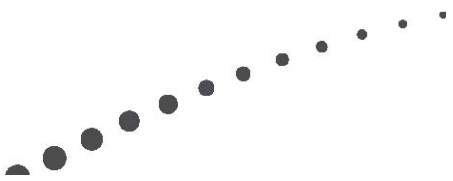
Citrix XenServer

Virtual Machine Backup



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Introduction and Overview

There are several ways of backing up virtual machines (VMs) running on Citrix XenServer. At a high-level, there are three categories for VM backups:

- Cold Backups
- Warm Backups
- Hot Backups

Cold backups and warm backups are supported in XenServer through the XenCenter export and copy capabilities as well as through scripting from the command-line interface (CLI). The primary focus of this document is *hot* backups, whereby virtual machines can be backed up without incurring downtime.

Hot Backup Approaches

A hot virtual machine backup is a way of backing up a VM without incurring any downtime for the system. With XenServer, there are several ways of conducting hot backups.

- Agent-based backup
- Backend storage replication
- Manual snapshots, from XenCenter
- Scripted snapshots through XenAPI
- XenServer's enhanced backup enablement feature, with a third party backup product

In the next section, these approaches are discussed in more detail.

Agent Based Backup

An agent based backup is the traditional way of performing file and full-system backups. In this scenario, a backup agent is installed in the VM guest operating system. A backup job or policy is defined in the backup software, and during the defined backup window the agent starts copying files to the desired backup server/backup medium. This solution offers simple file-level restore functionality, and many backup vendors have tailored their solutions to the backup needs of specific applications. For example, some vendors have engineered their backup agents for complex applications like Microsoft Exchange or SQL Server.

Although this method is proven to be very reliable, by default it does not benefit from any of the advanced features offered by an enterprise level virtualization platform. An implementation like this is the same as for a physical server environment.

Pros:

- Proven technology and approach
- Protects investment in current backup solution and knowledge
- Easy file-level restoration
- Agents tailored to specific applications

Cons:

- Long backup window can affect service-critical VMs
- Not specifically geared for virtual machines

Backend Storage Replication

When using Citrix XenServer with a shared Storage Repository (SR), it is possible to use a storage replication mechanism on the storage backend. Most NAS and SAN storage vendors offer solutions which can replicate data from one storage array to another, at the volume or LUN level. Third-party technologies for data replication are also widely available. Using backend storage replication to augment an agent or snapshot-based VM backups is a best practice.

Storage replication can be done to a storage array at a different location, this approach provides both backup and disaster recovery for virtual machines. Citrix XenServer has built-in functionality to export VM metadata which can be stored on the Storage Repository and replicated by the storage backend at the LUN or volume level. More details on this capability can be found in a separate document and video.

Storage Replication is an out-of-band solution, and has no awareness of the VM state. As a result, there is a possibility of data inconsistency. because this solution replicates the whole VM, file-level restoration is more complicated.

Pros:

- Replication optimized for storage solution
- Provides both VM backup and disaster recovery
- Augments other VM backup approaches

Cons:

- Additional hardware and software required
- More complicated file-level restoration
- Not aware of virtual machine state

Manual Snapshots - XenCenter

With the release of XenServer 5.5, XenServer includes disk snapshot capability for all Storage Repository types. XenCenter has been designed with a simple GUI to quickly and easily create a snapshot a virtual machine for backup purposes. Creating manual snapshots from XenCenter to backup a VM is mainly intended for ad-hoc backups of VMs. For example, before applying a Hotfix or service pack, a snapshot of the virtual machine can be taken so there is a mechanism of rolling back to a stable configuration. Snapshots created from XenCenter do not quiesce virtual machine disks.

Restoring files in this solution requires restoration of the full VM and manual file retrieval after this. Restoring the VM can be done from XenCenter, by creating a new VM from the snapshot.

