Implementing a Highly Scalable and Highly Available Server and Desktop Provisioning Solution

Using Citrix® Provisioning Server 5.0™, Sanbolic® Melio FS 2008™ and LaScala™

By Andrew Melmed, Director of Enterprise Solutions, Sanbolic Inc.

www.sanbolic.com
# Table of Contents

Introduction ................................................................. 3  
Prerequisites ................................................................. 5  
Installation ................................................................. 6  
Configuration ................................................................. 7  
Conclusion ................................................................. 19  
Recommended Reading ...................................................... 20
Introduction

This guide is designed to provide readers with the steps necessary to implement a highly scalable and highly available Server and Desktop Provisioning solution using Citrix Provisioning Server 5.0, Sanbolic Melio FS 2008, Sanbolic LaScala, and Storage Area Network (SAN) storage.

Citrix Provisioning Server 5.0

Boasting an abundance of new features, including a scalable database architecture based on Microsoft® SQL Server 2005™, a commonly supported and well-known management console via Microsoft Management Console™ (MMC), a standard virtual hard disk format (Microsoft VHD), and an intelligent, hierarchical approach to managing a Provisioning Server implementation, Citrix Provisioning Server 5.0 offers organizations a solid foundation upon which to build a flexible, scalable, dynamic delivery center powered by Citrix server (XenServer™), desktop (XenDesktop™), and application (XenApp™) virtualization technologies.

Sanbolic Melio FS 2008

Sanbolic Melio FS is a 64bit clustered file system that provides multiple servers with simultaneous access to the same storage partition or Logical Unit Number (LUN) on a SAN. With its advanced transaction managers, symmetrical architecture, full journaling, and dynamic clustering capability, Melio FS ensures the integrity of the data stored on the shared LUN by controlling read/write access to the data by multiple servers at any given time.

Sanbolic LaScala

LaScala is a host-based volume manager that incorporates advanced transaction management, locking, and clustering technology, to simplify management and improve the flexibility and reliability of shared storage environments. Using LaScala, multiple hosts can share access to and administer storage volumes spanning multiple storage controllers and access to volumes can be secured by defining host access to specific volumes using native Windows® security tools such as ACLs and Active Directory. In conjunction with a clustered file system like Melio FS, LaScala provides high performance shared access to data on volumes striped across many disks residing on multiple storage controllers.

SAN Storage

Offering block-level access to data stored on LUNs, SANs offer optimal performance for applications and/or environments requiring fast read/write operations, such as large-scale clustered processing and real-time data transactions.
Summary

Leveraging the performance, scalability, and reliability capabilities afforded by the collaboration of Melio FS 2008, LaScala, and SAN storage, organizations are able to fully realize the benefits of all the new features of Citrix Provisioning Server 5.0 designed to support the rapid and secure provisioning of server and desktop workloads to physical and virtual machines from a centrally-managed console.

**Note:** This guide is meant to complement Citrix Provisioning Server 5.0, Sanbolic Melio FS 2008, and Sanbolic LaScala product documentation; thus it is highly recommended that readers of this guide thoroughly read through all relevant Provisioning Server 5.0, Melio FS 2008, and LaScala product documentation prior to commencing with the implementation of a highly scalable and highly available Server and Desktop Provisioning solution. (See Recommended Reading on last page.)

It should also be noted that this guide was written with the assumption that storage has been previously allocated on the SAN, or the reader or individual responsible for implementing a highly scalable and highly available Server and Desktop Provisioning solution is able to allocate LUNs on the SAN to store the Provisioning Server vDisks and Target Device write caches. For information regarding how to configure LUNs on SAN storage, please refer to the SAN vendor’s product documentation.
Prerequisites

The following is a list of prerequisites for implementing a highly scalable and highly available Server and Desktop Provisioning solution using Citrix Provisioning Server, Sanbolic Melio FS and LaScala.

Servers:

- Microsoft® Windows Server 2003™ or 2008™, Standard or Enterprise editions
- The latest OS service packs and updates, along with the latest video and network drivers
- Microsoft’s (or other vendor’s) iSCSI software Initiator v2.07 or later or latest firmware and driver for iSCSI Host Bus Adapter (HBA) for iSCSI SAN connectivity
- Latest firmware and driver for Fibre Channel HBA for Fibre Channel SAN connectivity
- Microsoft Management Console 3.0 or later
- Microsoft .NET Framework™ 3.0 or later
- Sun Microsystems® Java™ v5.0.11 or later
- Application Server such as Microsoft IIS™ or Apache® Web Server
- Microsoft SQL Server 2005 or SQL Server Express 2005 with SP1
- Microsoft SQL Server 2005 Management Studio™
- Citrix Licensing Server v11.0 or later
- Citrix Provisioning Server (PVS) 5.0 Server
- Sanbolic Melio FS 2008 (Citrix-Ready™)
- Sanbolic LaScala

