Administrator's Guide

Thinware vBackup 5.0.0

Thinware vBackup – Administrator's Guide
Revision: 5.0.0-1

The latest product updates and most up-to-date documentation can be found on the Thinware website at:
http://www.vbackup.com/

Thinware, Inc.
www.thinware.net

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About This Book

The *Thinware vBackup Administrator's Guide* contains information about installing, configuring and managing a backup solution for virtualization environments running VMware vSphere.

Intended Audience

This book is for anyone who wants to provide backup solutions using Thinware vBackup. The information in this book is for experienced VMware vSphere and Microsoft Windows system administrators who are familiar with virtualization technology, backup operations and best practices.

Product and Documentation Feedback

Thinware welcomes your suggestions for improving our products and documentation. If you have comments, please send your feedback to: feedback@thinware.net

Technical Support Resources

The following technical support resources are available to you. The latest version of this book and release notes for the current version of Thinware vBackup can be found on the Thinware website at: http://www.thinware.net/Products/ThinwarevBackup/vBackupDocumentation/tabid/213/Default.aspx

Online and Telephone Support	To use online support to submit technical support requests, go to: http://www.thinware.net/Support/ContactSupport/tabid/217/Default.aspx
Online Knowledgebase	To view additional documentation such as miscellaneous how-to's, bug advisories and release notes go to: http://www.thinware.net/Support/KnowledgeBase/tabid/220/Default.aspx
Thinware Community Forum	To collaborate with other Thinware vBackup users, create a community discussion or to provide feedback in an open forum go to: http://www.thinware.net/Community/Forums/tabid/70/Default.aspx

Protecting Data with Thinware vBackup 1

Data backup, restoration and disaster recovery are among the most critical functions and processes of computer systems management. Thinware vBackup provides multiple solutions to perform backup and recovery related tasks, each suitable for a specific environment. This short introduction will help you as you get started designing, implementing and managing a solution to protect the data in your environment.

Data Protection Concepts and Definitions

The following concepts are essential to your understanding of backup processes:

1. **Application-consistent Backup:** A backup taken from snapshot after successfully *quiescing* the operating system and applications on the system being backed up.
2. **Crash-consistent Backup:** A backup taken from snapshot without first *quiescing* the operating system and applications on the system being backed up. This is equivalent to removing power from the system. Although all on-disk data is consistent, it may contain information that is only partially written.
3. **Differential Backup:** Backs up only the data that has changed since the last *full backup*.
4. **File-based Backup:** Backs up selected files and folders.
5. **Full Backup:** Backs up all data. A full backup serves as the starting point for *differential* and *incremental backups*.
6. **Host Server:** A server running VMware vSphere Hypervisor (or VMware ESXi) that provides computing resources to support one or more guest virtual machines.
7. **Host Server Accessible Backup Repository:** A storage location for backup data accessible to the host server. With VMware vSphere this can be a VMFS datastore located on locally attached hard disks or on a shared Fiber Channel or iSCSI SAN storage system or an NFS volume on a NAS storage system.
8. **Image-based Backup:** Backs up the operating system and all associated files including the system state, all application data and configurations and all user data.
9. **Inconsistent Backup:** A backup NOT taken from snapshot. Depending on the amount of time it takes to process, this type of backup often includes data saved at different times.
10. **Incremental Backup:** Backs up only the data that has changed since the last backup (whether full or incremental).
11. **Local Accessible Backup Repository:** A storage location for backup data accessible to the backup server.
12. **Management Server:** A server running VMware vCenter Server that provides a centralized interface and processes for managing one or more *host servers*.

13. **Quiescing:** A process of flushing all outstanding write operations to bring running application data and on-disk data to a consistent state.
14. **Replication:** Much like creating an image-based backup, replication is the process of duplicating a system and creating a live or stand-by replica of the system being duplicated.

Best Practices for Data Protection

The following best practices are not an exhaustive list, but will help you in your planning and in being prepared should a disaster occur:

1. Understand your backup storage requirements. For example, if you are backing up a virtual machine with a 100 GB virtual hard disk that has 20% free space and you want to retain two backups, you will need at least 160 GB dedicated to this virtual machine on your backup target, plus 80 GB free to run the backup process each time (when new backups are set to be created before expired backups are removed).
2. Monitor notifications and logs regularly. You should routinely review job completion notifications to verify backup jobs are completing successfully. You should also know when to expect notifications. For example, if you have a backup job that runs each night and one day you don't receive the regular notification, this may indicate a problem with scheduling or some other type of failure on the backup server that will need to be looked into.
3. Have a well documented recovery plan and test recovering from backup regularly. Backed up data is of no use if it can't be restored. You should routinely test recovering from backup. This not only helps you to verify that a recovery will be successful, it also familiarizes you with the process and helps you to know the amount of time a recovery will take.
4. Use multiple external or hot-swappable backup drives and rotate them on a regular basis. Establish a backup storage plan that includes the regular rotation of backup drives. Doing so will improve your disaster preparedness in the event that a failure occurs with one of your backup drives.
5. Rotate backup drives between onsite and offsite storage locations, or, if possible, automate replication of backup data to an offsite location. To help protect backups in case of disaster, you should store at least one set of full backups at a secure offsite location. Doing so will improve your disaster preparedness in the event that physical damage occurs to onsite hardware.
6. Secure and limit access to backup servers and backup data. Consider taking steps to prevent unauthorized access to sensitive data as well as steps to prevent manipulation of backup data by a malicious third-party.

