

VMware Consolidated Backup

Improvements in Version 3.5



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Introduction

Virtual machines have become a critical part of many datacenters. More and more production applications run in virtualized environments. The need to protect these virtual machines running the production applications against data loss is urgent. VMware Infrastructure provides a variety of capabilities to achieve this objective.

Some customers use backup methodologies already deployed in physical infrastructure to protect virtual machines. For some environments, this solution is sufficient. However, for the vast majority of customers, installing and maintaining backup software agents inside all virtual machines adds management overhead. This solution is also difficult to scale in consolidated environments in 24x7 datacenters as backup windows shrink and performance requirements become stringent. In general, agent-based backup can be problematic for environments where speed of backup and ease of management of the backup infrastructure are critical.

VMware Consolidated Backup offers a superior data protection solution for virtual machines. Consolidated Backup enhances the ability of backup software to take fast and efficient backups of the virtual machines. It offers a flexible solution by offloading the backup workload from production ESX Server hosts to proxy servers.

Key benefits of using Consolidated Backup to protect VMware Infrastructure include:

- Providing snapshot-based online backups of individual virtual machines
- Eliminating backup workload from production ESX Server hosts
- Eliminating backup window by leveraging VMFS snapshot technology for backup
- Eliminating need for backup agents on each virtual machine by centralizing backup management on the backup proxies
- Integrating with current backup software to back up virtual machines

Consolidated Backup is part of the VMware Infrastructure suite of products. VMware ESX Server, a key component of VMware Infrastructure, is a production-proven virtualization layer run on physical servers that abstracts resources to be provisioned to multiple virtual machines. For more information on VMware Consolidated Backup, see the white paper "Understanding VMware Consolidated Backup" on www.vmware.com.

What's New in VMware Infrastructure 3 Version 3.5

Version 3.5 of VMware Infrastructure introduces new features that make VMware Consolidated Backup more flexible, robust, and user-friendly. Consolidated Backup now supports more types of storage, including iSCSI SAN and NAS. In addition, the new version of Consolidated Backup can back up virtual machines stored on VMFS-based local storage on the ESX Server host.

With these enhancements, Consolidated Backup is the only solution that enables you to protect virtual machines across these diverse storage platforms using consistent methods, simplifying administration of this vital task.

This paper examines the new features in Consolidated Backup and explores the ways they help you implement efficient and effective backup protection for your VMware Infrastructure.

Key enhancements for Consolidated Backup in version 3.5 include:

- Support for backing up virtual machines stored on iSCSI SAN storage, Network Attached Storage (NAS) and local storage inside the ESX Server host
- Support for moving the backup snapshots of virtual machines over the LAN, removing the need for SAN-based storage
- Support for implementing the proxy server inside a virtual machine (with no tape drive support needed inside the virtual machine)
- Support for using VMware Converter as restore mechanism for Consolidated Backup images
- Support for 64-bit Windows Server 2003 and more versions of 32-bit Windows server 2003 as proxy server

Along with these major improvements, this version introduces many usability improvements.

Improved Storage Support

From the beginning, VMware Infrastructure 3 has supported many types of storage devices for on ESX Server. Each type of storage offers particular benefits to customers seeking to balance cost, performance, and manageability. Although ESX Server supported many types of storage for virtual machines, the Consolidated Backup snapshot mechanism was available to protect virtual machines only if they were stored on Fibre Channel Storage Area Networks. To back up virtual machines stored on NAS devices or local storage, customers had to employ less efficient data protection methods.

With version 3.5, Consolidated Backup now supports backing up virtual machines stored on iSCSI or local storage. Consolidated Backup can also back up `vmdk` files stored on NAS devices. This gives you flexibility to choose the storage for your virtual machines that best meets your needs without sacrificing backup efficiency.