Pros:

- Fast and Easy
- Requires minimum of storage space
- Integrated into XenCenter

Cons:

- Manual, may not be suitable for large environments
- More complicated file-level restoration
- Non-VSS snapshot

Scripted Snapshots through XenAPI

XenServer VM snapshots can also be made from either the XenServer (remote) CLI or through a XenServer API call. Snapshots created in this way can use the Citrix VSS provider for Windows VMs, which results in an application-consistent snapshot. For more details on the CLI command syntax, refer to the Citrix XenServer Administrator's guide. For more details on the XenAPI call, refer to the XenServer API Documentation.

Creating snapshots this way can be scripted and automated, which makes it possible to schedule a daily backup of the VMs in the environment. Although the snapshot creation is initiated from either the CLI or through an API call, the snapshot shows up in the VM's snapshot list in XenCenter. This can simplify the process of performing a full VM restoration. File-based restoration still require the VM to be restored and manual file retrieval.

Pros:

- Fast
- Requires minimum of storage space
- Customizable to specific business needs
- VM restore can be done from XenCenter

Cons:

- Requires additional knowledge of CLI or XenAPI
- More complicated file-level restoration

Enhanced Backup Enablement with Third Party Backup Products

XenServer 5.5 includes features to combine snapshot functionality with a third party backup solution. This provides a "best of both worlds" scenario, benefiting from the speed and size requirement of the XenServer snapshot functionality, while still protecting investments in existing third party backup solutions. This is a great approach for customers wanting to continue to leverage the benefits of the application-level awareness provided by agent-based solutions.

The specific interaction between the backup software and the XenServer environment varies, depending on the specific implementation of the third party backup solution. The snapshot can be either initiated from the backup software through a XenServer API call, or the snapshot can be initiated by the backup agent software in the VM via the VSS framework.

Pros:

- Fast
- Optimized performance for virtual machines
- Requires minimum of storage space
- Protects investment in current backup solution, knowledge, and application-specific features
- Offers advanced backup functionality through third party software

Cons:

- VSS-based approach available for Windows VMs only

In the next section, we discuss the implementation of this approach with a widely-used backup solution, Symantec NetBackup.

Enhanced Backup Enablement with Symantec NetBackup

This section describes how to use XenServer's backup enablement features with Symantec NetBackup. This includes an overview on how the different components interact together as well as specific setup instructions for Symantec and XenServer. The instructions for NetBackup describe how to set up a specific policy for backing up Windows VMs running on XenServer. This document does not cover any specific NetBackup installation instructions and general configuration, so having a good understanding of the NetBackup product is a prerequisite.

