data and storage management
- Reliable data protection

At the core of the Melio product suite is a 64-bit, symmetrical cluster file system called *Melio FS*™ that provides multiple Windows® servers with simultaneous, block-level access to one or more storage partitions or Logical Unit Numbers (LUNs) on a storage area network (SAN).



An advanced, all-purpose cluster file system, Melio FS supports all data and file types, enables dynamic infrastructure scale-out, and offers numerous options for improving storage performance.

The Melio product suite provides a unified data/storage management platform that integrates the Melio cluster file system with a cluster volume manager and includes additional tools for automating data management, protecting data, and clustering applications to enhance application availability and scalability. Advanced storage features such as volume sets, stripe sets, mirror sets (RAID1), dynamic volume expansion, Quality of Service (QoS), and live storage/data migration are also included in Sanbolic's latest, third-generation Melio product suite – ***Melio 3.5***™.

Citrix Provisioning Services and Sanbolic Melio – A Winning Combination

Combining the benefits of Citrix Provisioning Services (i.e., simplified desktop image deployment, management and maintenance) with the unique capabilities of Sanbolic Melio allows organizations to commence XenDesktop POCs quickly and easily. Moreover, after completing their POCs, they can migrate their virtual desktop infrastructures to production just as quickly and easily (using the same servers and storage) while possessing the innate ability to expand their VDI solutions seamlessly.

How Sanbolic Melio Enhances Citrix XenDesktop

With its symmetrical architecture, multi-layer locking, full journaling and dynamic cluster capabilities, Sanbolic Melio addresses the limitations and problems introduced by other storage options available for PVS HA, such as replication, network shares, PVS Read-Only LUNs and NAS.

Issues such as single points of failure, inefficient storage utilization, additional data and storage management overhead, and the inability to scale out a virtual desktop infrastructure without adversely affecting system performance, can make it extremely difficult for customers to deploy, manage and scale out their XenDesktop virtual desktop infrastructures in order to realize the full potential of VDI.

Leveraging the inherent performance, scalability and reliability capabilities of Melio and SAN storage, organizations are able to avoid the issues described above and achieve a superior return on their investments in XenDesktop.

The key benefits of using Sanbolic Melio with Citrix XenDesktop include:

- Improved performance via dedicated, high-bandwidth data paths to block-based storage.
- Seamless infrastructure scale-out that requires no downtime.
- Simplified data management for desktop images (vDisks) and optionally, write cache files.
- Simplified storage management using a single pane of glass to manage Melio shared volumes.
- High availability of vDisks, PVS and XenDesktop databases for enhanced fault-tolerance.
- Reliable data protection via VSS-based snapshots of Melio shared volumes.
- Faster POC deployment with less upfront cost.
- Rapid, effortless migration from POC to production.

Here's how Sanbolic Melio addresses the limitations and problems associated with the "other" storage options for PVS HA:

- Unlike file-sharing solutions such as Network Shares or NAS, Melio FS does not rely on CIFS (Common Internet File System) or NFS (Network File System) to provide shared access to data, allowing XenDesktop to scale by adding more PVS Servers without experiencing the locking contention issues often incurred by CIFS and NFS in larger file-sharing environments.

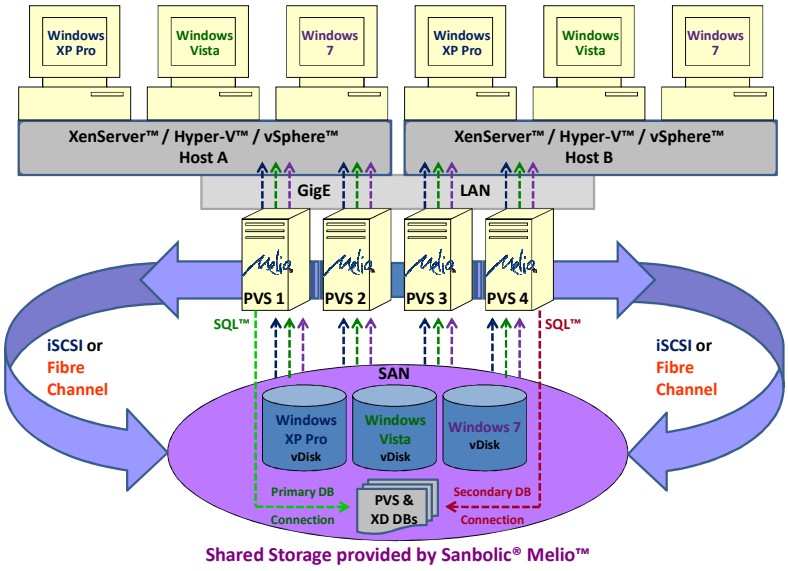
- Using Melio FS and SAN storage, storage operations are offloaded from the LAN, creating separate data paths for storage and application traffic and allowing bandwidth to be dedicated to each traffic type, improving the performance and scalability of PVS and ultimately, XenDesktop.