Using Consolidated Backup with iSCSI Storage

iSCSI is relatively new storage technology that leverages the simplicity and ubiquity of Ethernet network technology to share storage among ESX Server hosts. iSCSI has quickly become a popular choice among VMware users.

iSCSI is implemented in one of the two ways: One is with a software initiator, with iSCSI functionality emulated in software and a simple Ethernet adapter used for connectivity to the

network. The other method uses specialized iSCSI network adapters for connectivity. These adapters act as HBA interfaces but connect to the Ethernet network. Consolidated Backup supports both of these methods of connecting iSCSI storage to ESX Server hosts.

Your environment must meet the following requirements to enable Consolidated Backup to back up virtual machines stored on iSCSI storage:

- All ESX Server hosts and the proxy server must be able to see the iSCSI LUNs being protected
- VMFS must be used to store the virtual machines

These requirements are exactly same as those for implementing Consolidated Backup in a Fibre Channel SAN environment.

After you configure your iSCSI storage to work with ESX Server, configuring the proxy server is a simple task. Because iSCSI storage can be accessed from within a virtual machine using a software initiator, you can implement the proxy server in a virtual machine.

A software initiator gives you flexibility, but it also imposes demands on the resources of the host. Before implementing iSCSI using a software initiator, carefully consider the implications of such a configuration for storage performance. You should also gauge the impact of the CPU, memory, and networking resources available in the proxy server on scalability of the backup infrastructure.

If the resource requirements of a software initiator are reasonable, you can implement the proxy server inside a virtual machine. The proxy server still must run the Windows Server 2003 operating system, but you run that operating system and the proxy server software in a virtual machine eliminating the need to designate a separate physical system for taking backups.