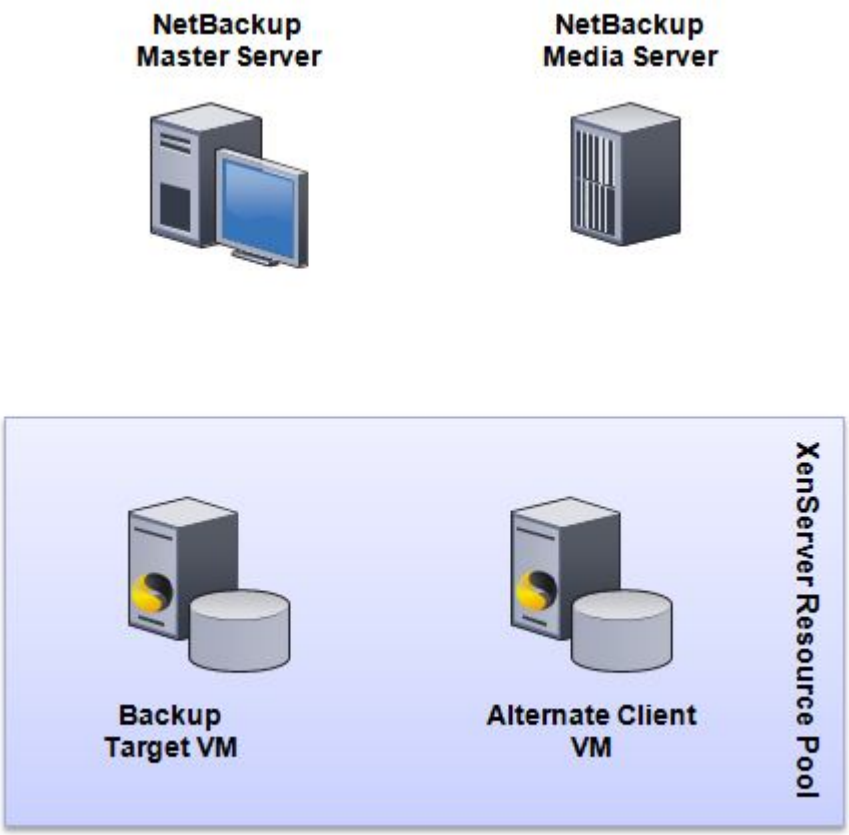
Solution Overview

The implementation of Symantec NetBackup (v 6.5 or later) with Citrix XenServer is dependent on the Symantec backup agent (NetBackup Client). The backup agent in the VM initiates the snapshot through the XenServer VSS provider, is used to attach the created snapshot to an alternate client VM. The backup agent on the alternate client VM backs up the files to the NetBackup Media Server.

Required components for this solution are:

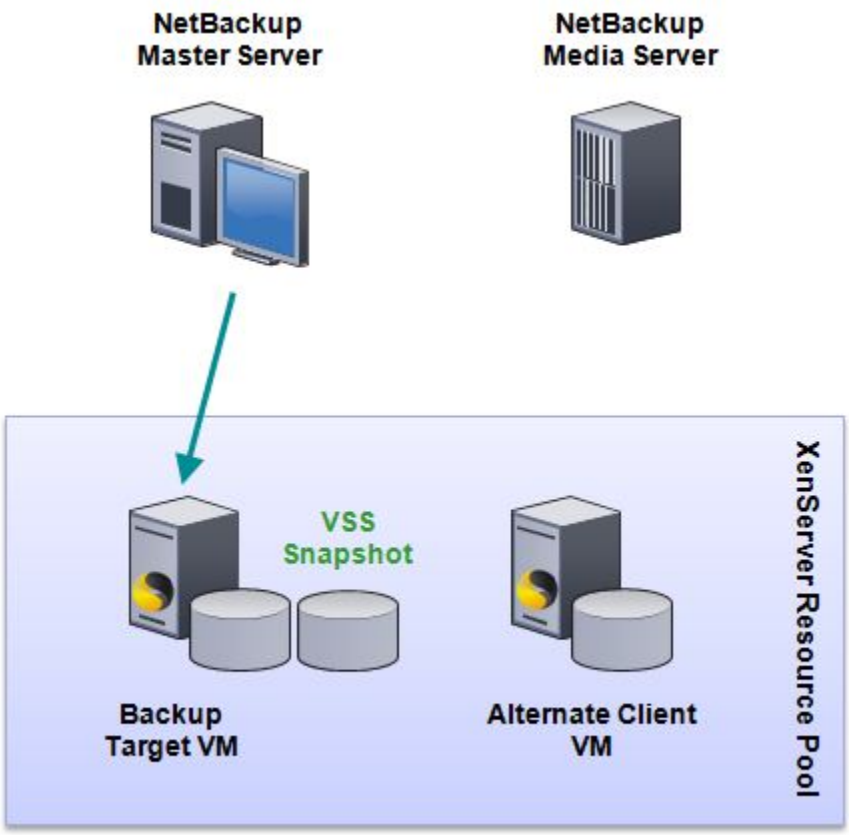
- NetBackup Master Server
- NetBackup Media Server (can be combined with the master on one server)
- Backup target VM(s) with the NetBackup client installed.
- Alternate client VM(s) with the NetBackup client installed

The Alternate Client feature of Symantec NetBackup enables off-host backups. The benefit of using this feature is that the backup time and associated load for the backup target is restricted to the time it takes to create the snapshot. After that, there is no load related to the backup process on that production VM or host during the actual transfer of data to the Media Server. Within a XenServer environment, an alternate client is simply a XenServer virtual machine configured in the same resource pool as the virtual machines being backed up. The VM runs Windows (?) and has the NetBackup agent installed. In larger environments, a dedicated XenServer host for the alternate client VM provides optimized performance.