Target Devices:

- Microsoft Windows Server 2003 or 2008, Windows XP™, Windows Vista™, Red Hat® Enterprise Linux Server™ 4 or 5, Novell® SUSE Linux Enterprise Server™ 9 or 10 SP1
- The latest OS service packs and updates, along with the latest video and network drivers
- Citrix Provisioning Server 5.0 Target Device

SAN Storage:

For iSCSI SANs:

- Server running Microsoft’s (or other vendor’s) iSCSI Target software or iSCSI storage controller
- Additional GigE NIC or iSCSI HBA installed in Provisioning Servers
- GigE switch

For Fibre Channel SANs:

- Fibre Channel storage controller
- Fibre Channel HBA installed in Provisioning Servers
- Fibre Channel switch
Installation

After all the proper hardware and software listed in the previous section have been acquired, the following steps should be taken to install the necessary components.

1. On the Citrix License Server, install the following:
   a. Microsoft Server 2003 or Server 2008 with the latest service packs and updates
   b. Microsoft .NET Framework
   c. Java Runtime Environment
   d. Application/Web Server (i.e., IIS, Apache, etc.)
   e. Microsoft SQL Server 2005 or SQL Server Express 2005
   f. Microsoft SQL Server 2005 Management Studio
   g. Citrix License Server v11.0 and License Server Management Console

2. On each Provisioning Server participating in the PVS Farm, install the following:
   a. Microsoft Server 2003 or Server 2008 with the latest service packs and updates
   b. iSCSI Initiator (software-based) or iSCSI HBA or Fibre Channel HBA
   c. Microsoft .NET Framework
   d. Java Runtime Environment
   e. Microsoft Management Console (MMC) 3.0
   f. Microsoft SQL Server 2005 or SQL Server Express 2005
   g. Microsoft SQL Server 2005 Management Studio
   h. Citrix Provisioning Server 5.0 Server
   i. Sanbolic Melio FS 2008 (Citrix-Ready™)
   j. Sanbolic LaScala

3. On the Master Target Device, install the following:
   a. Latest OS service packs, updates, video and network adapter drivers
   b. Citrix Provisioning Server 5.0 Target Device
Configuration

Once the hardware and software components have been installed on the servers and target devices, the following steps can be taken to implement a highly scalable and highly available Server and Desktop Provisioning solution using Citrix Provisioning Server, Sanbolic Melio FS and LaScala.

Citrix License Server:

1. On the License Server, open the License Management Console (Start > Programs > Citrix > Management Consoles > License Management Console).
2. Select **Configure License Server** and follow the instructions for installing a Citrix Provisioning Server 5.0 Datacenter and/or Desktop license file(s).
3. Select the **Current Usage** tab and confirm that the correct license file(s) have been installed.
4. Restart the following services on the License Server:
   a. Citrix Licensing
   b. Citrix License Management Console

Citrix Provisioning Servers:

On each Provisioning Server participating in the PVS Farm, perform the following steps to establish connectivity to the SAN that will store the PVS vDisks and Target Device write caches (optional):

1. **For iSCSI SANs using software-based iSCSI Initiators:**
   a. Connect the GigE interface used exclusively for iSCSI data traffic to the SAN.
   b. Use Microsoft’s (or respective vendor’s) iSCSI Initiator configuration utility to configure connectivity (using the GigE interface dedicated to iSCSI data traffic only, i.e., non-PVS, non-Melio FS) to the Target LUN(s) on the SAN.
   c. Confirm connectivity between the servers and the Target LUN(s) on the SAN.
2. **For iSCSI SANs using hardware-based iSCSI Initiators (HBAs):**
   a. Connect the iSCSI HBA to the SAN.
   b. Use the iSCSI HBA vendor’s configuration utility to configure connectivity to the Target LUN(s) on the SAN.
   c. Confirm connectivity between the servers and the Target LUN(s) on the SAN.
3. **For Fibre Channel SANs:**
   a. Connect the Fibre Channel HBA to the SAN.
   b. Confirm connectivity between the servers and the LUN(s) on the SAN.
Once the Provisioning Servers have established connectivity to the SAN, connect the interface associated with the IP address selected during the installation of Melio FS (for cluster administration) and LaScala (for volume management) to a standalone Ethernet switch or VLAN. (See screens below.)

