



Symantec NetBackup **Blueprints**

Blueprint for VMware

Symantec Backup and Recovery Technical Services



Notice



This NetBackup Blueprint presentation includes example diagrams that contain objects that represent applications and platforms from other companies such as Microsoft and VMware. These diagrams may or may not match or resemble actual implementations found in end user environments. Any likeness or similarity to actual end user environments is completely by coincidence.

The goal of the diagrams included in this blueprint presentation is not to recommend specific ways in which to implement applications and platforms from other companies such as Microsoft and VMware; the purpose of these diagrams is to illustrate NetBackup best practices only.

For guidelines and best practices on installing and configuring applications and platforms from other companies, please refer to best practice documentation and other resources provided by those companies.

These **Blueprints** are designed to show customer challenges and how NetBackup solves those.

- Each Blueprint consists of:
 - **Pain Points:** Explain the current challenges a customer faces.
 - **Whiteboards & Example Diagrams:** Describe the implementation of NetBackup solution.
 - **Best Practices:** Present NetBackup best practices to avoid common pitfalls
- Use these **Blueprints** to present the NetBackup best practice implementation example



Pain Points

Symantec NetBackup Blueprints



- Downtime is expensive
- Capacity Planning
 - More resources are required when compared to physical servers
- Requirement for High Availability
- Application Performance Impact
 - Backing up a client via a backup agent installed in the VM congests network, impacts performance
- Complex Root Cause Analysis
- Many different recovery scenarios



NetBackup Advantages

Symantec NetBackup Blueprints



- Performs full backups and block-level incremental backups (BLIB) of a virtual machine.
- Query-based automation for virtual machine selection
- Can restore the full virtual machine.
- Can restore individual files (within the guest OS) from a full virtual machine backup.
- Can restore to the original virtual machine, to other locations on the ESXi host, or to a different ESXi host.
- Starting from NetBackup 7.5, single-pass backup of application data** apart from OS and flat files supported in earlier versions.
- Simplifies disaster recovery.

** Make sure appropriate license options are installed for application backup and recovery on a Virtual Machine.



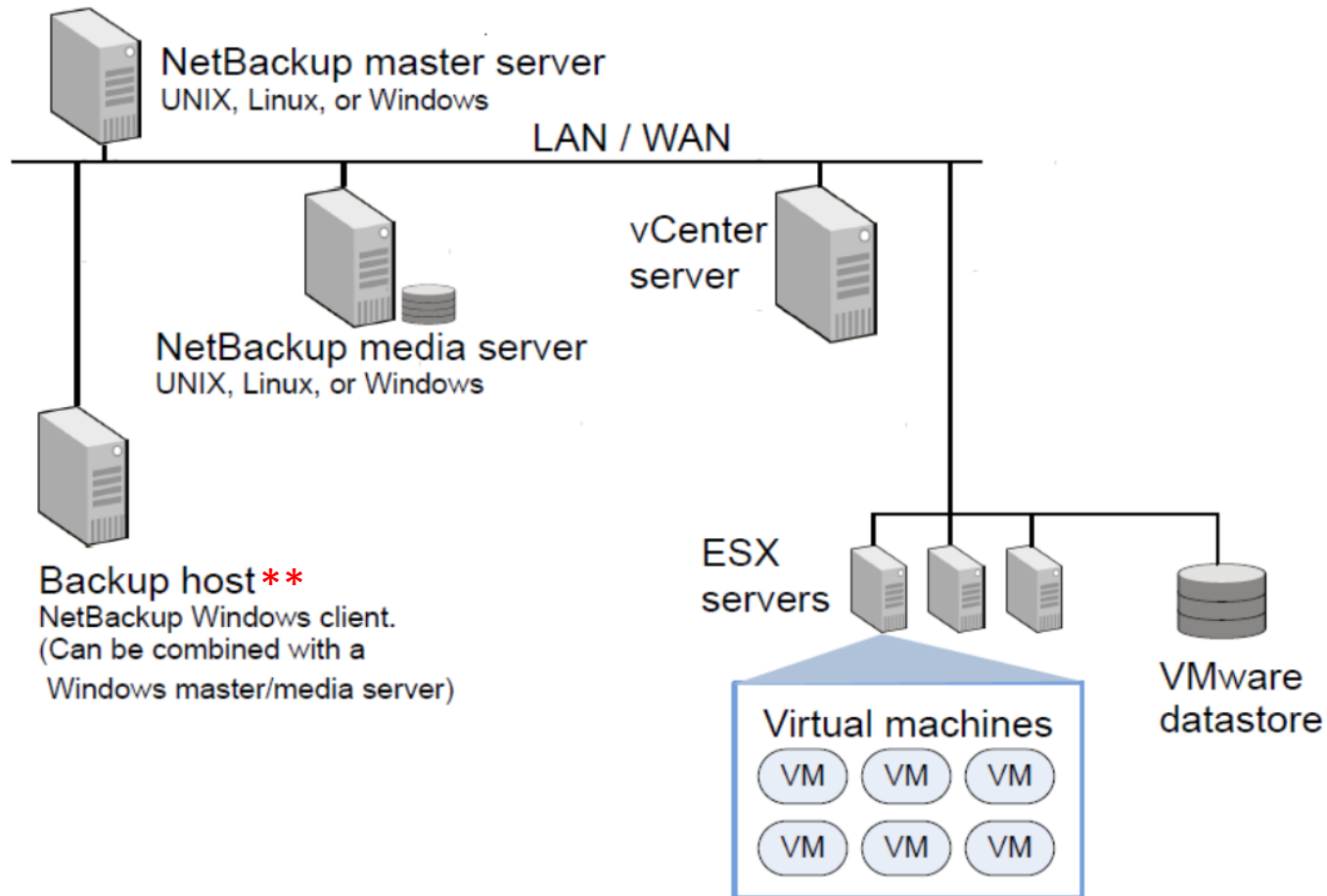
Whiteboards

Symantec NetBackup Blueprints



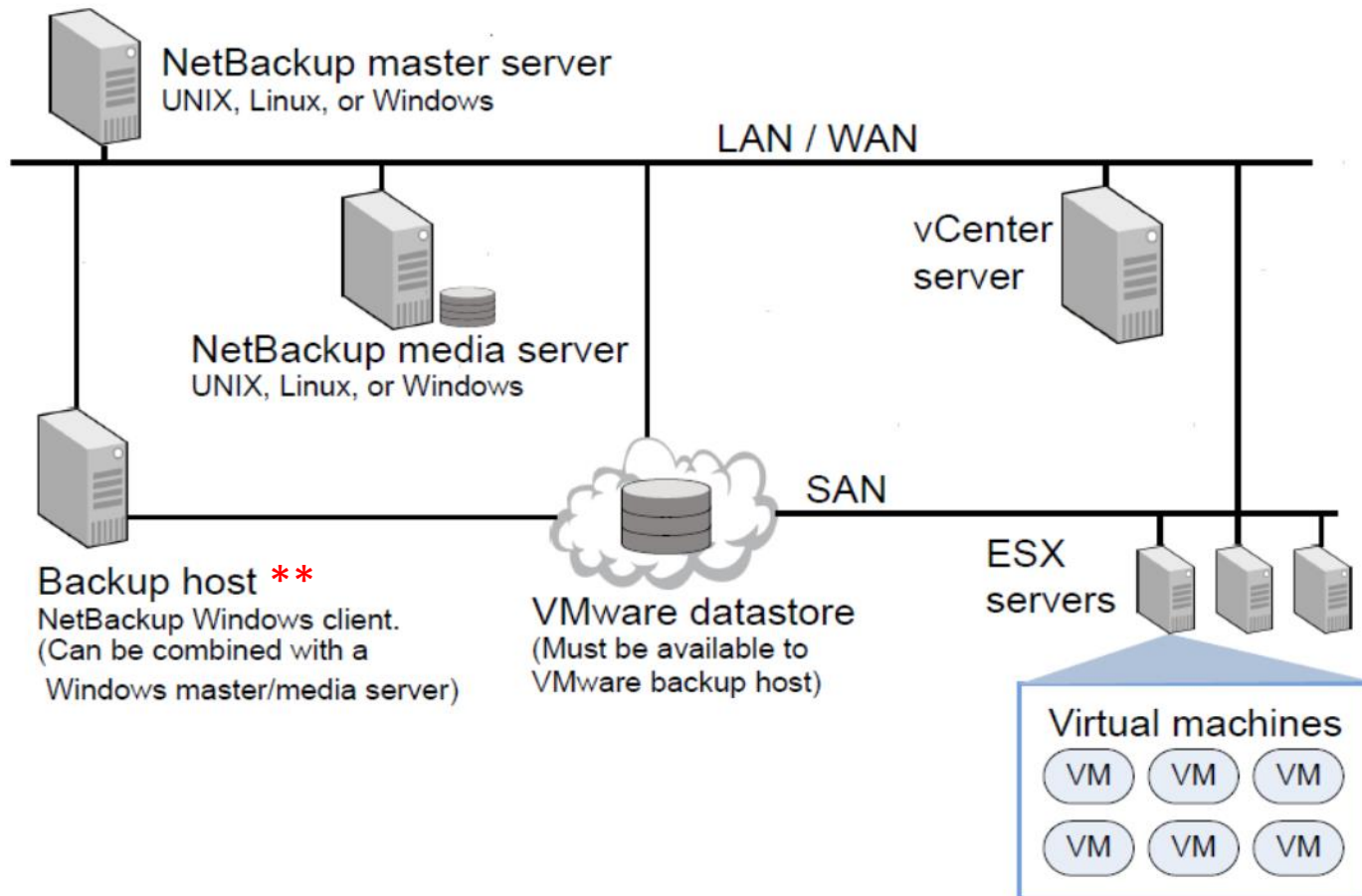
Whiteboards: VMware

Local Network access to datastore



** NetBackup backup host can now be running on Suse Linux and Redhat Linux or can be a NetBackup appliance. Refer to NetBackup software compatibility list for supported OS versions.

Whiteboards: VMware SAN access to datastore



** NetBackup backup host can now be on Suse Linux and Redhat Linux or can be a NetBackup appliance. Refer to NetBackup software compatibility list for supported OS versions.