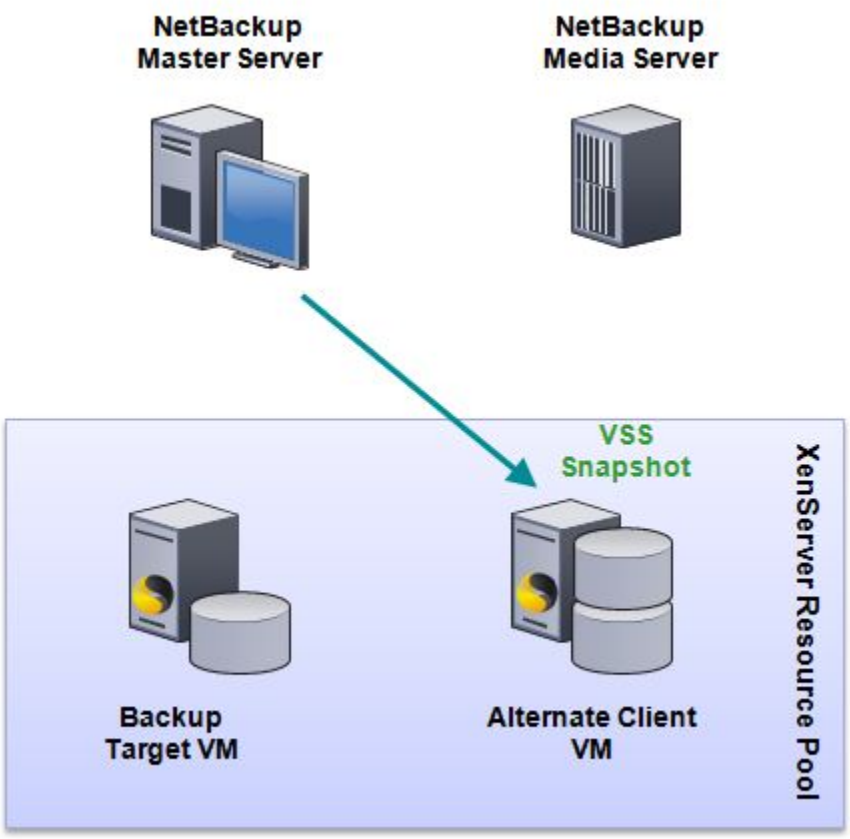
When a backup job starts, the following steps are followed:

Step 1: The NetBackup Server starts the job and instructs the agent in the backup target to initiate the VSS snapshot