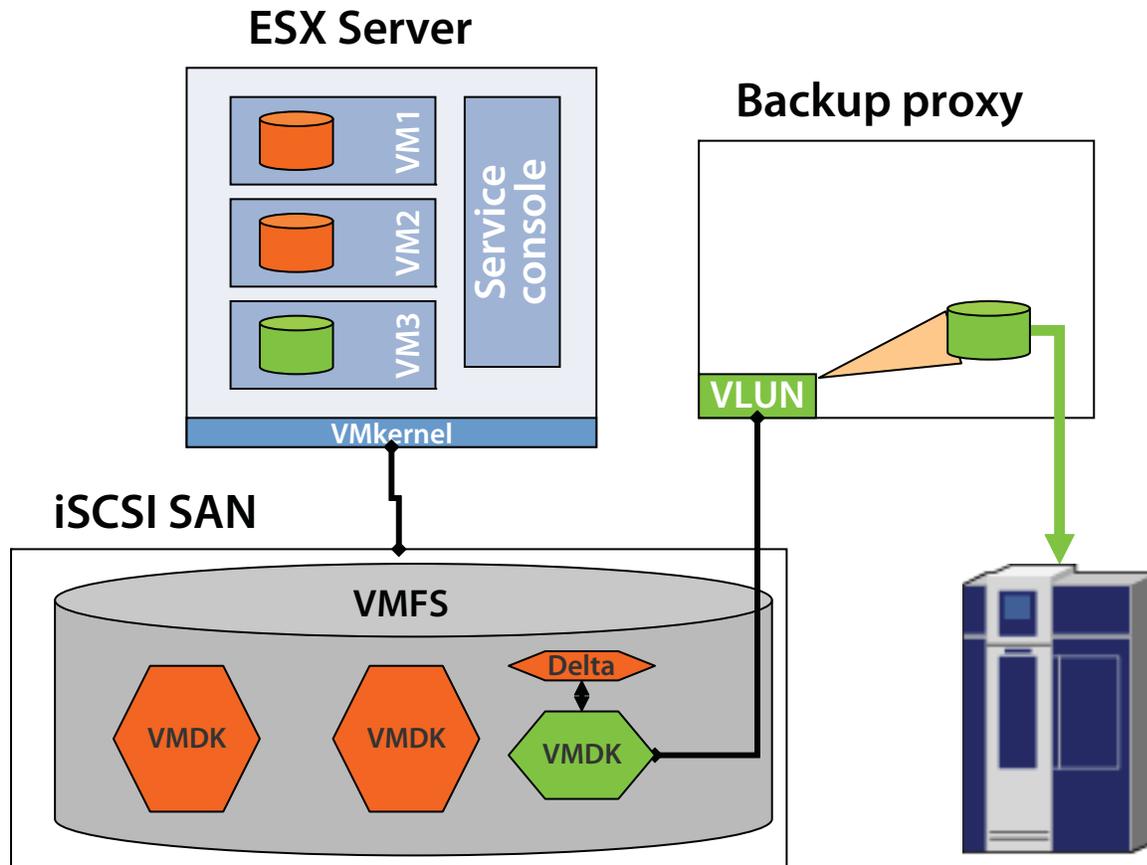


Figure 1: Implementing Consolidated Backup with iSCSI SAN storage

Figure 1 shows how Consolidated Backup is implemented using iSCSI SAN storage. The ESX Server host, the iSCSI storage, and the backup proxy server are connected using either hardware iSCSI initiators or software initiators. If the backup proxy server is using a software initiator, it can be implemented in a virtual machine. Consolidated Backup functions exactly the same way whether the backup proxy is on a physical host or in a virtual machine.

As shown in the Figure 1, a Consolidated Backup snapshot creates a delta disk file that holds all the writes after the snapshot is taken. Thus the virtual machine you are backing up (VM3 in this case) can continue to functioning normally while the backup proxy is backing up its VMDK file. The VLUN driver installed on the proxy server makes the VM3 .vmdk file appear to be a virtual drive. Backup software then backs up the data on this drive to a secondary medium such as a tape drive.

This procedure is same procedure you would use to create a backup using Consolidated Backup and a Fibre Channel SAN. Indeed, iSCSI storage is a type of SAN that retains all the benefits of SAN shared storage including block addressability.

LAN-based Data Mover

Version 3.5 of VMware Infrastructure 3 adds a new option for actually moving backup data. Consolidated Backup previously relied on a storage network to move data from an ESX Server host to a proxy server. Both transport methods enjoy the core Consolidated Backup advantages of snapshot-based online backup and offloading the backup workload to a non-production system hosting the backup proxy server.

The previous dependency on a storage network to move the data meant that you would need to implement block-based storage networking (SAN or iSCSI) to perform backups with maximum efficiency.

With the new LAN-based data mover technology, you can take advantage of the snapshot capability of Consolidated Backup to perform online backup of individual virtual machines even if you do not have a block-based shared storage environment — even if you do not have any shared storage at all. For example, if you use a network attached storage system, internal storage, or direct attached storage, you can back up your virtual machines using Consolidated Backup.

The key advantages of using Consolidated Backup in LAN mode are:

- Backing up virtual machines on NAS or local storage without disruption, using the Consolidated Backup snapshot feature
- Cutting costs of implementing storage by leveraging available storage and Ethernet network connections to back up virtual machines
- Implementing the backup proxy server in a virtual machine, if desired
- Backing up virtual machines on local storage without the need for backup agents installed in the virtual machines