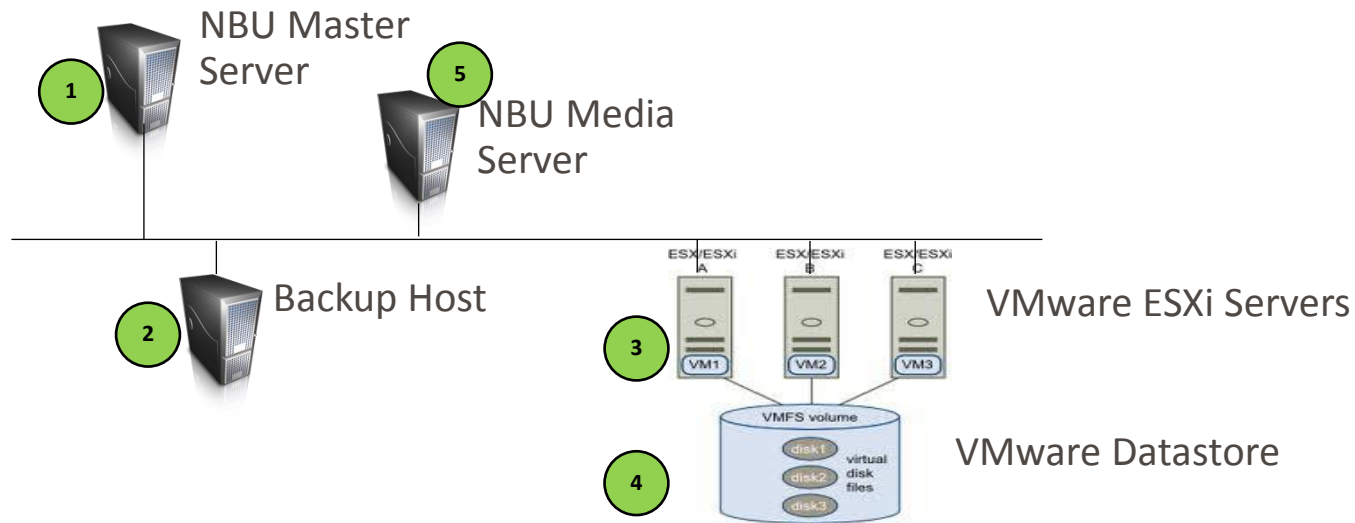
Term	Description
.vmdk file	A file or set of files that appears as a physical disk drive to a guest operating system. These files can be on a host machine or on a remote file system
.vmx file	An editable file containing virtual machine configuration. This .vmx file is created when a virtual machine is created. It is used to identify and run a specific virtual machine.
Quiesce	The act of quieting (file-system consistent quiescing) a VM, usually through VMware tools.
VMware Tools	A set of drivers for VMs to work correctly with synthetic hardware devices.
Datastore	A disk resource where VMs can run.
ESXi Server	Provides a virtualized hardware environment to VMs.
vCenter Server	Co-ordinates multiple ESXi servers and can migrate VMs between ESXi servers.

Term	Description
Backup host	<ul style="list-style-type: none">• A NetBackup host that helps perform backups on behalf of VMs.• This host can be a NetBackup media server.• This has operating system restrictions, with the NetBackup client installed.• Requires access to VMware datastore (except using NBD transport type)
Discovery host	<ul style="list-style-type: none">• Used for automatic selection of VMs for backup.• Can be any host supported for NetBackup Server software.• Can be the same host as backup host.
Backup media server	Reads and writes backup data.
NetBackup Client	Installed on the backup host which is not a media server; not required on the virtual machine **

** NetBackup client must be installed on the virtual machine to protect application data.

Whiteboards: VMware

Overview of VMware backup process



- 1 The NetBackup master server initiates the backup.
- 2 The NetBackup client on the VMware backup host initiates a VMware snapshot on the virtual machine.
Windows: VSS synchronizes the file system on the virtual machine.
Linux: The SYMCquiesce utility can quiesce the file system on supported Linux operating systems.
- 3
- 4 The VMware server creates a snapshot on the virtual disk datastore.
- 5 The NetBackup client on the backup host reads the snapshot from the datastore and writes the data to the NetBackup storage unit.

Whiteboards: VMware

NetBackup version support for VMware



	NetBackup Versions***					
	7.0.x	7.1	7.5.x	7.5.0.3	7.5.0.5	7.6.x
Supported Functions	Backup Host (Windows Only), GRT (Windows Guest OS only)	Backup Host (Windows Only), GRT (Windows, Suse and RedHat Linux Guest OS only) *	Backup Host (Windows Only), GRT (Windows, Suse and RedHat Linux Guest OS only)*, Application Support(Single Pass)**	Backup Host (Windows and Suse Linux Only), GRT (Windows, Suse and RedHat Linux Guest OS only)*, Application Support(Single Pass)**	Backup Host (Windows, Suse and RedHat Linux only), GRT (Windows, Suse and RedHat Linux Guest OS only)*, Application Support(Single Pass)**	Backup Host (Windows, Suse and RedHat Linux only), GRT (Windows, Suse and RedHat Linux Guest OS only)*, Application Support(Single Pass)**, NetBackup Accelerator, Replication Director and Instant Recovery support for VMs
Policy Type	Flashbackup Windows	Flashbackup Windows	VMware	VMware	VMware	VMware

* SYMCquiesce utility can be optionally installed after installing NetBackup client.

** Installation of NetBackup client inside the VM is a requirement. A separate Application State Capture (ASC) job runs to protect application data. Symantec VSS tools instead of VMware VSS tools to be installed separately inside a virtual machine running applications to support truncation of transaction logs.

*** Refer to technote [TECH127089](#) for complete listing of OS and VMware versions support.

- To use the **hotadd** transfer type for backup or restore, the VMware backup host must be a virtual machine.
- NetBackup for VMware cannot back up the data on an independent disk, because an independent disk cannot be captured with a snapshot. The backup succeeds but the backup image contains no data for the independent disk.
- If a Windows virtual machine includes Veritas Storage Foundation volumes, the Enable file recovery from VMbackup option is not supported. This is also true for the virtual machines that contain encrypted drives.
- VMware does not support non-ASCII characters in virtual machine display names or in other objects that are associated with the virtual machine.
- Raw Disk Mappings are not protected via VMware backups.
- ReFS and Windows Deduplication file systems in Windows 2012 is not supported for individual file restores. Alternatively, use Instant Recovery option to access individual files for unsupported configuration.

- On Linux virtual machines, NetBackup requires a special utility (SYMCquiesce) to quiesce the file system in preparation for taking the snapshot. Without SYMCquiesce, NetBackup cannot guarantee that data in the file system is in a consistent state when the snapshot occurs. Install SYMCquiesce utility after installing NetBackup client.
- For Linux files or directories, NetBackup for VMware has the same path name restriction as NetBackup on a Linux physical host. Files or directories with path names longer than 1023 characters cannot be individually backed up or restored. Such files can be restored when you restore the entire virtual machine from a full virtual machine backup.
- Unmounted LVM2 volumes must start with /dev

Whiteboards: VMware

Notes on display names for Virtual Machines



When VMware virtual machines are included in a NetBackup policy, certain characters are not allowed in the virtual machine display name. These restrictions apply only if the policy **PrimaryVMidentifier** option is set to **VMware display name**.

If the display name contains the wrong characters, the backup may fail.

For NetBackup, the following characters are allowed in virtual machine display names:

- Uppercase and lowercase ASCII characters
- Numbers
- Period (.)
- Hyphen (-)
- Underscore (_)
- Plus sign (+)
- Percent sign (%)
- Left and right parentheses ()
- Spaces

- Unless a NetBackup client is installed on the virtual machine, you must do the restore from the NetBackup master server.
- Always Identify the source client for a restore using the method the VMWare policy uses (If the policy lists VM by display name, use the same display name in the restore GUI)
- To restore files to the original virtual machine location, the destination must be specified as the virtual machine's host name.
- Cross-platform restore of individual files is not supported. Restore of individual files from a backup of the full virtual machine is not supported if the virtual machine contains Storage Foundation Volume Manager volumes.
- To restore Windows NTFS-encrypted files individually, you must install a NetBackup client on the virtual machine.
- VMware does not support the restore of virtual machines directly to an ESXi 5.x server that vCenter manages. To restore the virtual machine, select the vCenter server as the destination.
- If the attempt to restore a full virtual machine fails while using the SAN transport type, try the NBD transport type instead.

Important virtual machine related benefits in NetBackup 7.6 are:

- NetBackup Accelerator for VMware
This feature significantly reduces the time taken to perform virtual machine backups with any-level recovery.
- Instant Recovery for VMware
This feature enables administrators to instantly power on protected VM directly on NetBackup disk backup target without needing to restore the virtual machine.
- NetBackup for vCloud Director
This feature is used to automatically interrogate vCloud Director to discover newly provisioned VMs.

- **NetBackup plugin for vCenter**
This feature integrates with vSphere clients to provide historical backup related graphical reports to VM administrators. This feature also enables VM administrators to initiate full recovery of VMs directly from the vSphere interface
- **Windows BMR P2V for VMware**
This feature enables recovery of physical Windows-based machine to a virtual machine using physical-to-virtual (P2V) recovery which is integrated in the BMR console.
- **Replication Director for VMware**
This feature helps protect VMware infrastructure residing on NAS datastores by using Virtual Machine Intelligent Policy (VIP) and hardware snapshots technologies.