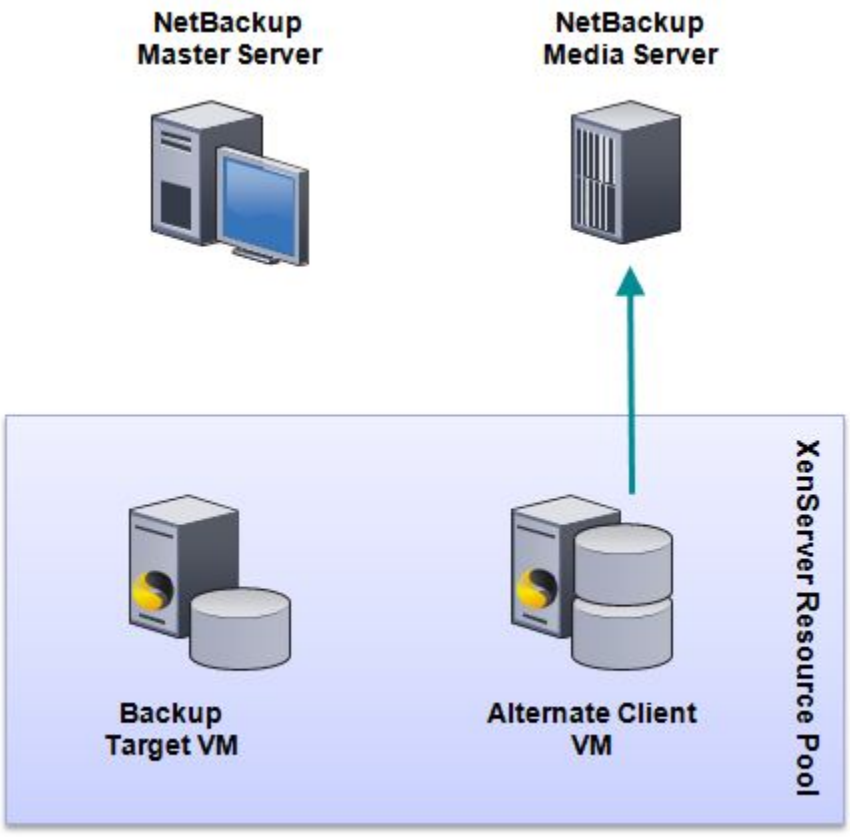


Step 2: The XenServer VSS framework reports the transportable XenServer snapshot ID to the agent, which is reported to the NetBackup Server.

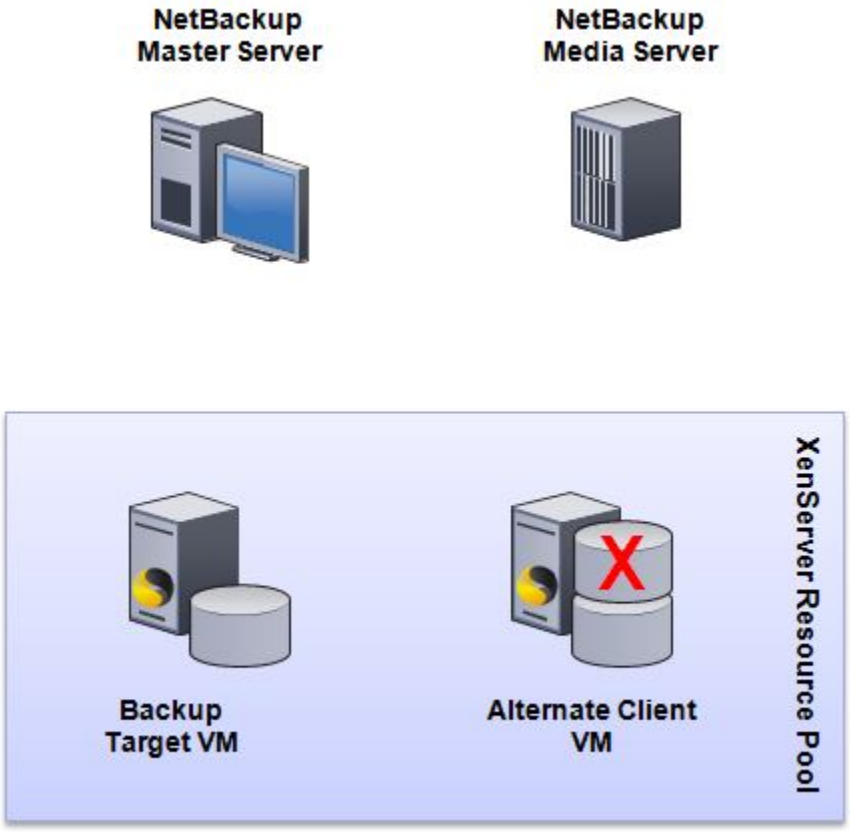
Step 3: The NetBackup Server instructs the Alternate Client to attach the snapshot with the reported transportable snapshot ID through the VSS framework and commence the backup.