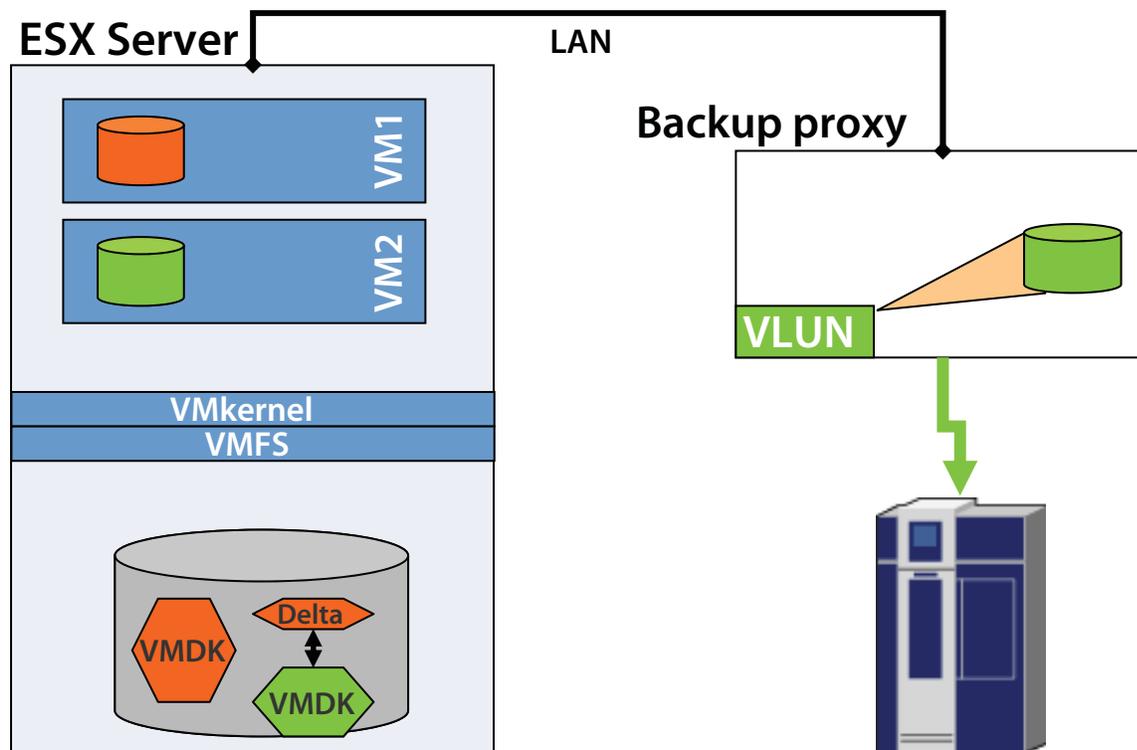


Figure 2: Backing up a virtual machine stored on local storage using LAN-based Consolidated Backup

Figure 2 shows how Consolidated Backup works in LAN mode to back up a virtual machine. Consolidated Backup creates a snapshot of the virtual machine's `vmdk` file (for VM2 in this case). The `.vmdk` file is then mounted via the ESX Server LAN connection using the VLUN driver installed on the proxy server. Backup software installed on the proxy server then copies the data to the secondary storage, such as tape.

The actual data transfer takes place over the LAN. When the backup software reads data from the virtual drive mounted through the VLUN driver, the data is transferred via the LAN between the ESX Server host on which the virtual machine resides and the backup proxy server. The ESX Server host provides network, CPU, and memory resources for the data transfer. As a result, performance of the virtual machines running alongside the backup job could be affected during the data transfer.

The impact of these resource demands can be minimized by planning backups during off-peak hours and doing robust resource planning.

Proxy in a Virtual Machine

Earlier versions of Consolidated Backup required a separate physical computer for the backup proxy. This was necessary because the proxy server must be able to access the same SAN volumes that the ESX Server hosts are using to store the virtual machines. In addition, it is not possible to connect a Fibre Channel device directly to a virtual machine.

Because Consolidated Backup supports network-based backup and iSCSI devices, the storage accessibility limitations of virtual machines no longer prevent you from using a virtual machine as the backup proxy server.

Now that you do not need a separate physical proxy for backup, you can use Consolidated Backup more cost effectively, especially in small environments where it is impractical to designate a separate proxy server to protect a small number of ESX Server hosts.

You can use a proxy server running in a virtual machine to backup virtual machines stored on iSCSI SAN, NAS, or local storage, provided the virtual machine has access to the storage device. You cannot use a proxy server running in a virtual machine to protect virtual machines stored on a Fibre Channel SAN.

When your proxy server is running in a virtual machine, you can store your backups on secondary NAS storage or on iSCSI storage. You can also store backups on the proxy server's VMDK or RDM storage. It is not currently possible to connect a tape drive to the virtual machine.