Example Diagrams

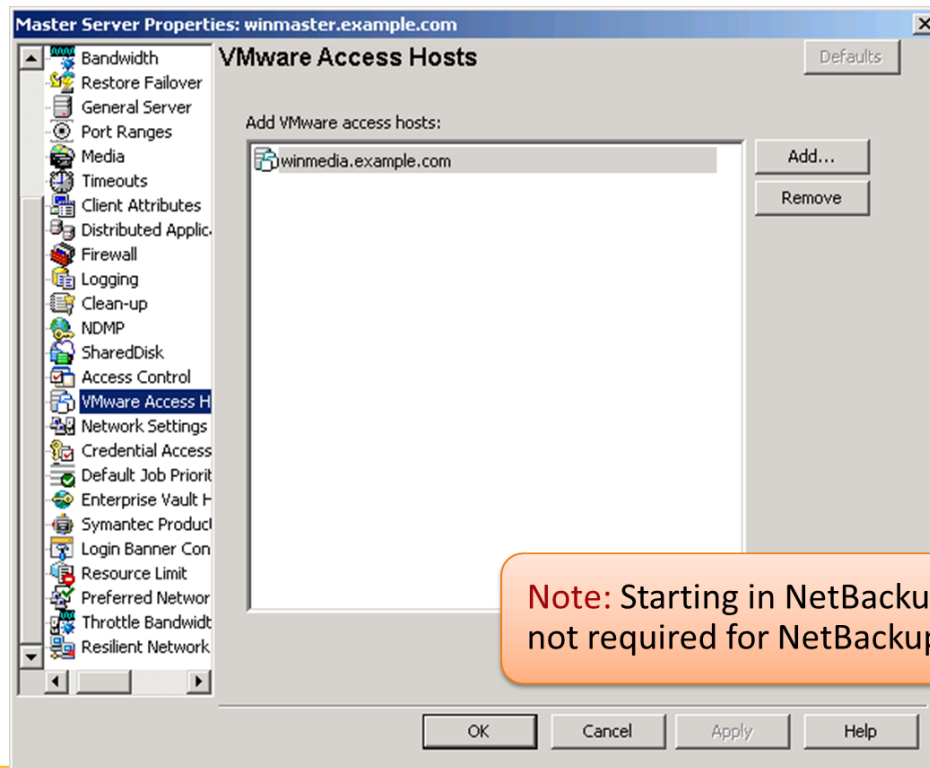
Symantec NetBackup Blueprints



Example Diagram: VMware Overview of NetBackup Tasks (1)



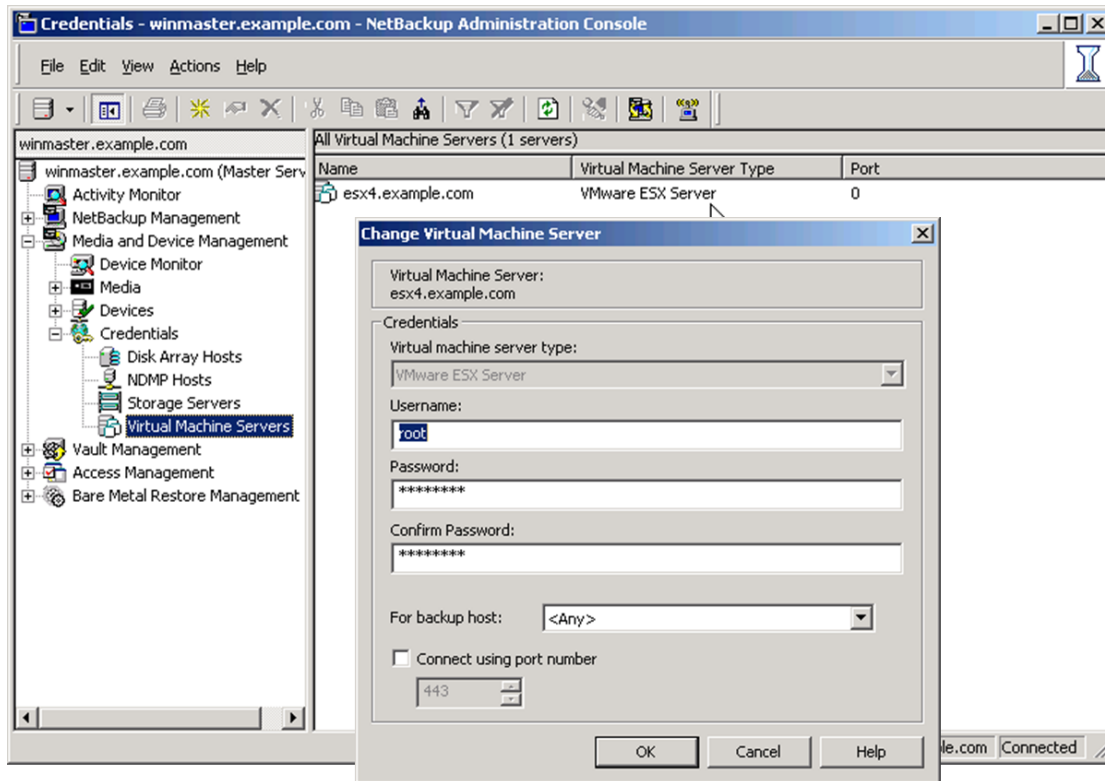
- 1 Install NetBackup Master and Media Server
Download Product Guides <https://sort.symantec.com/netbackup>
- 2 Install the NetBackup 7.6.0.1 Enterprise Client license on the master server, and install NetBackup client 7.6.0.1 software on the VMware backup host.
- 3 Add the VMware backup host to your NetBackup configuration.



Note: Starting in NetBackup 7.5, this step is not required for NetBackup media servers.

Example Diagram: VMware Overview of NetBackup Tasks (2)

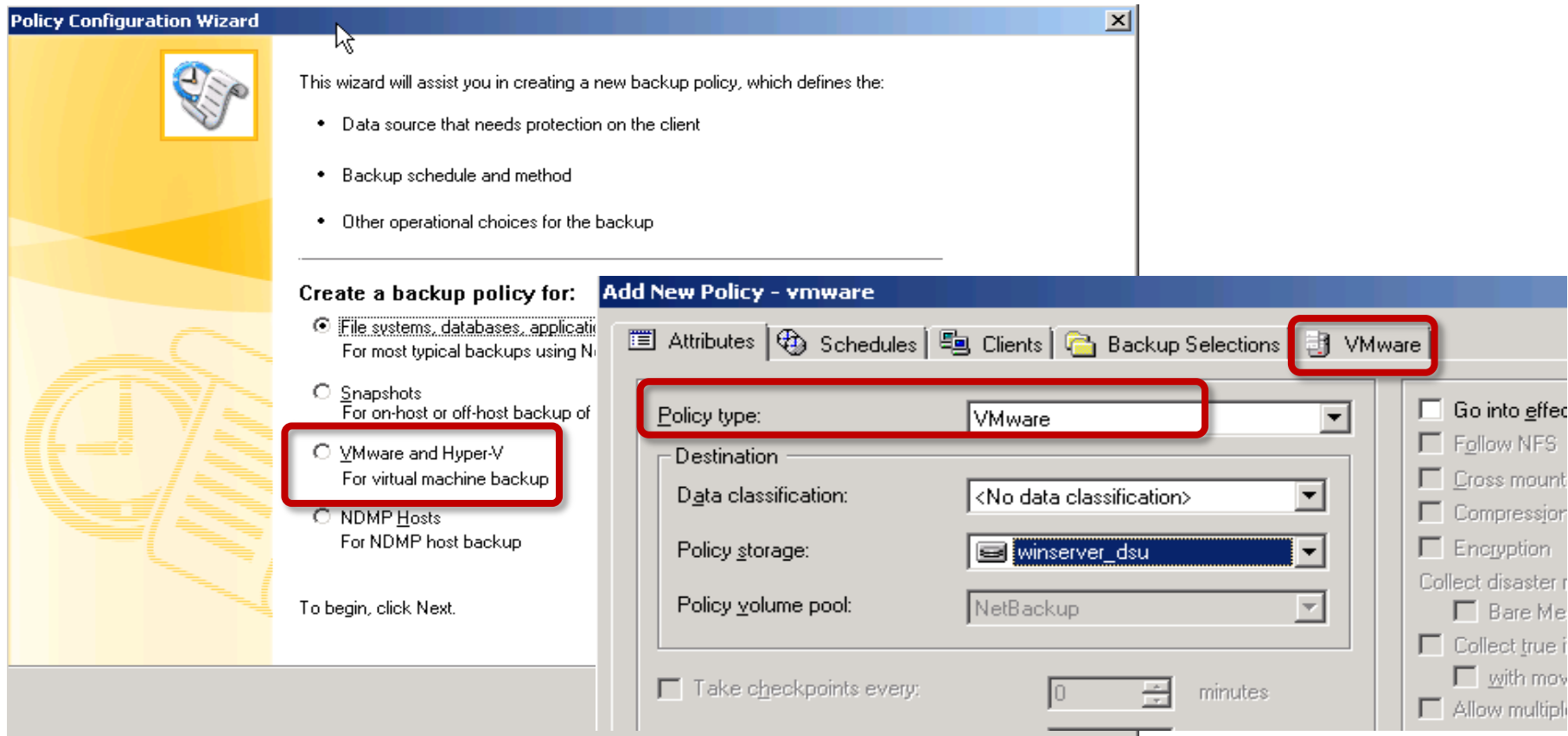
- 4 Set NetBackup access credentials for the VMware vCenter (if any), or for VMware ESXi servers.



- 5 Create a NetBackup policy for VMware.