- With Melio FS, when one or more Provisioning Servers lose network connectivity or encounter a system failure, the remaining servers continue to access the shared volume containing the vDisks and optionally, write cache files, thus removing any single points of failure and enhancing the fault-tolerance of XenDesktop.

- Unlike Windows Disk Manager, administrators using the volume manager integrated into the Melio product suite can create and manage Melio shared volumes (basic partitions, volume sets, stripe sets or mirror sets) from a central console – greatly simplifying storage management for XenDesktop.

- Melio shared volumes comprised of multiple LUNs provisioned from different storage arrays can be created, allowing customers to take advantage of multiple storage controllers, additional caching and additional drives to improve I/O performance for XenDesktop.
- Melio shared volumes can be expanded on the fly (without restarting disk management services or rebooting servers), allowing storage to scale quickly and easily to support increased I/O demand and/or provide additional capacity for new vDisks as the virtual desktop infrastructure grows.
- vDisks stored on Melio shared volumes can be protected using a simple, GUI-based utility that allows administrators to define policies to copy or move vDisks automatically from one volume to another. In addition, VSS-based snapshots of Melio shared volumes can be taken and mounted with a single click of a button for reliable data backup and recovery.
- SQL Servers can be clustered on Melio shared storage to enable high availability of the PVS and XenDesktop databases, allowing the databases to be automatically reassigned to another SQL Server when the initial SQL Server hosting the database fails – further enhancing XenDesktop fault-tolerance.
- Administrators can perform maintenance tasks (OS updates, anti-virus updates, add/remove programs, etc.) on vDisks without having to copy them from one PVS Server to another every time the contents of a vDisk are changed (i.e., replication) or without the use of a separate management wizard that toggles LUN access from read-only mode to read-write mode and back to read-only mode (i.e., PVS Read-Only LUNs), greatly simplifying XenDesktop image management while eliminating inefficient storage utilization.

Now that we've explained how Sanbolic Melio enhances Citrix XenDesktop, let's show you a sample illustration of a XenDesktop virtual desktop infrastructure built using Melio shared storage.



Conclusion

Citrix-Ready™ certified and used by organizations around the world to enhance Citrix solutions such as XenApp™ and XenDesktop, Sanbolic's Melio software installs quickly and easily on all industry-standard servers (and virtual machines) running Windows® Server 2003™ or Windows® Server 2008™ and supports all SAN protocols, including iSCSI, Fibre Channel and Infiniband. Once installed, Melio makes it easy for customers to create and manage flexible, scalable, highly-available shared storage to enable PVS HA and enhance the performance, scalability and availability of their Citrix application delivery and/or virtual desktop infrastructures.

By combining the benefits of Citrix Provisioning Services and Sanbolic Melio, organizations are able to get started with XenDesktop POCs quickly and easily, with less effort and lower upfront cost. Upon successful completion of their POCs, they can move their virtual desktop infrastructures into production just as quickly and easily using Melio's advanced features; and when it's time to expand their virtual desktop infrastructures, add more PVS Servers to support additional virtual desktops seamlessly while maintaining a rich desktop experience for their users. In all these ways, Sanbolic Melio helps organizations achieve the greatest return on their investments in Citrix XenDesktop.

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