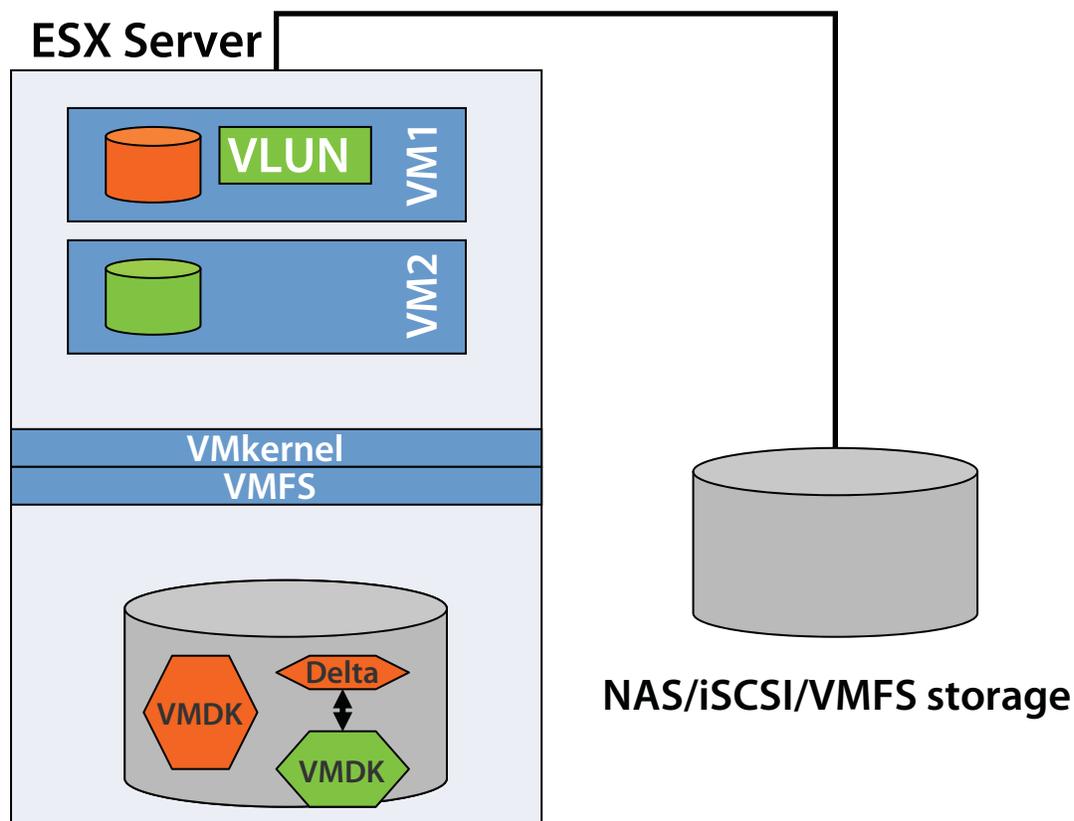


Figure 3: Running the backup proxy inside a virtual machine

In Figure 3, virtual machine VM1 is used as a backup proxy. This virtual machine must run Windows with the Consolidated Backup VLUN driver installed. It must also have connectivity to the storage used for storing virtual machines (VM2 in this case). Besides being able to access the virtual machines you want to back up, the proxy server virtual machine must have enough disk space to store the backup images. You can connect iSCSI storage using a software initiator inside the virtual machine, use a NAS device, or even use additional virtual disks connected as storage devices to store the backups.

You can use a backup proxy inside a virtual machine to protect more than one ESX Server host. The proxy server virtual machine must be able to see storage on all ESX Server hosts it is protecting.

Simplify Restore with VMware Converter

VMware Infrastructure 3 version 3.5 makes it much easier to use VMware Converter Enterprise to restore a virtual machine from a Consolidated Backup backup image. Using VMware Converter has many advantages over other methods of restoring a backup image. Besides restoring a virtual machine directly to the ESX Server host, VMware Converter can also customize the virtual machine as it is restored. This gives you an easy way to change networking parameters for the virtual machine. This means that you can use a Consolidated Backup image as a template to provision multiple virtual machines.