Example Diagram: VMware NetBackup Policy for VMware

Create NetBackup for VMware policy using Policy Creation Wizard or Manually

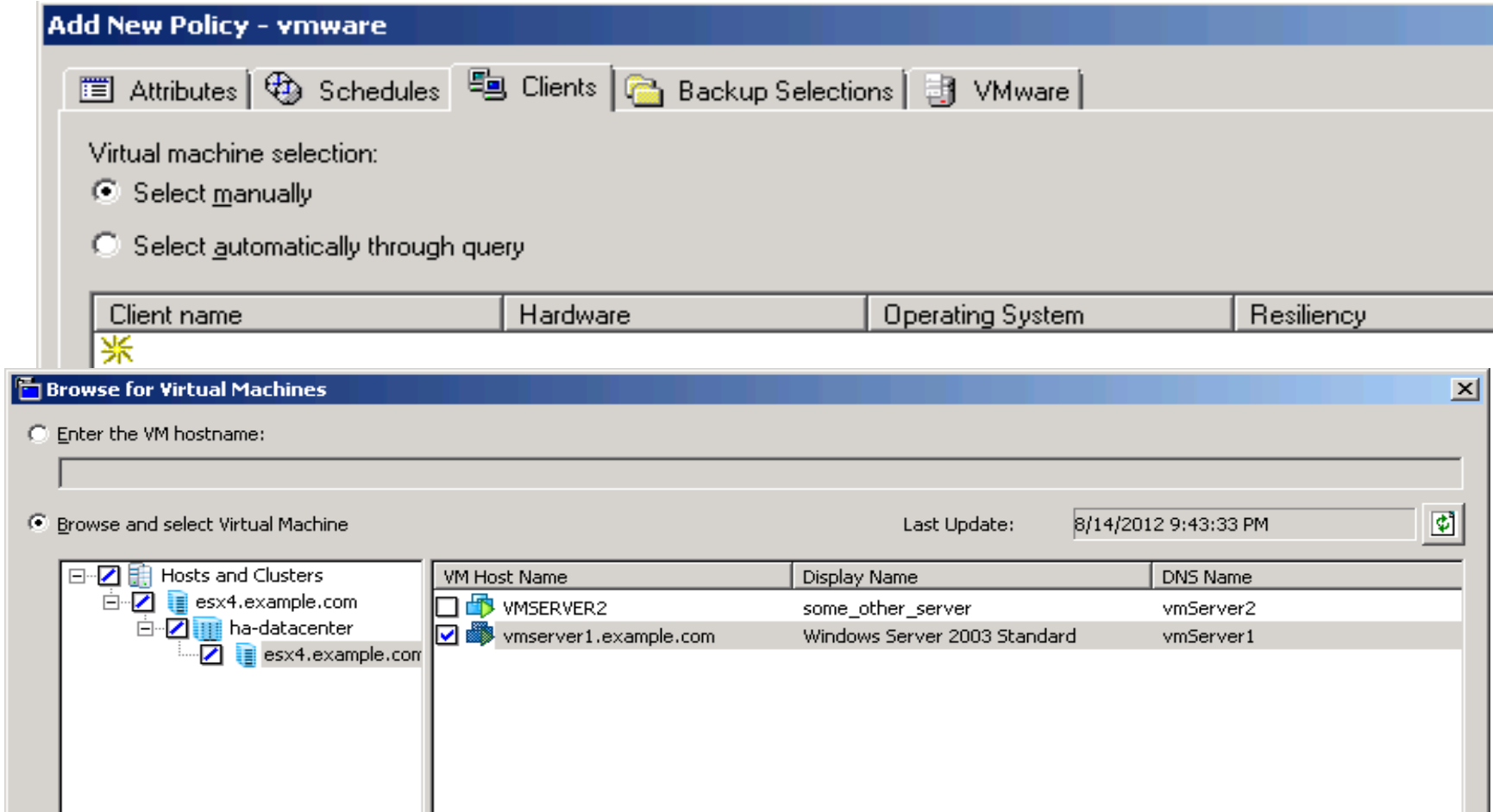


The image shows two overlapping windows from the NetBackup software. The background window is the 'Policy Configuration Wizard', which explains that the wizard will assist in creating a new backup policy. It lists three main areas: data source, backup schedule, and other operational choices. Under 'Create a backup policy for:', there are four radio button options: 'File systems, databases, applications', 'Snapshots', 'VMware and Hyper-V', and 'NDMP Hosts'. The 'VMware and Hyper-V' option is selected and highlighted with a red box. The foreground window is the 'Add New Policy - vmware' dialog. It has tabs for 'Attributes', 'Schedules', 'Clients', 'Backup Selections', and 'VMware'. The 'VMware' tab is active and highlighted with a red box. In this tab, the 'Policy type' dropdown is set to 'VMware' and is also highlighted with a red box. Other fields include 'Data classification' (set to '<No data classification>'), 'Policy storage' (set to 'winserver_dsu'), and 'Policy volume pool' (set to 'NetBackup'). There is also a checkbox for 'Take checkpoints every:' with a value of '0' minutes.

NOTE: If **Flashbackup-Windows** (used in Netbackup 7.0.x and 7.1.x versions) policies exist, they can be upgraded to VMware policy by using **nbplupgrade** utility.

Example Diagram: VMware Clients and Backup Selection - Manual

Manual selection of clients.



The screenshot displays two windows from the Symantec NetBackup console. The top window, titled "Add New Policy - vmware", has tabs for "Attributes", "Schedules", "Clients", "Backup Selections", and "VMware". The "Clients" tab is active, showing "Virtual machine selection:" with two radio buttons: "Select manually" (selected) and "Select automatically through query". Below this is a table with columns: "Client name", "Hardware", "Operating System", and "Resiliency". A yellow asterisk icon is visible in the "Client name" column.

The bottom window, titled "Browse for Virtual Machines", has two radio buttons: "Enter the VM hostname:" (unselected) and "Browse and select Virtual Machine" (selected). A "Last Update:" field shows "8/14/2012 9:43:33 PM". The left pane shows a tree view with "Hosts and Clusters" expanded to "esx4.example.com" > "ha-datacenter" > "esx4.example.com". The right pane shows a table of VMs:

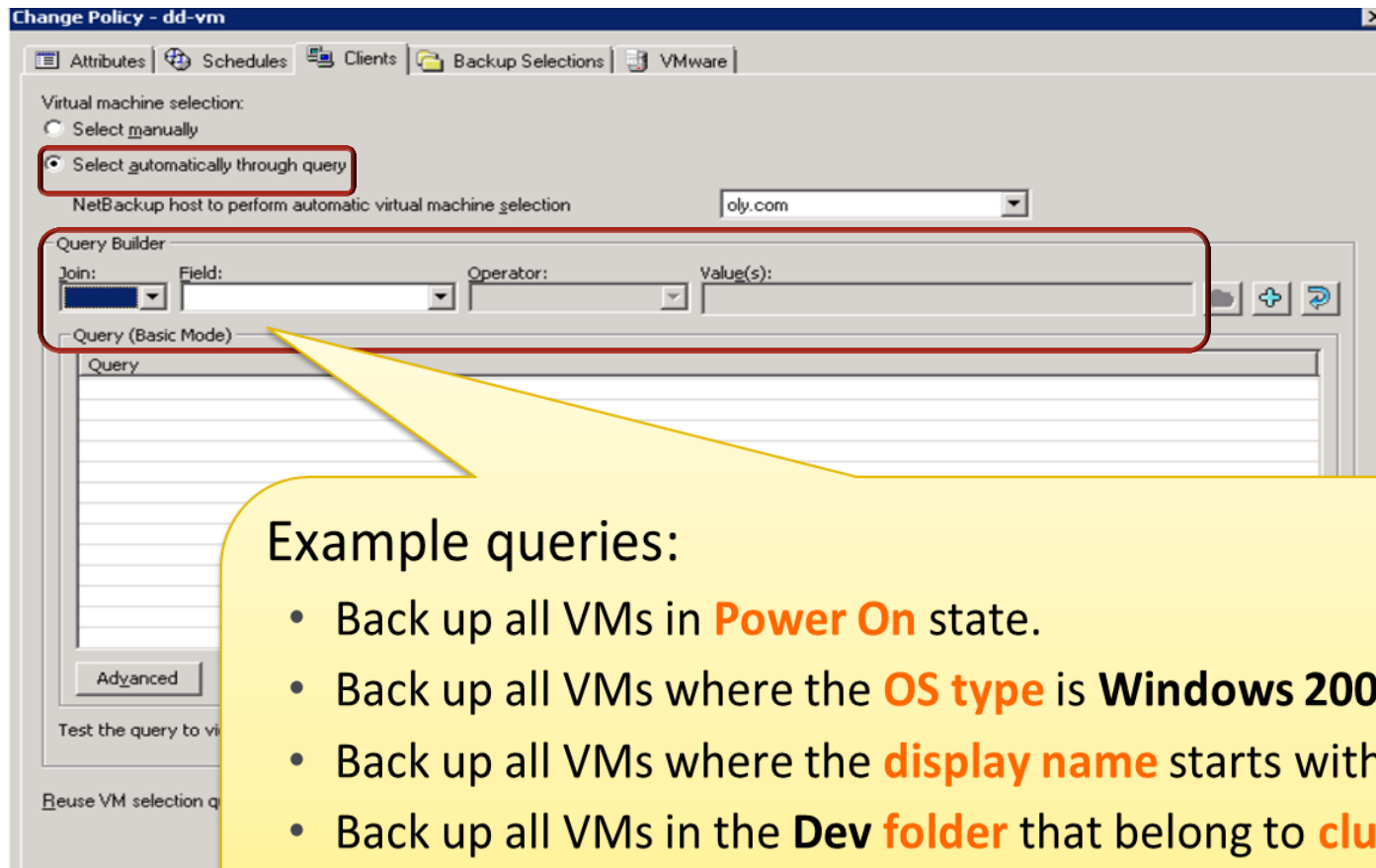
VM Host Name	Display Name	DNS Name
<input type="checkbox"/> VMSEVER2	some_other_server	vmServer2
<input checked="" type="checkbox"/> vmserver1.example.com	Windows Server 2003 Standard	vmServer1

NetBackup can be configured to automatically select virtual machines based on a range of criteria. This is Virtual Machine Intelligent Policy (VIP).

This feature:

- Simplifies the policy configuration for sites with large virtual environments.
- Allows the backup list to stay up-to-date with changes in the virtual environment.
- Allows the Virtual machine selection to take place dynamically at the time of the backup.
- Has Basic/Advanced query builder to narrow searches and automatically select Virtual Machines.
- Has the ability to run test query to view virtual machine selections.

Example Diagram: VMware Clients and Backup Selection – VIP



Example queries:

- Back up all VMs in **Power On** state.
- Back up all VMs where the **OS type** is **Windows 2008**.
- Back up all VMs where the **display name** starts with “Vmprod”.
- Back up all VMs in the **Dev folder** that belong to **cluster Cluster03**.
- Back up all VMs in **Power On** state in **datastore Storage 1** where the **OS type** is **RedHat Linux**.

Example Diagram: VMware Clients and Backup Selection – VIP

VM selection status is as per current VM environment. Query result may vary with any change in the VM environment

Testing query for policy: VM_PowerStateOn_Win

```
vmware:/?filter=ESXserver AnyOf "bastok.hro.spt.symantec.com" AND VMGuestOS Equal "windows7Server64Guest"
```

Test Query Results

VM Name	Selection
10.66.16.24	INCLUDED
PFTEST	EXCLUDED
PFTEST2	EXCLUDED
PFTEST3	EXCLUDED
10.66.16.165	INCLUDED
10.66.17.212	INCLUDED
W2K3_X86	EXCLUDED

Included: 3 Excluded: 6 Failed: 0

Close Help

Query Builder

Join: Field: Operator: Value(s):

Query (Basic Mode)

Query

```
ESXserver AnyOf "bastok.hro.spt.symantec.com"
AND VMGuestOS Equal "windows7Server64Guest"
```