Step 4: After attaching the snapshot, the Alternate Client starts the backup of files according to the policy to the NetBackup Media Server.



Step 5: After the backup completes, the attached snapshots aree detached from the Alternate Client and the snapshot is deleted.



XenServer Configuration

This section contains specific XenServer Configuration options for enabling Enhanced Backup Enablement for Symantec NetBackup.

Installing and enabling the Citrix VSS Provider

Although part of the XenServer Tools, the XenServer VSS Provider is not installed and enabled by default. To install and enable this in virtual machines you wish to backup, take the following steps after the XenServer Tools are installed:

1. Navigate to the directory where the drivers have been installed (by default C:\Program Files\Citrix\XenTools)
2. Double-click the install-XenProvider.cmd command to install and activate the VSS provider

Note: the XenServer VSS provider is uninstalled automatically when the XenServer Tools are uninstalled, and mustbe activated again upon reinstallation. They can be uninstalled separately from the XenServer Tools by using the uninstall-XenProvider.cmd in the same directory.

Enabling access to snapshots for alternate client

By default VMs only have access to their own snapshots. XenServer does a security check to prevent a VM from importing another VMs disk without authority. Because in this scenario the alternate client must have access to the snapshots of other VMs, we need to modify this parameter.

To do this, take the following steps:

1. Go to the CLI of one of the servers.
2. Determine the UUID of the alternate client VM, do this by typing:
   # *xe vm-list name-label=<name label of VM>*

   Note: The xe command support autocompletion by pressing Tab, so there is no need to type the full name label of the VM, just the starting characters and hit the Tab button to autocomplete.

   The output of this command contains the UUID of the alternate client VM, make a note of this UUID.

3. Allow this VM to access snapshots from other VMs, by typing:
   # *xe vm-param-set other-config:snapmanager=true uuid=<uuid of VM from previous step>*

Repeat these steps if you have multiple alternate clients in your environment.

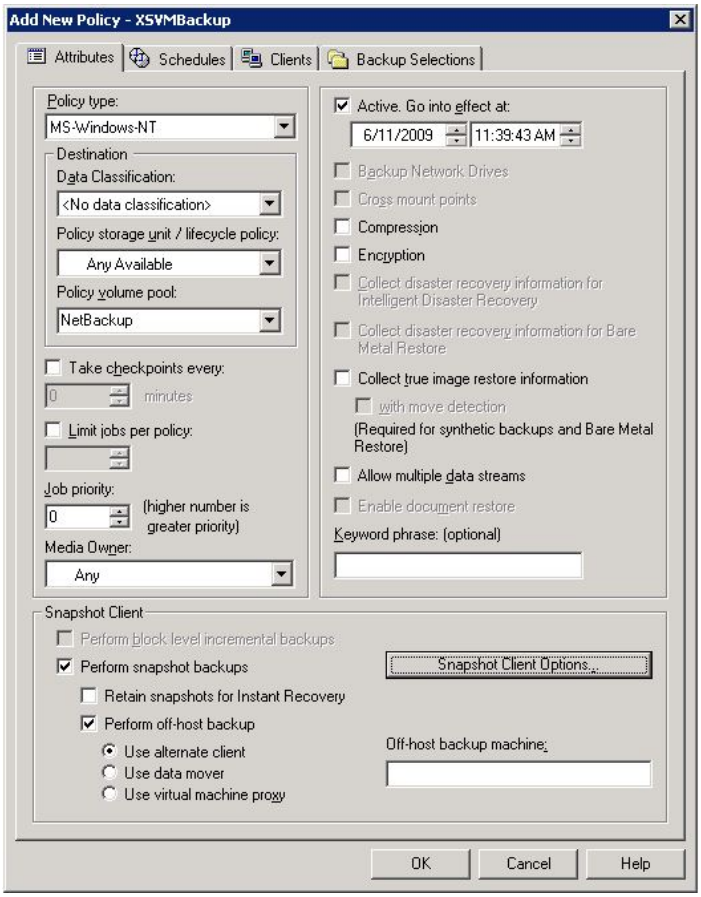
Symantec NetBackup Configuration

This section contains instructions for creating a backup policy in Symantec NetBackup and setting other configuration options within the scope of this document.