**Melio FS:**

![Melio FS Network Configuration Screen]

**LaScala:**

![LaScala Network Configuration Screen]
Note: As the Ethernet switch or VLAN will be dedicated to cluster administration and volume management traffic only, no other Provisioning Server interfaces, Target Devices, or non-PVS devices should be connected to this switch or VLAN.

Perform the following steps on one Provisioning Server to create the shared storage for the vDisks and Target Device write caches.

1. Launch LaScala Volume Manager (Start > Programs > LaScala > LaScala Volume Manager).
2. When the Volume Manager console appears, select View > Rescan Disks from the toolbar.
3. Right-click on each LUN on the left-hand side, select Manage Multiple and click OK.
4. Right-click on each LUN on the right-hand side and select New > Partition.
5. Select the default values and click OK. The partitions will appear in the top window pane.
6. In the top, left-hand window pane, right-click and select New > Stripe Set.
7. Select the default values and click OK.
   Note: All partitions making up the stripe set must be of equal size.
8. Select and drag each partition into the stripe set.
9. Select Action > Apply Changes to create the stripe set.
10. Once Windows recognizes the new disk, the New Hardware Found wizard will appear.
11. Follow the instructions to install the new disk and when prompted to reboot, select No.
12. Right-click on the stripe set and select Create Logical Drive.
   a. Select the option to use the same drive letter for the new disk on each server.
   b. Select the option to format the new disk using Melio FS.
   c. Enter a label for the new disk (optional).
13. Click OK to create the new disk.
14. Once the new disk (stripe set) has been created, it will appear in the top, left-hand window pane with an associated drive letter.
15. Open My Computer to view the new drive and test read/write access to the new drive.

To confirm shared access to the storage, open My Computer on all other Provisioning Servers and test read/write access to the new drive.

Once the SAN is ready to store the PVS vDisks and Target Device write caches, select one Provisioning Server to create the PVS database by performing the following steps:

1. Launch the Provisioning Server Configuration Wizard (Start > Programs > Citrix > Provisioning Server > Provisioning Server Configuration Wizard).
2. Follow the instructions (refer to the Citrix Provisioning Server 5.0 Installation and Configuration Guide for details) to create a new PVS database, including configuring the Provisioning Server Farm, network services (DHCP, PXE, BootP), License Server, User Account, Streaming service, and bootstrap and start all Provisioning Server services.
**Note:** In the event that the server hosting the PVS database fails unexpectedly (i.e., hardware failure or loss of network connectivity), all Provisioning Servers participating in the PVS Farm may lose connectivity to the PVS database; causing target devices to lock up until access to the PVS database can be reestablished. Thus, it is highly recommended that a proper configuration (i.e., Microsoft Cluster Server, SQL Cluster, etc.) be employed to ensure the PVS database is accessible at all times.

**Note:** For the purpose of this document, the Citrix License Server has been selected to host the PVS database.

3. If the PVS database is created successfully, the last screen in the Configuration Wizard will appear as follows:

![Provisioning Server Configuration Wizard](image)

4. Click **Done** to close the Provisioning Server Configuration Wizard.
Once the PVS database has been created, perform the following steps on the server hosting the PVS database (i.e., Citrix License Server):

1. Verify the new PVS database (i.e., PVSDB) has been created by checking the C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Data directory for the associated PVS database files (.mdf and .LDF).
2. Launch SQL Server 2005 Management Studio and click **Connect** to connect to the database server (Start > Programs > Microsoft SQL Server 2005 > SQL Server Management Studio).

3. In the Databases console, note the new PVS database under the **Databases** tree.

To allow each Provisioning Server to access the PVS database, perform the following steps on the server hosting the PVS database (i.e., Citrix License Server):

1. Launch SQL Server 2005 Surface Area Configuration (Start > Microsoft SQL Server > Configuration Tools > SQL Server Surface Area Configuration).

2. Select \textit{Surface Area Configuration for Services and Connections}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{sql_server_surface_area_configuration.png}
\caption{SQL Server 2005 Surface Area Configuration}
\end{figure}

\textbf{Minimize SQL Server 2005 Surface Area}

SQL Server 2005 improves manageability and security by giving administrators more control over the surface area of local and remote instances of SQL Server 2005. With the SQL Server 2005 Surface Area Configuration tools, you can easily:

- Disable unused services and network protocols for remote connections.
- Disable unused features of SQL Server components.

For new installations, use these tools to enable required features, services, and network protocols that are disabled by default. For upgraded instances, use these tools to identify and disable unused features, services, and protocols.