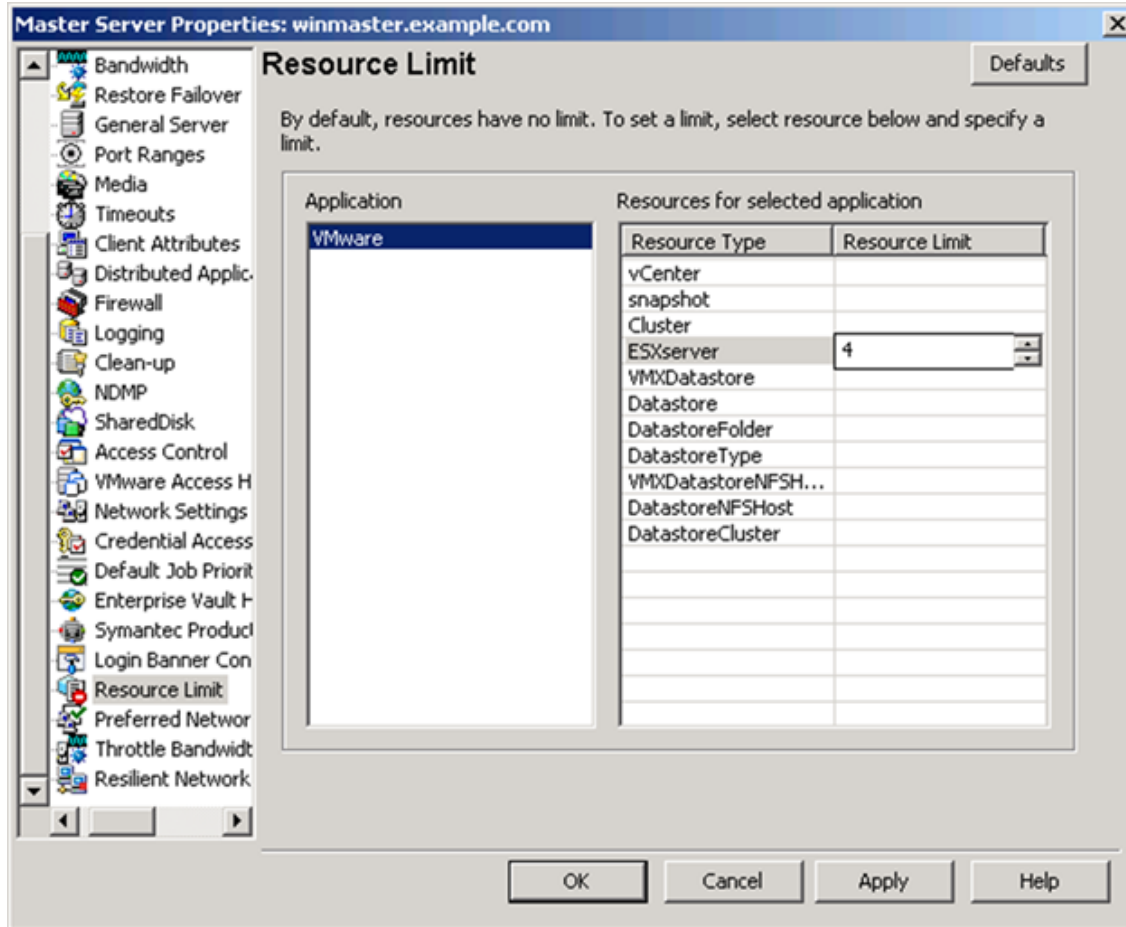
Advanced Edit Remove

Test the query to view results. VMs selected for backup may vary with any change in the virtual environment.

Test Query

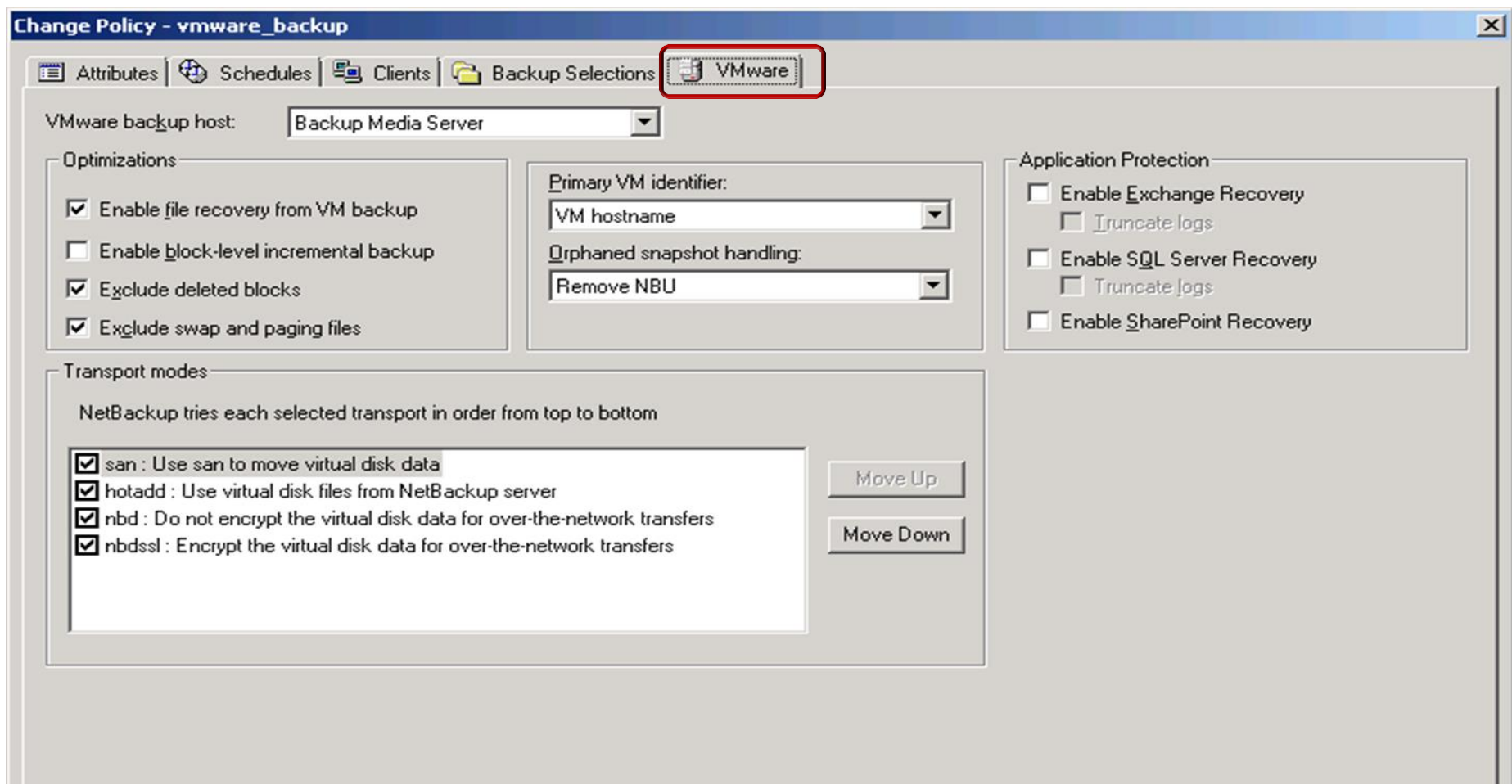
Example Diagram: VMware Resource Limit

This is a setting to control the number of simultaneous backups that can be performed on a VMware resource type. This setting applies to all NetBackup policies**.



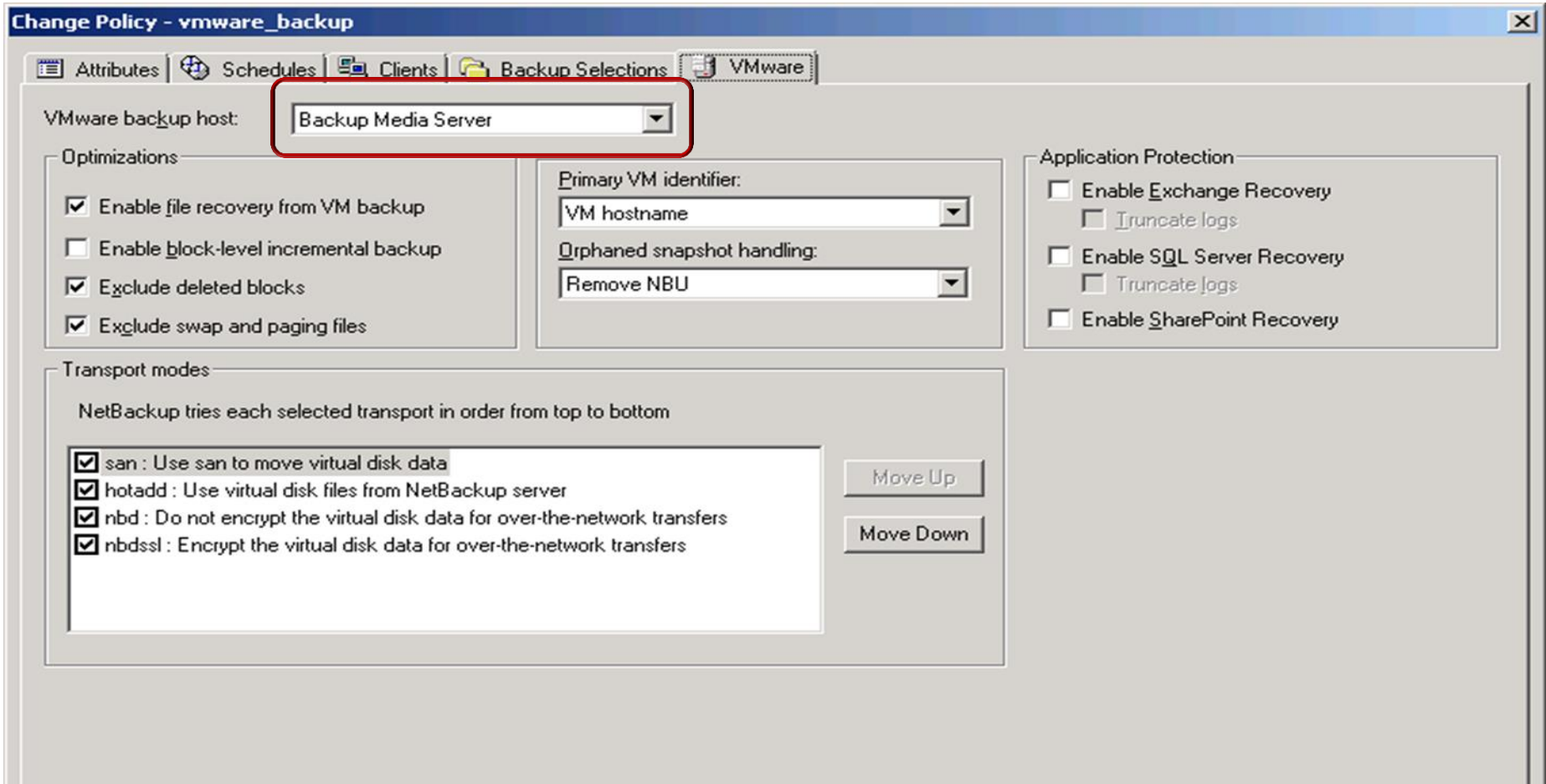
**The Resource Limit screen applies only to policies that use automatic selection of virtual machines (Query Builder). If virtual machines are selected manually on the Browse for Virtual Machines screen, the Resource Limit settings have no effect. Refer to article [HOWTO70967](https://www.symantec.com/au/techsupport/howto/70967)