How Thinware vBackup Can Help

Thinware vBackup addresses many of the issues and pain-points encountered with traditional backup approaches. Thinware vBackup can help you:

1. Eliminate the need for backup windows by moving to a snapshot-based backup approach.
2. Simplify backup administration by removing the need to install backup agents in systems you need to protect.

3. Reduce the load on your VMware ESXi host servers by moving backup operations to a dedicated backup server.
4. Backup virtual machines regardless of their power state.
5. Reduce the time required to restore a failed system. With imaged-based backups there is no need to perform the time consuming tasks involved with reinstalling and patching the operating system and then reinstalling and patching applications before recovering backup data.

Understanding Thinware vBackup 2

Thinware vBackup creates backups of virtual machines without interruption to system availability, data access or the services they provide. Thinware vBackup manages backups, removing them automatically once expired. Thinware vBackup also supports compression and thin-provisioning to reduce space requirements of storage systems housing backups and replicas.

Thinware vBackup Overview

Thinware vBackup supports integration with VMware vSphere APIs for Data Protection (VADP) to backup virtual machines running on VMware vSphere. Thinware vBackup eliminates the need for having a backup agent installed in each virtual machine you want to protect. Thinware vBackup also works with VMware vCenter Server to enable backup of virtual machines even when they are moved between host servers using VMware vMotion or VMware Distributed Resource Scheduler (DRS).

Virtual machine backups created by Thinware vBackup are stored in native VMware format and are supported by standard VMware products and utilities such as VMware vCenter Converter Standalone, VMware Workstation, VMware Player, VMware Virtual Disk Manager and VMware Disk Mount to perform restoration and recovery functions.

Thinware vBackup can be installed on a physical machine or a virtual machine and serves as a centralized backup server to facilitate and manage automated backup operations. A single Thinware vBackup server can be used to protect an unlimited number of virtual machines running in multiple VMware environments.

Virtual machine backups can be stored on any storage system accessible to the VMware ESXi host server the virtual machine is running on or any storage system accessible to the Thinware vBackup server. Backups can be stored with or without compression and there are two levels of compression available.

To ensure application consistency in backups, Thinware vBackup supports quiescing a virtual machine's guest operating system by means of VMware Tools and, in the case of virtual machines running Microsoft Windows, Microsoft Windows Volume Shadow Copy Service (VSS). This means that applications will write to disk any data currently in memory prior to backup job processing so that a later restore will bring the application back to a consistent state.

Software Licensing

Licensing for Thinware vBackup is per VMware ESXi host server. One license entitlement is required for each host server virtual machines will be backed up from.

License entitlements for Thinware vBackup come in three editions:

1. **Standard Edition:** Includes all of the basic features required to schedule and automate backup of VMware vSphere virtual machines to local accessible storage
2. **Advanced Edition:** Adds advanced features such as: e-mail notification, compression, multiple backup jobs per virtual machine, support for backing up to host server accessible storage and the ability to exclude one or more of a virtual machine's disks from backup
3. **Professional Edition**: Full featured with advanced compression and the ability to integrate with VMware VADP and VMware vCenter Server

It is possible to configure licensing in Thinware vBackup to support any number, and any mixture, of the above license editions. For example, you could have 2 host servers licensed as Advanced Edition and 3 host servers licensed with Professional Edition all protected using the same Thinware vBackup server.

Backing Up Virtual Machines

During the backup process Thinware vBackup creates a snapshot of the virtual machine. This snapshot can be quiescent (application consistent) or non-quiescent (crash consistent) depending upon your needs and the configuration of your environment. Data is backed up from the snapshot, not the running virtual machine. This is done to ensure that backup data is consistent and that backup operations do not interfere with live data or services provided by the virtual machine.

Backup Process Workflow

The following steps describe the backup process workflow used by Thinware vBackup:

1. Contact management server to determine host server the virtual machine is currently assigned to (note: this step is skipped if VMware vCenter Server is not used)
2. Command host server to create temporary snapshot of virtual machine
3. Use host server to access virtual disks contained in snapshot and virtual machine configuration information
4. Copy virtual disk data and configuration information to backup target on Thinware vBackup server
5. Command host server to remove temporary snapshot of virtual machine (created in step 2)
6. Remove expired backup(s)
7. Send notification e-mail (note: this step is skipped if e-mail notification is not configured)
8. Add backup to inventory in Thinware vBackup and record process results in task entry

Available Command Protocols

The following command protocols are available and can be configured individually for each host server based on the requirements and configuration of your environment:

1. **SSH:** Utilizes SSH to communicate backup operation commands (works with "free" and "paid" editions of VMware vSphere Hypervisor)

   Note: The use of this command protocol requires SSH service to be running on the host server