Users with administrative privileges on Microsoft Windows Vista and later versions will no longer have administrative privileges on this SQL Server installation by default. To explicitly add yourself as a SQL Server administrator, click on the link:

- \textit{Add New Administrator}

- \textit{Read more about configuring the SQL Server surface area.}

\textbf{Configure Surface Area for localhost}

\begin{itemize}
\item \textit{Surface Area Configuration for Services and Connections}
\item \textit{Surface Area Configuration for Features}
\end{itemize}
3. When the Services and Connections console appears, select **Remote Connections**.

4. Select **Local and remote connections Using TCP/IP only** and click **OK** to apply the change.
5. Expand the **SQL Server Browser** tree.
6. Click **Start** to start the **SQL Server Browser** service.
   **Note:** The **SQL Server Browser** service *must* be started on all Provisioning Servers participating in the Provisioning Server Farm, which can be accomplished by repeating steps 5 and 6 on each server or via the Windows Services applet on each server.
7. Right-click on **My Computer** and select **Manage > Services and Applications > Services**.
8. Scroll down the list and verify that the **SQL Server** and **SQL Server Browser** services are started.

**Note:** Verify that the **SQL Server** and **SQL Server Browser** services have been started on all Provisioning Servers participating in the Provisioning Server Farm.

![Image of Computer Management with Services and Applications open](image)

Once the PVS database is accessible to all Provisioning Servers, perform the following steps on each Provisioning Server to join them to the Provisioning Server Farm:

1. Launch the Provisioning Server Configuration Wizard (Start > Programs > Citrix > Provisioning Server > Provisioning Server Configuration Wizard).
2. Select the option **Join existing farm** and then select the PVS database.
3. Complete the Configuration Wizard to configure and start the Provisioning Server services.

Once all the Provisioning Servers have been configured, launch the Provisioning Server console (Start > Programs > Citrix > Provisioning Server > Console) on each Provisioning Server in the Provisioning Server Farm and perform the following:

1. Right-click on **Provisioning Server Console** at the top of the left window pane and select **Connect to Farm**.
2. When prompted, click **Connect** to connect to the Provisioning Server Farm.
3. When the Provisioning Server Farm appears, expand the Farm to view its contents.

The Provisioning Server Farm is now ready to be managed (refer to the *Citrix Provisioning Server 5.0 Administrator's Guide* to configure additional Sites, Servers, vDisks, Target Devices, and Stores).

**Citrix Provisioning Server Target Devices:**

1. Boot the Master Target Device (i.e., system containing a hard drive with the OS, system files, and user applications to be copied to a vDisk) and enter the system BIOS setup.
2. Enable PXE (Preboot eXecution Environment) on the network adapter and reboot.
3. Enter the system BIOS setup and move the PXE-enabled network adapter to the top of the system boot sequence.
4. Follow the instructions provided in the *Citrix Provisioning Server 5.0 Installation and Configuration Guide* to complete the following:
   a. Add the Master Target Device to the PVS database.
   b. Create and format a vDisk.
   c. Copy the image on the Master Target Device’s hard drive to the new vDisk.
   d. Configure the vDisk properties.
   e. Boot additional Target Devices off the vDisk.
Conclusion

With a dynamic Server and Desktop Provisioning solution powered by Citrix Provisioning Server 5.0, organizations are able to realize the numerous benefits afforded by the rapid and secure provisioning of server and desktop workloads to both physical and virtual machines via a centrally-managed console, including a significant reduction in total cost of ownership, vastly improved server and desktop workload manageability, and a dramatic increase in business agility, all of which can be achieved by the following:

- Simplifying and streamlining server and desktop workload management.
- Reducing software rollout and upgrade risks.
- Rapidly repurposing servers with minimal effort.
- Extending Citrix Server, Desktop, and Application Virtualization capabilities for Citrix XenServer, XenDesktop, and XenApp, respectively.

Implementing *Citrix Provisioning Server 5.0* in conjunction with *Sanbolic Melio FS 2008, LaScala* and SAN storage offers organizations a highly scalable and highly available Server and Desktop Provisioning solution capable of supporting the business and mission-critical applications hosted by today's datacenter while serving as the building block for tomorrow's dynamic delivery center.
Recommended Reading

The following documents are available at http://support.citrix.com/:

*Citrix Provisioning Server 5.0 Installation and Configuration Guide*

*Citrix Provisioning Server 5.0 Administrator’s Guide*

*Citrix Provisioning Server 5.0 Programmer’s Guide*

*Citrix Provisioning Server 5.0 Release Notes*

The following documents are available at http://www.sanbolic.com/:

*Sanbolic Melio FS 2008 User’s Guide*

*Sanbolic LaScala User’s Guide*

*Delivering a Highly Available Citrix Provisioning Server using Sanbolic Melio FS (white paper)*