Example Diagram: VMware VMware Policy Tab



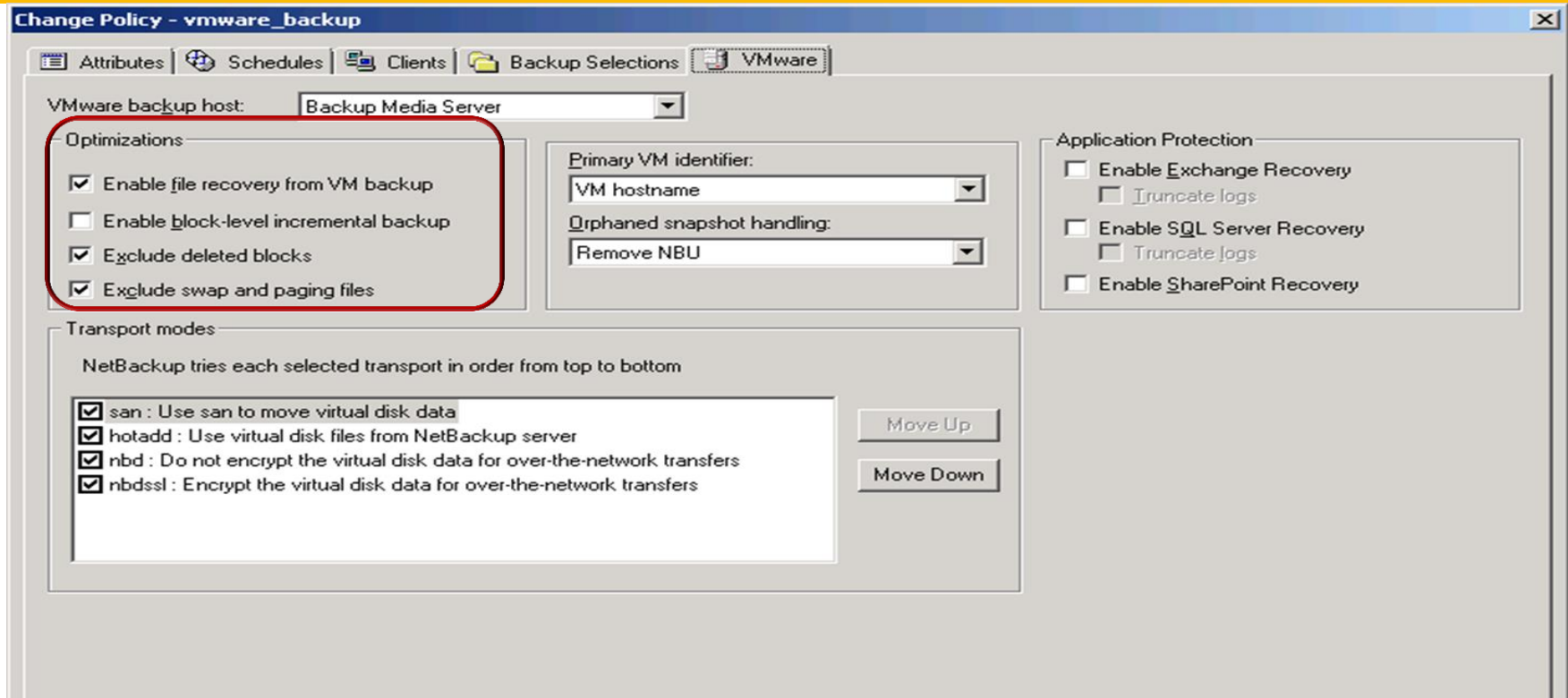
- VMware tab shows up on selecting “VMware” as the policy type
- This tab is used to configure virtual machine protection behavior

Example Diagram: VMware Backup Host Selection



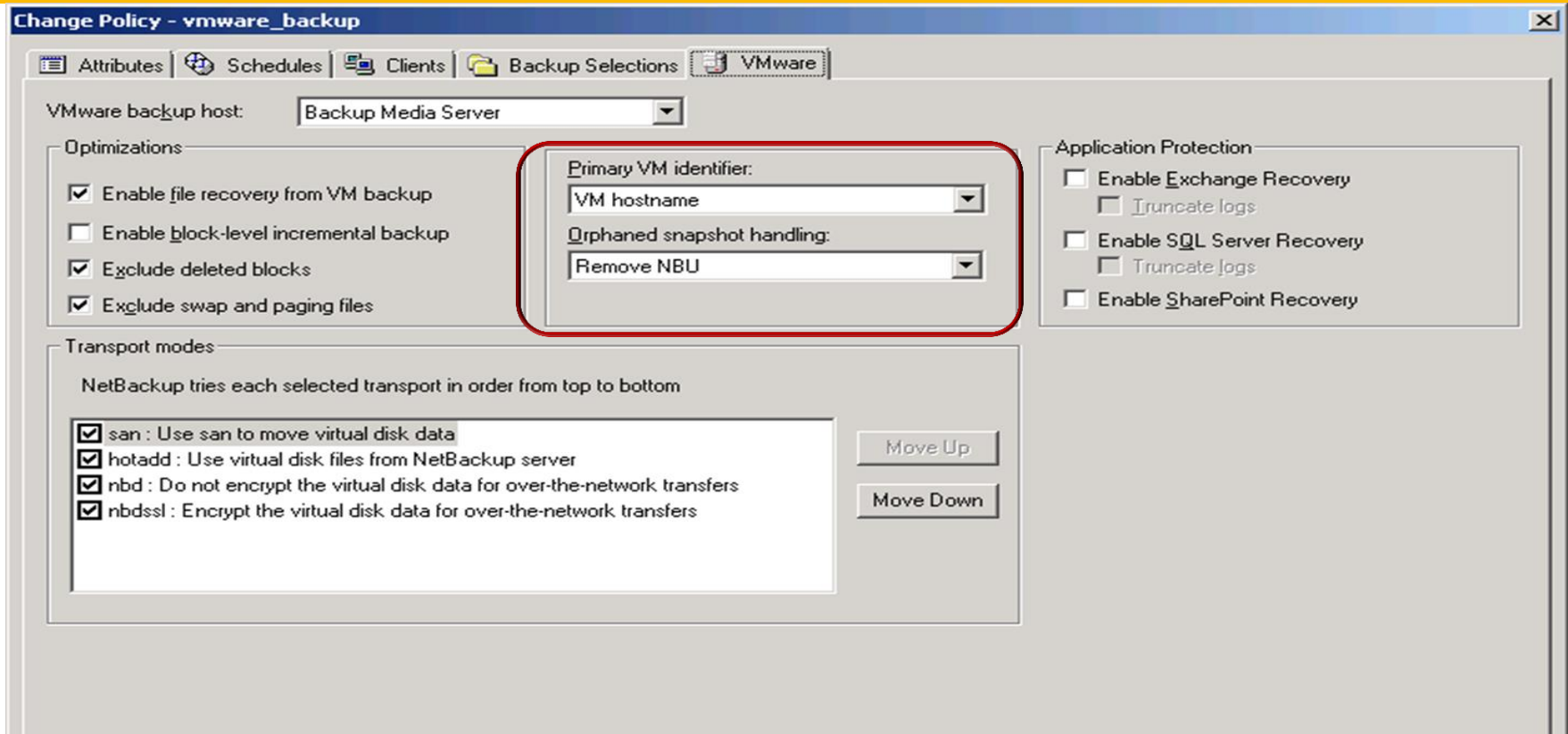
- Choose an appropriate backup host. If a media server running on a supported OS is available, this could act as a backup host.
- There could be more than one backup host available.

Example Diagram: VMware Backup Optimization



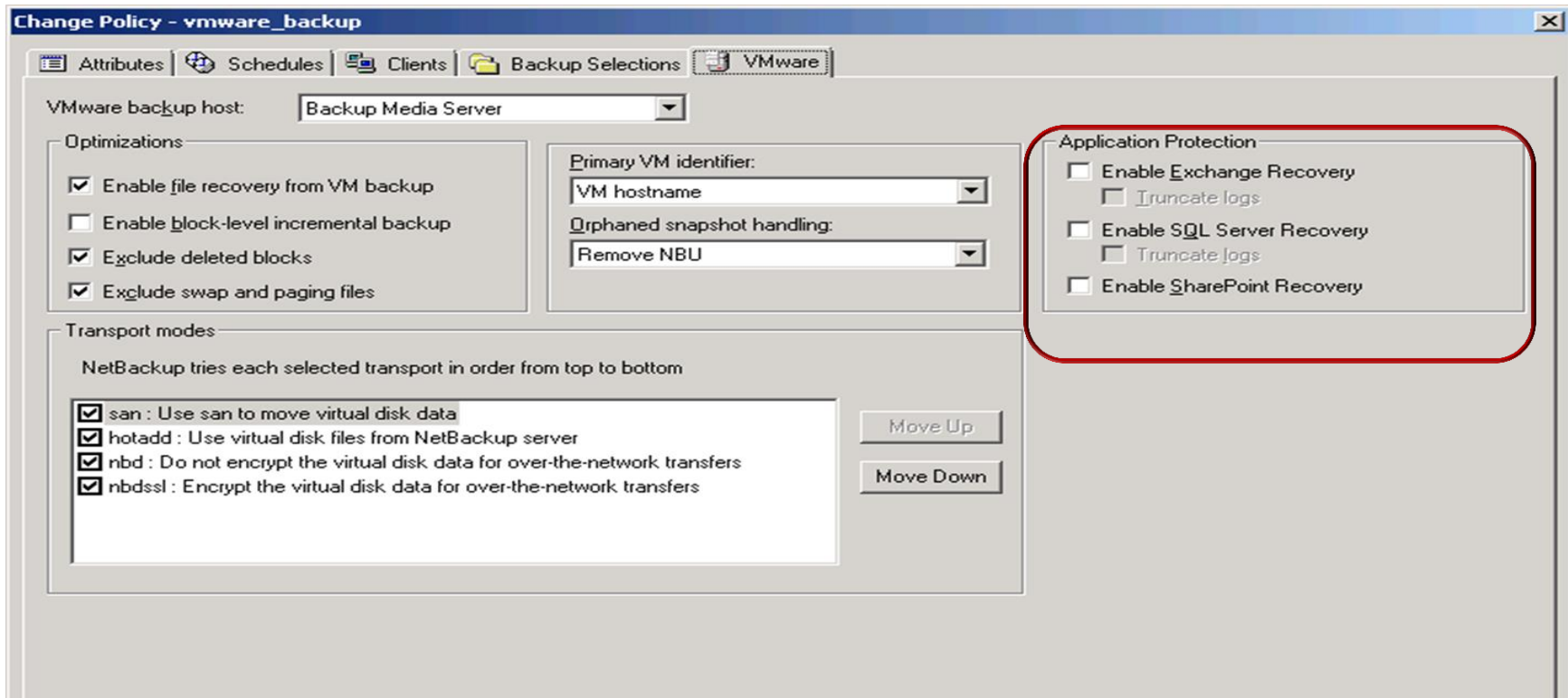
- Select **Enable file recovery from VM backup** option for Granular Recovery of individual files (selected by default).
- Block Level Incremental Backups (BLIB) reduces the size of backups. BLIB works with VMware's Changed Block Tracking in vSphere to track block-level changes.
- **Exclude deleted blocks** option reduces the size of VM backups by excluding any deleted sectors in the file system (selected by default).