2. **VADP:** Utilizes VMware VADP to communicate backup operation commands (only works with “paid” editions of VMware vSphere Hypervisor)

Available Data Transfer Protocols

The following data transfer protocols are available and can be configured individually for each host server based on the requirements and configuration of your environment:

1. **HTTPS-NFC:** Utilizes HTTPS and VMware Network File Copy (NFC) to transfer backup data

   Note 1: The use of this data transfer protocol requires VMware Virtual Disk Development Kit to be installed on the Thinware vBackup server, see “Installing VMware Virtual Disk Development Kit” on page 14 and “Configuring Thinware vBackup Settings” on page 15 for more information
   Note 2: This data transfer protocol is not supported with VMware ESXi 6.5 or VMware ESXi 6.7

2. **SCP:** Utilizes Secure Copy (SCP) to transfer backup data

   Note: The use of this data transfer protocol requires SSH service to be running on the host server

3. **SCP+C:** Utilizes Secure Copy (SCP) with compression to transfer backup data

   Note: The use of this data transfer protocol requires SSH service to be running on the host server

Installing and Configuring Thinware vBackup 3

Follow these steps to install and configure Thinware vBackup in your environment:

1. Verify minimum software and hardware requirements
2. Setup Thinware vBackup server and install required integration utilities
3. Install Thinware vBackup and configure settings
4. Add management and host servers and virtual machines to inventory
5. Create, configure and schedule backup jobs

Verifying System Requirements

Certain software and hardware requirements must be met and should be verified as early in the setup process as possible. The following requirements are specific to Thinware vBackup and may be in addition to requirements specific to Microsoft Windows operating system or the VMware integration utilities which will be installed on the Thinware vBackup server:

VMware Environment

One or more VMware ESXi host server(s) and (optional) VMware Virtual Center/VMware vCenter Server management server(s)

Supported versions:

- VMware ESXi – 3.5 and later
- VMware Virtual Center – 2.5
- VMware vCenter Server – 4.0 and later

Thinware vBackup Server

Hardware (physical or virtual):

- Minimum 2 GB RAM, 4 GB recommended
- Minimum dual-core processor, quad-core recommended
- Network adapter (NIC)
- If using local accessible backup repositories: Internal, external or hot-swappable hard drive for backup storage, multiple external or hot-swappable drives recommended

Software:

- Microsoft Windows Operating System

  Supported versions:

- Microsoft Windows 7 Professional, Enterprise or Ultimate
- Microsoft Windows 8/8.1 Professional or Enterprise
- Microsoft Windows 10 Professional or Enterprise
- Microsoft Windows Server 2008/2008 R2 Standard, Enterprise or Datacenter
- Microsoft Windows Server 2012/2012 R2 Essentials, Standard or Datacenter
- Microsoft Windows Server 2016 Essentials, Standard or Datacenter

Note 1: Only 64-bit versions of the above operating systems are supported.
Note 2: Microsoft Windows Server Core is not supported for running Thinware vBackup.

- Integration Utilities
  - VMware Virtual Disk Development Kit (VDDK)

    Supported versions:
    - 5.1.4 – build 2248791
    - 5.5.4 – build 2454786

    Note 1: There are many versions of VMware VDDK available for download on VMware's website and VMware's versioning numbers for VMware VDDK can make choosing the proper version a little confusing. Because of this it is important to note that the version of VMware VDDK you need to download and install is determined by the utility using it, NOT the version of VMware vSphere you are running.
    Note 2: VMware VDDK 5.5.x is only available in ZIP format (vs. Windows installer as with previous versions) and, by itself, requires manual Windows registry configuration to work properly. VMware VDDK 5.5.x also does not include the VMware Disk Mount utility. To work around these issues, it is recommended that you install both VMware VDDK 5.1.4 and VMware VDDK 5.5.4. See "Configuring Thinware vBackup Settings" on page 15 for more information on how to configure Thinware vBackup to use two different versions of VMware VDDK.

Setting Up a Thinware vBackup Server

The following sections describe how to install the required integration utilities and Thinware vBackup on the Thinware vBackup server:

Installing Required Integration Utilities

Depending on the data transfer protocols, backup repository types, backup disk formats or compression levels to be used, certain integration utilities are required to be installed on the Thinware vBackup server. The following sections describe the different integration utilities supported by Thinware vBackup and how to install them:

Installing VMware Virtual Disk Development Kit

If you will be using HTTPS-NFC data transfer protocol, local accessible backup repositories with hosted disk format split-disk format or compression, or to enable to recovery of individual files and folders from backups, download and install VMware Virtual Disk Development Kit (VDDK).

1. Download VMware VDDK 5.1.4 from VMware at: https://my.vmware.com/web/vmware/details?downloadGroup=VSP510-VDDK-514&productId=285
2. Complete installation of VMware VDDK 5.1.4 accepting all defaults
3. Download VMware VDDK 5.5.4 from VMware at: https://my.vmware.com/web/vmware/details?downloadGroup=VDDK554&productId=353
4. Unzip VMware-vix-disklib-5.5.4-2454786.x86_64.zip (downloaded in step 3) to C:\Temp\VMware-vix-disklib-5.5.4-2454786.x86_64 and copy unzipped folder to: C:\Program Files\VMware

Installing Thinware vBackup

Download and install Thinware vBackup.