VMware Converter is integrated with VirtualCenter 2.5. It is installed as an add-on component of VirtualCenter. You can launch it from the VI Client. Figure 4 shows the VMware Converter wizard.

After starting VMware Converter, you can browse for Consolidated Backup images to restore. VMware Converter works only with image-level backups of the virtual machines. It is an excellent tool to restore an entire virtual machine or to provision a new virtual machine from a backup image created by Consolidated Backup.

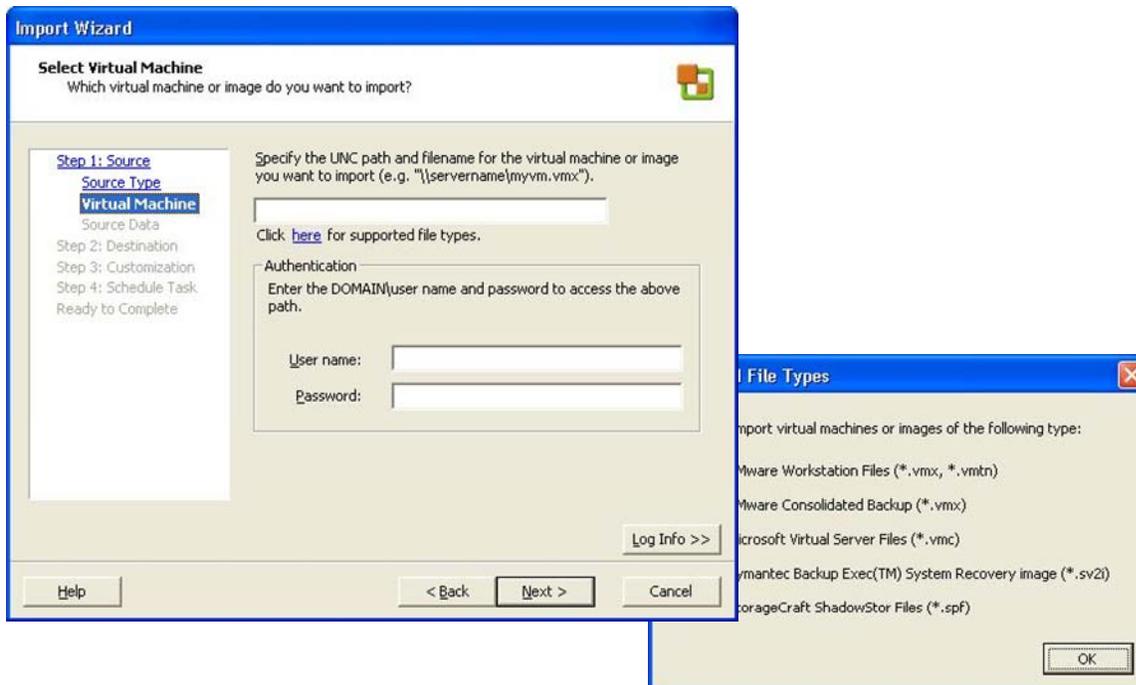


Figure 4: Using VMware Converter to restore Consolidated Backup image backups

If you need to restore single files, you should use Consolidated Backup file-level backups (supported for Windows virtual machines only) and the restore function of third-party backup software.

Usability Improvements

Besides the enhancements detailed in this paper, VMware Infrastructure 3 version 3.5 brings many other improvements to Consolidated Backup, providing better usability and broadening the range of supported configurations. Some of the changes are:

- Optional prompt for passwords if you want to perform interactive backup jobs.
- Support for custom scripts Consolidated Backup can run if a backup fails. This allows cleanup and better notifications in case of backup job failure.
- Graceful exit when a backup job is interrupted. Consolidated Backup now cleans up the snapshots and temporary files on the proxy when you interrupt the backup process.
- Support for installing the Consolidated Backup proxy and VirtualCenter Management Server on the same host.
- Support for storage array WWNs, so device mapping need not be exactly the same on ESX Server hosts and the backup proxy.

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