Example Diagram: VMware Virtual Machine Identifier



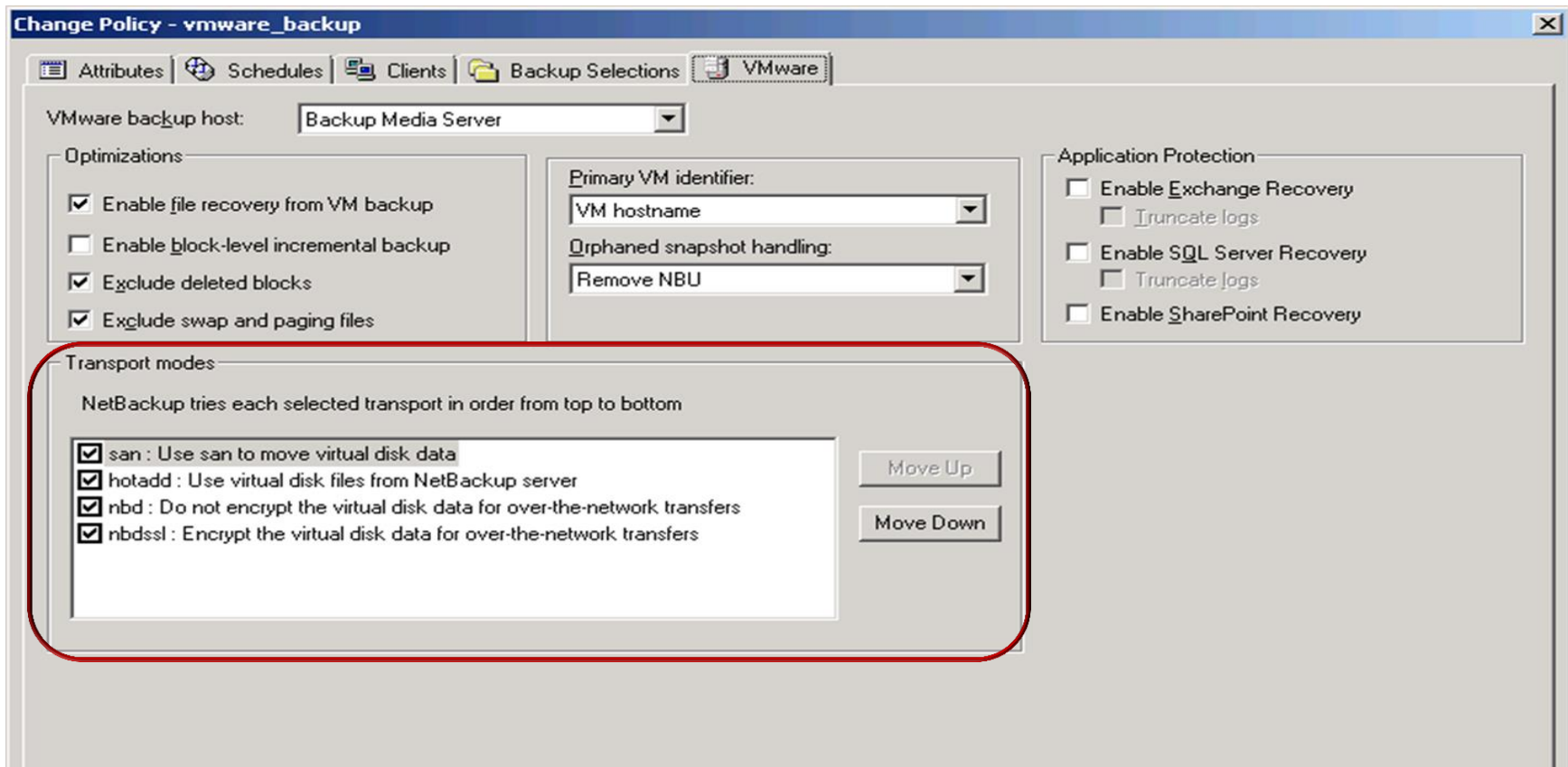
- **Primary VM Identifier** setting specifies the type of name by which NetBackup recognizes virtual machines when it selects them for backup.
- Undeleted snapshots can cause restores to fail due to unavailable disk space. **Orphaned snapshot handling** option specifies the action that NetBackup takes when a snapshot is discovered before NetBackup creates a new snapshot for the virtual machine backup.

Example Diagram: VMware Application Protection



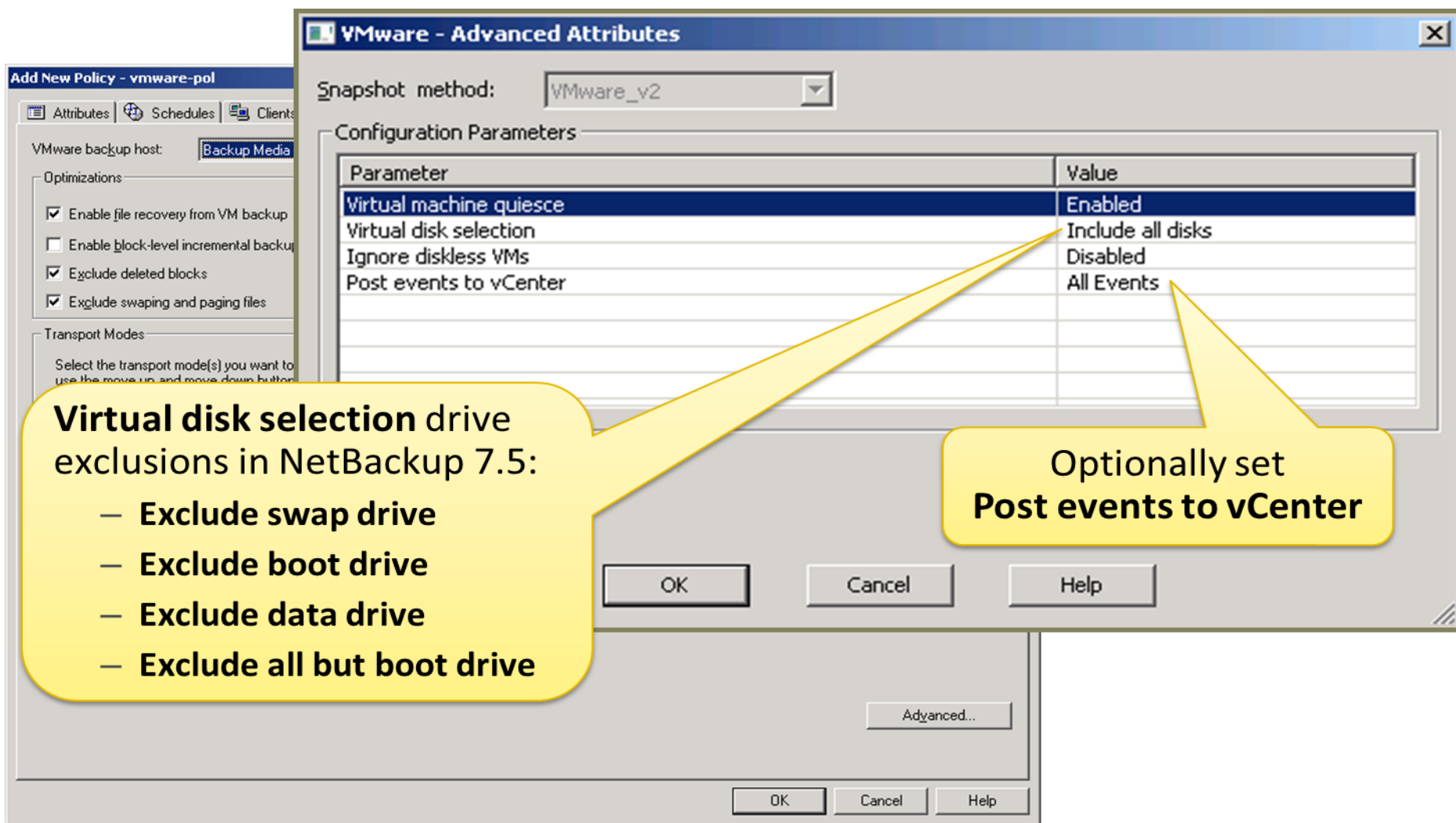
- NetBackup client must be installed to capture application related data. An Application State Capture job runs to get this information.
- Symantec VSS tools must be installed to truncate transaction logs.
- Valid NetBackup for Application Protection licenses must exist for successful backup.
- Block Level Incremental (BLIB) option must be cleared for application backups.

Example Diagram: VMware Transport Modes



- By default, all modes are selected. NetBackup tries each mode in order.
- The transport modes determine how the snapshot data travels from the VMware datastore to the VMware backup host.
- NetBackup uses the first mode that succeeds for all disks in the virtual machine.