1. Download Thinware vBackup from Thinware at: http://www.thinware.net/Products/ThinwarevBackup/vBackupEULAAcceptance/tabid/214/Default.aspx
2. Complete installation of Thinware vBackup accepting all defaults

Upgrading Thinware vBackup from a Previous Version

Complete the following steps to upgrade Thinware vBackup from a previous version:

1. VERY IMPORTANT – Backup the Thinware vBackup database BEFORE uninstalling current version
   Open Thinware vBackup Client (Windows Start menu > All Programs > Thinware vBackup > Thinware vBackup Client) and from the Tools menu choose "Backup Database…". Save database backup to a directory other than the Thinware vBackup application directory (such as C:\Temp)
2. Uninstall current installed version of Thinware vBackup
3. Download new version of Thinware vBackup from Thinware at: http://www.thinware.net/Products/ThinwarevBackup/vBackupEULAAcceptance/tabid/214/Default.aspx
4. Complete installation of new version of Thinware vBackup accepting all defaults
5. Open Thinware vBackup Client and import the database backed up in step 1 (from the Tools menu, choose "Import Database…")

Obtaining and Installing Your Software License for Thinware vBackup

A valid software license is required to use Thinware vBackup. Please review this section for instructions on how to obtain and install your software license for Thinware vBackup.

1. If you have not already done so, download and install Thinware vBackup, see "Installing Thinware vBackup" on page 14 for instructions.

2. Open Thinware vBackup Client (Windows Start menu > All Programs > Thinware vBackup > Thinware vBackup Client) and from the Tools menu choose “Configure Licensing”.
3. Click the Copy button next to the Hardware ID field. The hardware ID is needed when entering requests or orders for licensing on our website.
4. Depending your licensing needs, request or order your license from Thinware at:
    - **30-Day Trial License Requests:** http://www.thinware.net/Products/ThinwarevBackup/Try/tabid/231/Default.aspx
    - **Standard Edition License Requests:** http://www.thinware.net/Products/ThinwarevBackup/StandardEditionLicenseRequest/tabid/234/Default.aspx
    - **Advanced and Professional Edition Orders:** http://www.thinware.net/Products/ThinwarevBackup/tabid/202/www.thinware.net/Products/ThinwarevBackup/Buy/tabid/235/Default.aspx
5. Once your license request or order has been processed you will receive an e-mail with your license file attached. The license e-mail will come from sales@thinware.net and the license file attachment will be in ZIP format.
6. Follow the instructions included in the license e-mail to install your license.

Note 1: Licenses for Thinware vBackup are assigned to a specific computer and activated based on a hardware fingerprint. Certain hardware changes can cause the hardware fingerprint to change and thus invalidating your license. If this happens simply submit a license reactivation request to sales@thinware.net and include your license key and the new hardware ID displayed on the “Configure Licensing” screen in Thinware vBackup Client (see step 2 above).
Note 2: If the Thinware vBackup server is a member of an Active Directory domain all interactive and non-interactive user sessions must use a domain user account when using Thinware vBackup to execute backup jobs. Failure to login using a domain user account may cause backup jobs to fail due to licensing errors.
Note 3: Restore processes do not require license validation. If your license becomes invalidated for any reason you can still perform restore operations as needed (even though licensing errors are displayed when opening Thinware vBackup Client).

Configuring Thinware vBackup Settings

In certain cases integration utilities settings will need to be configured before Thinware vBackup can successfully execute jobs. Logging, e-mail notification settings and client preferences are optional. To view or edit settings, open Thinware vBackup Client (Windows Start menu > All Programs > Thinware vBackup > Thinware vBackup Client) and from the Tools menu choose “Settings…”.

Integration Utilities

1. **VMware Virtual Disk Development Kit:** If used, path to directory or directories VMware Virtual Disk Development Kit (VDDK) utilities are installed

- **VMware Virtual Disk Manager Application Directory:** Path to directory VMware Virtual Disk Manager is installed (if instructions for "Installing VMware Virtual Disk Development Kit" on page 14 were used set this field to: C:\Program Files\VMware\VMware-vix-disklib-5.5.4-2454786.x86_64\bin)
- **Disable VMware Virtual Disk Manager Logging:** Disable this setting if you need VMware Virtual Disk Manager to log all tasks and results during backup and restore operations, the log for VMware Virtual Disk Manager can grow quite rapidly, it is recommended to only disable this setting when troubleshooting issues
- **Use same application directory setting for VMware Disk Mount:** Enable this setting if you will be using the same version of VMware Virtual Disk Development Kit for both VMware Virtual Disk Manager and VMware Disk Mount utilities
- **VMware Disk Mount Application Directory:** Path to directory VMware Disk Mount is installed (if instructions for "Installing VMware Virtual Disk Development Kit" on page 14 were used set this field to: C:\Program Files (x86)\VMware\VMware Virtual Disk Development Kit)