Creating a policy for backing up VMs on XenServer

A lot of the configuration of a backup policy in NetBackup is depending on the backup environment. A working backup policy for backing up VMs in a XenServer environment must have the following parameters configured:

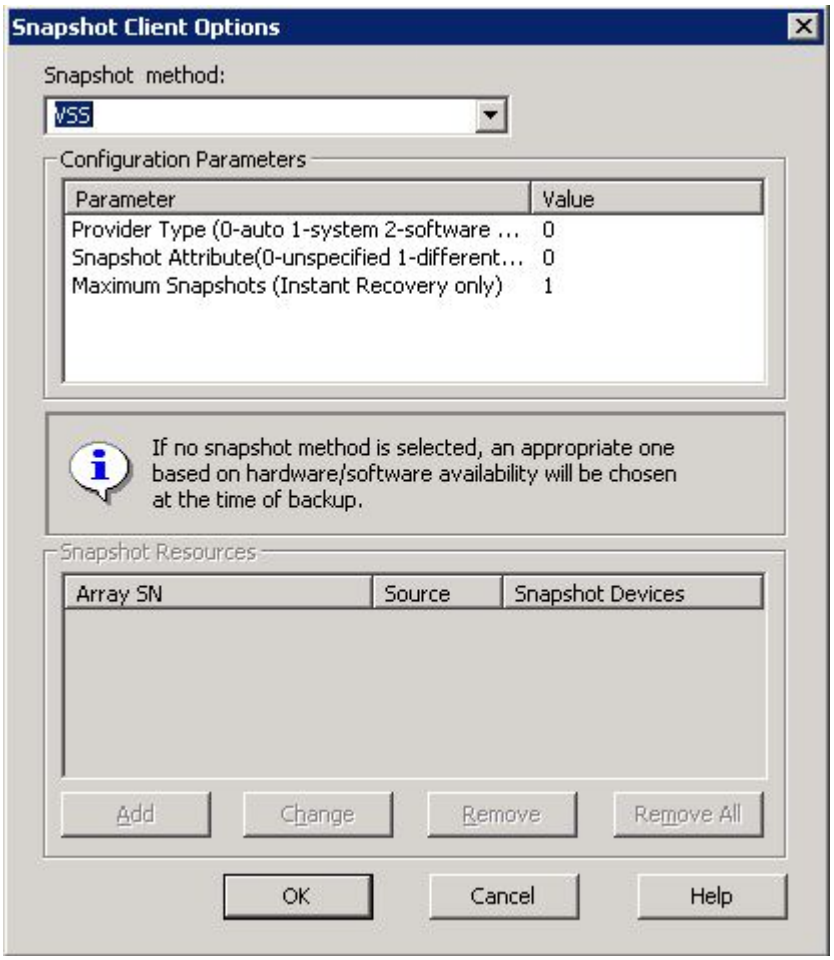
Attributes tab:



- Policy Type: MS-Windows-NT
- Perform snapshot backups: checked
- Retain snapshots for Instant Recovery: unchecked
- Perform off-host backup: checked
- Use alternate client: selected with the alternate client machine name filled out

Snapshot Client Options:

- Snapshot method: VSS
- Configuration Parameters: leave defaults



Schedules tab:

The schedule is depending on the environment. Full backups as well as incremental backups are supported in this solution.

Clients tab:

Enter or select the clients you want to back up.

Backup selections tab:

Enter or select the drives you want to backup from the specified clients listed at the Clients tab.

Note: Make separate policies for clients with different drive configurations, because the VSS framework returns an error if it cannot find the specified disks.

Restoring Files from backup

The normal file restoration procedure for NetBackup can be followed, user initiated through the NetBackup client software from the targeted client VM.

About Citrix

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