Example Diagram: VMware Advanced Attributes



The screenshot shows the 'VMware - Advanced Attributes' dialog box. The 'Snapshot method' is set to 'VMware_v2'. The 'Configuration Parameters' table is as follows:

Parameter	Value
Virtual machine quiesce	Enabled
Virtual disk selection	Include all disks
Ignore diskless VMs	Disabled
Post events to vCenter	All Events

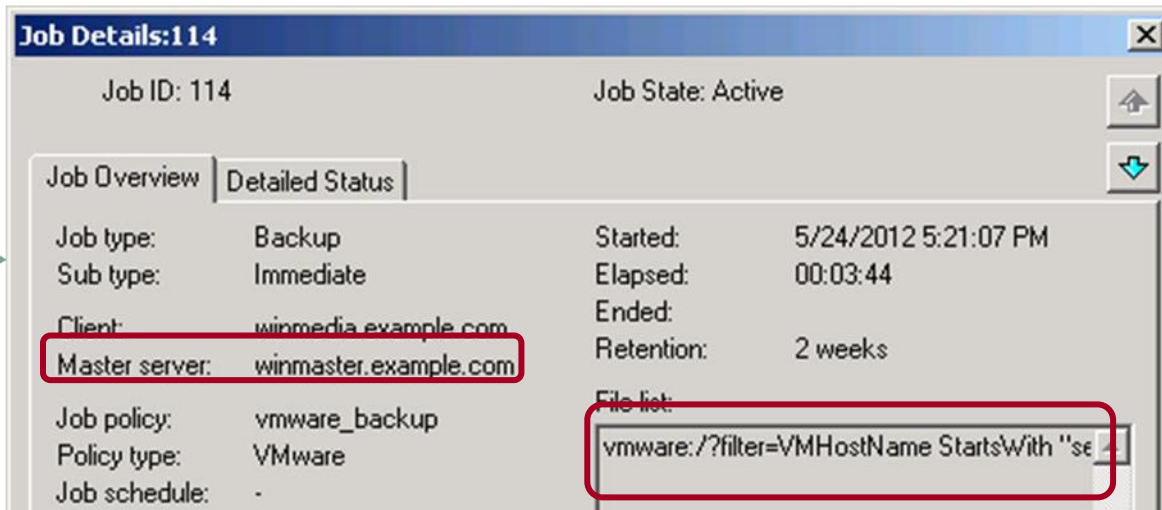
Two callouts provide additional information:

- Virtual disk selection drive exclusions in NetBackup 7.5:**
 - Exclude swap drive
 - Exclude boot drive
 - Exclude data drive
 - Exclude all but boot drive
- Optionally set Post events to vCenter**

Example Diagram: VMware Virtual Machine Backup with Client Discovery

- The first parent job runs with the discovery host as **Client** and resolves virtual machines with the query in the **File list**.
- Each virtual machine has a parent snapshot and child backup job.

Job ID	Parent...	Type	Job S...	State ...	Status	Job Policy	Job S...	Client	Media...	Start ...	Storage Unit
114	114	Backup	Active			vmware_backup	-	winmedia.example.com	winme...	5/24/2...	
115	114	Snapshot	Active			vmware_backup	-	server1.example.com	winme...	5/24/2...	media_bdisk_
116	115	Backup	Active			vmware_backup	full	server1.example.com	winme...	5/24/2...	media_bdisk_




Job Details: 114

Job ID: 114 Job State: Active

Job Overview | Detailed Status

Job type: Backup Started: 5/24/2012 5:21:07 PM
Sub type: Immediate Elapsed: 00:03:44
Client: winmedia.example.com Ended:
Master server: winmaster.example.com Retention: 2 weeks
Job policy: vmware_backup File list:
Policy type: VMware vmware:/?filter=VMHostName StartsWith "se
Job schedule: -

Example Diagram: VMware Restoring a Virtual Machine



Full virtual machine recovery

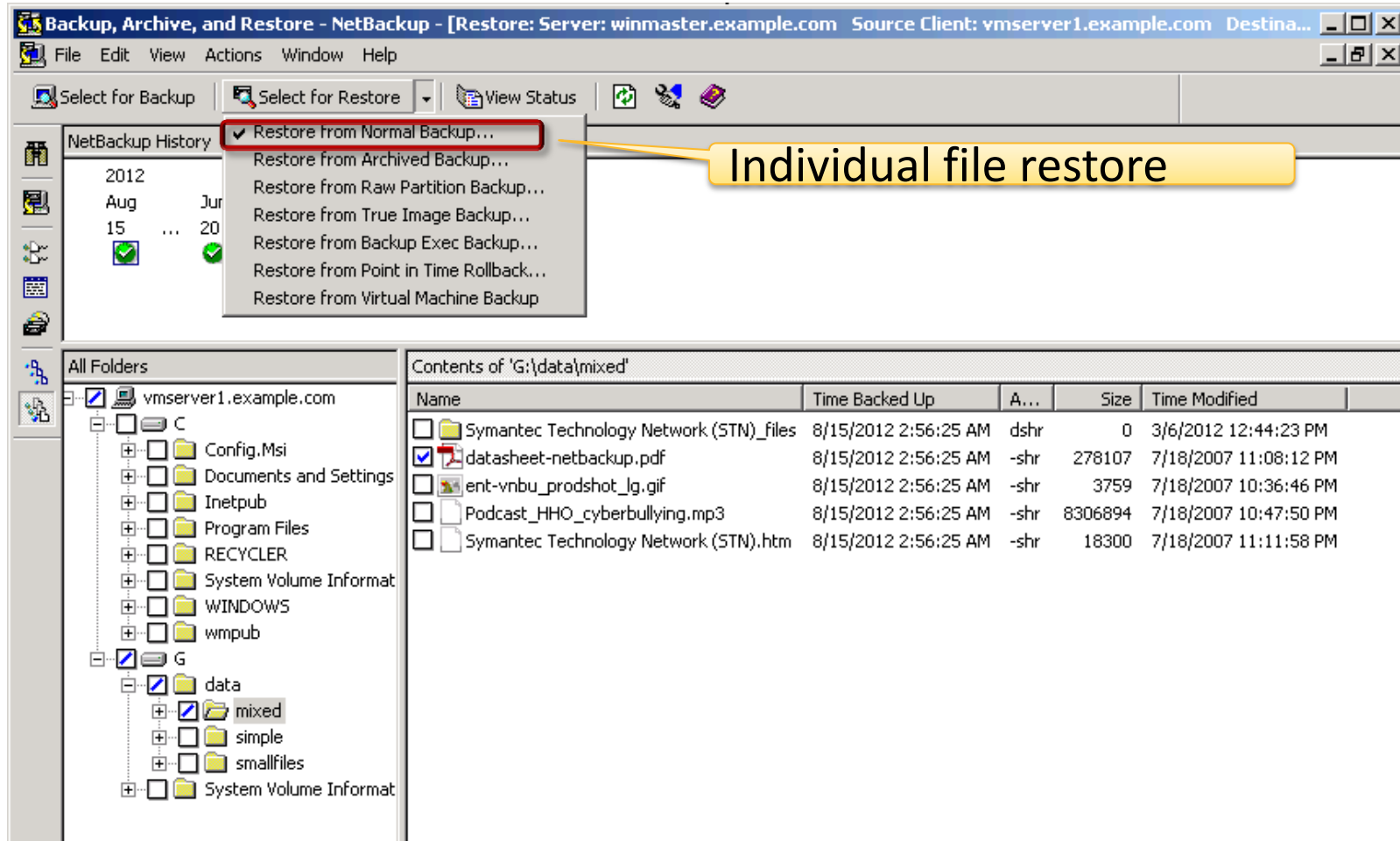
Notes:

- The source must be the VM identifier (host name, display name, or UUID) that was used during the backup.
- The destination client field is ignored, and is selected later in the **Virtual Machine Recovery** wizard.

Name	Time Backed Up	A...	Size	Time Modified
<input type="checkbox"/> Windows Server 2003 Standard.vmdk	8/15/2012 2:56:25 AM	-shr	10485760KB	8/15/2012 2:57:30 AM
<input type="checkbox"/> Windows Server 2003 Standard_1.vmdk	8/15/2012 2:56:25 AM	-shr	16777216	8/15/2012 2:57:30 AM

Example Diagram: VMware Restoring Individual Files

Restoring individual files from a virtual machine backup



The screenshot shows the Symantec NetBackup console window titled "Backup, Archive, and Restore - NetBackup - [Restore: Server: winmaster.example.com Source Client: vmserver1.example.com Destina...". The "Select for Restore" dropdown menu is open, and the "Restore from Normal Backup..." option is selected and highlighted with a red box. A yellow callout box with the text "Individual file restore" points to this option. The main window displays the "Contents of 'G:\data\mixed'" table, which lists several files and folders. The file "datasheet-netbackup.pdf" is selected with a blue checkmark.

Name	Time Backed Up	A...	Size	Time Modified
<input type="checkbox"/> Symantec Technology Network (STN)_files	8/15/2012 2:56:25 AM	dshr	0	3/6/2012 12:44:23 PM
<input checked="" type="checkbox"/> datasheet-netbackup.pdf	8/15/2012 2:56:25 AM	-shr	278107	7/18/2007 11:08:12 PM
<input type="checkbox"/> ent-vnbu_prodshot_lg.gif	8/15/2012 2:56:25 AM	-shr	3759	7/18/2007 10:36:46 PM
<input type="checkbox"/> Podcast_HHO_cyberbullying.mp3	8/15/2012 2:56:25 AM	-shr	8306894	7/18/2007 10:47:50 PM
<input type="checkbox"/> Symantec Technology Network (STN).htm	8/15/2012 2:56:25 AM	-shr	18300	7/18/2007 11:11:58 PM



Life Preservers

Symantec NetBackup Blueprints



- Review Compatibility Lists Before Implementation
- Understand Key Limitations and Workarounds for VMware
- Use the Correct Backup Method for Virtual Machines
 - *Understand agentless vs. agent-based backup*
 - *Apply the right or “best” method for the virtual machines being protected*
- For a more efficient backup, the NetBackup media server and the VMware backup host should be installed on the same host
- Leverage Deduplication for Backup Storage Optimization

- VMware recommends to run between one and three simultaneous backups of virtual machines that reside on the same datastore. Use **Host Properties | Master Server Resource Limits** to control this function.
- Make sure that the VMware backup host has enough hardware resources to handle the number of simultaneous backups that occur.
- Include in a single NetBackup policy those virtual machines that use the same datastore.
- NetBackup supports multiple backup hosts. When a single backup host is saturated with a backup process, another backup host can be added to increase backup throughput.

- VMware backups over SAN

<http://www.symantec.com/connect/articles/netbackup-vmware-backup-over-san>

- Permissions needed to properly backup and restore VMs

[TECH130493](#)

- Reducing the size of VMware backups

[HOWTO44443](#)

- VM performance impact using snapshots

[Snapshot performance](#)

- Understanding Virtual machine snapshots

[Virtual Machine Snapshots](#)

Thank You!

Symantec Backup and Recovery Technical Services