Logging

1. **Enable Windows Event Logging:** Controls whether Windows Event Log will be used to log backup processes (default value: enabled—checked)
2. **Enable Task Logging:** Controls whether task history in Thinware vBackup will be used to log backup processes (default value: enabled—checked)
3. **Keep last (number) tasks in history:** Number of task entries to maintain (default value: 10,000)
4. **Disable support data logging:** Controls whether support data will be saved with task entries (default value: enabled—unchecked)

E-mail Notification

1. **Send e-mail notifications:** Controls whether e-mail notifications will be sent when a backup job completes based on the selected criteria:
    - **When a job fails:** When checked an e-mail notification will be sent when a job fails
    - **When a job completes with error(s):** When checked an e-mail notification will be sent when a job completes with one or more errors
    - **When a job completes successfully:** When checked an e-mail notification will be sent when a job completes successfully
2. **From Address:** E-mail address used for Thinware vBackup e-mail notifications
3. **Notification Recipients:** One or more e-mail addresses to send Thinware vBackup e-mail notifications to

SMTP Server

1. **Hostname/IP:** Hostname or IP address of SMTP server
2. **Port:** Port used for SMTP mail service (if other than 25)
3. **Connection Type:** Sets the type of connection to be used when connecting to the SMTP server (choices: Non-encrypted or Encrypted: Explicit SSL)

4. **Username and Password:** If required, credentials for user account with privileges to send mail on SMTP server

Client Preferences

1. **Expand all datacenters and servers at startup:** If checked, all datacenters, management servers and host servers in inventory tree will be expanded when Thinware vBackup Client is opened. Default value is enabled (unchecked).
2. **Show elapsed time in long format:** If checked all elapsed time values will be displayed in long date format (example long format: 32 minutes and 47 seconds, standard format: 00:32:47). Default value is diabled (unchecked).
3. **Auto Refresh Interval:** Interval (in seconds) for automatic database refreshes. This allows changes to job status and backup inventory and task entries to automatically be displayed. Default value is 180 seconds (3 minutes). Set value to 0 (zero) to disable auto refresh.
4. **Tasks to Display in History:** Number of entries to display in task history. Default value is 50.
5. **Recent Tasks Timeout:** Time (in seconds) to display completed task entries in recent tasks pane. Default value is 900 seconds (15 minutes). Set value to 0 (zero) to disable recent tasks pane.

Adding Management and Host Servers and Virtual Machines to Inventory

See "Managing Inventory of Protected Systems" on page 18

Creating, Configuring and Scheduling Backup Jobs

See "Managing Backup Jobs" on page 20 and "Scheduling Backup Jobs Using Windows Task Scheduler" on page 21

Using Thinware vBackup 4

Thinware vBackup Client provides an interface for managing protected systems, backup jobs and the backups created by Thinware vBackup. The following sections provide an overview of how to use Thinware vBackup Client to perform these tasks.

Managing Inventory of Protected Systems

One of the first steps you will need to complete when setting up Thinware vBackup is adding management and host servers and virtual machines to inventory. Complete the following steps to add new systems or change or remove existing systems:

To add a new VMware vCenter Server management server:

1. In Thinware vBackup Client, from the Inventory menu, choose "Add Management Server…"
2. On the Add Management Server wizard, enter the hostname or IP address of the management server, port used for web services connections (if other than 443), credentials for the user account used to connect and check "Validate connectivity" to validate connectivity and to enable discovery of attached host servers and virtual machines. If "Validate connectivity" is not checked, discovery of host servers and virtual machines will be disabled. Depending on system resources, validating connectivity and discovering attached host servers and virtual machines can take up to a minute or longer. Click Next
3. Review the management server summary and click Next
4. Select discovered host servers to be added. For each host server selected you will be prompted to provide required settings for the host server. Click Next
5. Select discovered virtual machines to be added and click Next
6. Review the wizard summary and click Finish to add the management server

To edit properties of an existing management server:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the management server in the inventory tree on the left
3. On the management server's Summary tab, under the Commands section, click "Edit Properties"
4. On the Edit Management Server wizard, follow the steps as on the Add Management Server wizard
5. Review the wizard summary and click Finish to save your changes

To remove a management server:

1. In Thinware vBackup Client, from the View menu, choose Inventory

2. Select the management server in the inventory tree on the left
3. On the management server's Summary tab, under the Commands section, click Remove

To add a new VMware ESXi host server:

1. In Thinware vBackup Client, from the Inventory menu, choose "Add Host Server…"
2. On the Add Host Server wizard, enter the hostname or IP address of the host server, port used for web services connections (if other than 443), select management server (if applicable), credentials for the user account used to connect and check "Validate connectivity" to validate connectivity and to enable discovery of attached virtual machines. If "Validate connectivity" is not checked, discovery of host servers and virtual machines will be disabled. Depending on system resources, validating connectivity and discovering attached host servers and virtual machines can take up to a minute or longer. Click Next
3. Review the host server summary and click Next
4. Select discovered virtual machines to be added and click Next
5. Select command protocol and data transfer protocol to be used, enter ports used for SSH and/or NFC (if other than 22 and 902 respectively) and click Next
6. Select the appropriate license to assign to the host server and click Next
7. Review the wizard summary and click Finish to add the host server

To edit properties of an existing host server:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the host server in the inventory tree on the left
3. On the host server's Summary tab, under the Commands section, click "Edit Properties"
4. On the Edit Host Server wizard, follow the steps as on the Add Host Server wizard
5. Review the wizard summary and click Finish to save your changes

To remove a host server:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the host server in the inventory tree on the left
3. On the host server's Summary tab, under the Commands section, click Remove

To add a new virtual machine:

1. In Thinware vBackup Client, from the Inventory menu, choose "Add Virtual Machine…"
2. On the Add Virtual Machine wizard, enter the name of the virtual machine, select the management or host server the virtual machine is attached to and click Next
3. Review the virtual machine summary and click Next
4. Review the wizard summary and click Finish to add the virtual machine

Tip: New virtual machines can also be automatically discovered and added using the Edit Management Server and Edit Host Server wizards.

To edit properties of an existing virtual machine:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Commands section, click "Edit Properties"
4. On the Edit Virtual Machine wizard, follow the steps as on the Add Virtual Machine wizard
5. Review the wizard summary and click Finish to save your changes

To remove a virtual machine:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Commands section, click Remove

Managing Backup Jobs

Backup jobs are used to define the settings used when creating virtual machine backups. Complete the following steps to add new virtual machine backup jobs or change or remove existing virtual machine backup jobs:

To add a new backup job:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job will be added for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Commands section, click "Add Job"
4. On the Add Job wizard, enter a name for the job, provide appropriate settings for the job, clicking Next to continue after each section of settings
5. Review the wizard summary and click Finish to add the Job

Tip: You can copy and paste backup jobs between virtual machines or within the jobs list of a single virtual machine. This helps if you need the same or similar backup job configuration for multiple virtual machines, or if you need to configure a similar backup job for a single virtual machine. To copy a backup job's configuration to the clipboard, right-click the backup job and click Copy. You can then paste the backup job configuration to the same virtual machine or to any other virtual machine.

To edit an existing backup job:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be edited and choose "Edit Properties…"
4. On the Edit Job wizard, follow the steps as on the Add Job wizard
5. Review the wizard summary and click Finish to save your changes

To execute a backup job ad hoc:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be edited and choose "Execute Now"

To execute a backup job in test mode:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
6. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be edited and choose "Execute Now (test mode)"

Note: Executing a backup job in test mode simply verifies all virtual machine and backup job settings and tests connectivity to the management and/or host server the virtual machine is currently assigned to—no backup data will be created. This can be helpful when needing to verify settings for new jobs or when troubleshooting errors with existing jobs.

To remove a virtual machine backup job:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be removed and choose "Remove"

Scheduling Backup Jobs Using Windows Task Scheduler

Complete the following steps to schedule backup and replication jobs using Windows Task Scheduler:

Create Windows Scheduled Task(s) for executing vBackup jobs:

1. Open Task Scheduler (Windows Start menu > All Programs > Accessories > System Tools > Task Scheduler)
2. In Task Scheduler, under Task Scheduler (Local), expand Task Scheduler Library folder, expand Thinware folder and click vBackup folder
3. From the Action menu choose "Create Task…"
4. On the Create Task form, complete the General tab as described below:
    - Enter a unique name for the task (e.g. vBackup-[Machine Name]-[Job Name])
    - Set task to run under a user account with appropriate permissions
    - Set task to Run whether the user is logged in or not
    - Set task to Run with highest privileges
5. On the Triggers tab, add an On a schedule-based trigger per your requirements
6. On the Actions tab, add a Start a program-based action as described below:
    - Set Program/script to path of Thinware vBackup executable (e.g. "C:\Program Files (x86)\Thinware\vBackup\vBackup.exe")

- Add arguments based on the following:

  To execute the default job for a virtual machine:

  -v [virtual machine name] (e.g. -v vm01)

  To execute a specific job for a virtual machine:

  -v [virtual machine name] -j [job name] (e.g. -v vm01 -j job01)

7. Repeat step 2-6 as required to add additional jobs to be executed by this task
8. Click OK to close the Create Task form
9. Enter the password for the user account the task will be ran under and click OK

Note 1: The task will fail if you do not provide the job name argument (e.g. -j [job name]) when no default job is set for the virtual machine.
Note 2: All arguments containing spaces must be enclosed in quotes. For example if your virtual machine is named "domain controller 1" (and you wish to execute the default job) the arguments should be entered as -v "domain controller 1". It is same for job name arguments. For example if your virtual machine is named "domain controller 1" and you wish to execute a job named "job 1" the arguments should be entered as -v "domain controller 1" -j "job 1".
Note 3: Mapped drives (to a network share) in Windows do not persist to user sessions used to execute scheduled tasks. If you are using a mapped drive as your Backup Root you will need to map the drive in an action preceding the action that executes the Thinware vBackup job. An easy way to do this is using the Windows "net use" command (e.g. net use X: \\servername\sharename\foldername).
Note 4: If the Thinware vBackup server is a member of an Active Directory domain all non-interactive user sessions (such as user sessions created by scheduled tasks) must use a domain user account when using Thinware vBackup to execute backup jobs. Failure to set scheduled tasks to run under a domain user account may cause backup jobs to fail due to licensing errors.

Test task to verify proper configuration:

1. In Task Scheduler, select the task created above
2. From the Action menu, choose Run

   Note: Since scheduled tasks run in non-interactive user sessions all processes will run in the background and the Thinware vBackup console will not be displayed (as when executing a backup job from Thinware vBackup Client)

3. Complete one or more of the following processes to verify successful completion

   1. Open VMware vSphere Client and review the task history for the host server
      Note: There will be a "Create virtual machine snapshot" and a "Remove snapshot" task for the virtual machine each time a Thinware vBackup job is executed
   2. Review the task history in Thinware vBackup for the virtual machine and backup job that was executed
      1. In Thinware vBackup Client, from the View menu, choose Inventory

2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job and choose "View Task History"

3. Verify virtual machine backup exists
    1. In Thinware vBackup Client, from the View menu, choose Inventory
    2. Select the virtual machine the backup is for in the inventory tree on the left
    3. On the virtual machine's Backups tab, verify the backup exists (for backups on local accessible backup repositories you can also verify that the status reads OK and you can right-click the backup and choose Open)

Managing Virtual Machine Backups Created by Thinware vBackup

Virtual machine backups created by Thinware vBackup can be managed in Thinware vBackup Client. Complete the following steps to manage virtual machine backups:

To set a virtual machine backup as unmanaged:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and choose "Set as Unmanaged"

To move a virtual machine backup:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and choose "Move…"
4. Select location for the backup to be moved to and click OK

To permanently delete a virtual machine backup:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and choose "Delete from Disk"

Troubleshooting Backup Job Failures

E-mail notifications, task entries and console messages are all available to assist you in troubleshooting backup job failures.

When reviewing e-mail notifications and task entries, you should look for minor errors (preceded by the word "Error") or critical errors (preceded by the word "CRITICAL"). Minor errors will typically not cause a backup job to fail, but should be looked into as they may indicate other issues. Critical errors will always cause a backup job to fail.

To view the task history for a backup job:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job and choose "View Task History"

Tip: Most backup job errors happen while the virtual machine's disk files are being backed up. To assist with troubleshooting Thinware vBackup captures the response returned by the VMware utility/API being used. If the backup job fails due to an error encountered while backing up a virtual machine's disk files you can find the error detail in the task entry. The error message will be preceded with "Unable to verify backup of Hard disk X" (where X equals the hard disk number). For common errors you may also see a corresponding "tip" on how to resolve the issue or how to perceive the error (if it is merely a warning).

To execute a backup job in interactive mode (where the console output is displayed):

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be edited and choose "Execute Now"

To execute a backup job in test mode:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the job is for in the inventory tree on the left
3. On the virtual machine's Summary tab, under the Jobs section, right-click the job to be edited and choose "Execute Now (test mode)"

Note: Executing a backup job in test mode simply verifies all virtual machine and backup job settings and tests connectivity to the management and/or host server the virtual machine is currently assigned to—no backup data will be created. This can be helpful when needing to verify settings for new jobs or when troubleshooting errors with existing jobs.

Data Restoration and Disaster Recovery 5

Hopefully it will never happen, but when it comes time to restore a virtual machine from backup, or to recover individual files and folders contained in a virtual machine backup, you will need to be prepared. The following sections describe the processes and tools that can be used to restore full virtual machines, or to recover individual files and folders, from virtual machine backups created by Thinware vBackup.

Restoring Virtual Machine from Backup Located on Host Server Accessible Backup Repository

Instantly Restoring Virtual Machine from Backup Using VMware vSphere Client or VMware Host Client

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be instantly restored using VMware vSphere Client or VMware Host Client. Complete the following steps to instantly restore a virtual machine from backup using VMware vSphere Client or VMware Host Client:

1. Open VMware vSphere Client (desktop) or VMware Host Client (web) and login to the host server
2. Use the datastore browser to locate the backup you wish to restore
3. Right-click the virtual machine's configuration (VMX) file in the backup directory and click "Register VM" (note: in the desktop version of VMware vSphere Client this menu item reads "Add to Inventory")
4. Locate the virtual machine in inventory and power-on, the virtual machine will now be running from backup storage
5. In Thinware vBackup Client, from the View menu, choose Inventory
6. Select the virtual machine the backup is for in the inventory tree on the left
7. On the virtual machine's Backups tab, right-click the backup and click "Remove from Inventory"

Note 1: To be compatible with instantly restoring using VMware vSphere Client the virtual machine backup's virtual disk file(s) must be saved in managed disk format.
Note 2: Virtual machine backups registered and powered-on for instant restore can be later powered-off and restored to production storage (see "Restoring Virtual Machine from Backup Using VMware vSphere Client" on page 26 or "Restoring Virtual Machine from Backup Using VMware ESXi Shell" on page 26 for instructions).

Restoring Virtual Machine from Backup Using VMware vSphere Client or VMware Host Client

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be restored using VMware vSphere Client or VMware Host Client. Complete the following steps to restore a virtual machine from backup using VMware vSphere Client or VMware Host Client:

1. Open VMware vSphere Client (desktop) or VMware Host Client (web) and login to the host server
2. Use the datastore browser to locate the backup you wish to restore
3. Right-click the backup directory and click Move, select new location for virtual machine data folder on production storage
4. Once the backup directory is moved to production storage, right-click the virtual machine's configuration (VMX) file (located in the new data folder location) and click "Register VM" (note: in the desktop version of VMware vSphere Client this menu item reads "Add to Inventory")
5. Locate the VM in inventory and power-on, the virtual machine will now be running from production storage
6. In Thinware vBackup Client, from the View menu, choose Inventory
7. Select the virtual machine the backup is for in the inventory tree on the left
8. On the virtual machine's Backups tab, right-click the backup and click "Remove from Inventory"

Note 1: To be compatible with restoring using VMware vSphere Client the virtual machine backup's virtual disk file(s) must be saved in managed disk format.
Note 2: If the virtual machine backup was previously instantly restored, and is now running or registered from backup storage, it must first be powered-off and removed inventory before completing these steps.

Restoring Virtual Machine from Backup Using VMware ESXi Shell

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be restored using VMware ESXi Shell. Restoring virtual machines from backup using VMware ESXi Shell provides more options than using VMware vSphere Client or VMware Host Client, but may be more complicated for users without more advanced knowledge of VMware ESXi. Complete the following steps to restore a virtual machine from backup using VMware ESXi Shell:

1. Access VMware ESXi Shell (local or remote) and login to the host server
2. Create directory for virtual machine data folder on production storage using **`mkdir`** command
   Syntax: `mkdir %directory-path%`
   Example: `mkdir /vmfs/volumes/datastore1/vm01`
3. Obtain list of virtual machine backup's files using **`ls`** command, the list of file names will be used in steps 4, 5 and 6
   Syntax: `ls %directory-path%`
   Example: `ls /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001`

Note 1: Make a note of the .vmx, .nvram and .vmdk file names

Note 2: Ignore VMDK files ending with "-flat.vmdk" or "-s###.vmdk", these files will not be used

Note 3: If the virtual machine backup was created before the virtual machine was powered-on for the first time a non-volatile RAM (NVRAM) file may not exist in the backup directory

4. Copy virtual machine backup's configuration (VMX) file to directory to directory created in step 2 using **cp** command

   Syntax: `cp %source-vmx-path% %destination-vmx-path%`

   Example: `cp /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.vmx /vmfs/volumes/datastore1/vm01/vm01.vmx`

5. Copy virtual machine backup's non-volatile RAM (NVRAM) file to directory created in step 2 using **cp** command

   Syntax: `cp %source-nvram-path% %destination-nvram-path%`

   Example: `cp /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.nvram /vmfs/volumes/datastore1/vm01/vm01.nvram`

   Note: If the virtual machine backup was created before the virtual machine was powered-on for the first time a non-volatile RAM (NVRAM) file may not exist in the backup directory

6. Copy virtual machine backup's virtual disk (VMDK) file(s) to directory created in step 2 using **vmkfstools** command

   Syntax: `vmkfstools –i %source-vmdk-path% %destination-vmdk-path% -d %disk-format%`

   Disk format options: `thin, zeroedthick or eagerzeroedthick`

   Example: `vmkfstools /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.vmdk /vmfs/volumes/datastore1/vm01/vm01.vmdk –d zeroedthick`

   Note 1: Do not copy the VMDK files ending with "-flat.vmdk", these files will be created in the destination directory automatically

   Note 2: Do not copy the VMDK files ending with "-s###.vmdk", these files will not be used

7. If different source and destination file names were used in steps 4, 5 and 6 use **vi** command to edit file name references in machine configuration (VMX) file created in step 4

   Syntax: `vi %vmx-path%`

   Example: `vi /vmfs/volumes/datastore1/vm01/vm01.vmx`

   Note: When finished editing, press ESC, type `:wq` and press Enter

8. Register restored virtual machine using **vim-cmd solo/registervm** command and virtual machine configuration (VMX) file created in step 4

   Syntax: `vim-cmd solo/registervm %vmx-path%`

   Example: `vim-cmd solo/registervm /vmfs/volumes/datastore1/vm01/vm01.vmx`

9. Obtain restored virtual machine's VMID using **vim-cmd vmsvc/getallvms** command, the VMID will be used to power-on the restored virtual machine in step 10

   Syntax: `vim-cmd vmsvc/getallvms`

   Note: The VMID is listed in the first column, make a note of this

10. Power-on restored virtual machine using **vim-cmd vmsvc/power.on** command and restored virtual machine's VMID obtained in step 9

    Syntax: `vim-cmd vmsvc/power.on %vmid%`

    Example: `vim-cmd vmsvc/power.on 54`

Note 1: Restoring a virtual machine using VMware Shell requires ESXi Shell (for local shell) or SSH (for remote shell) service to be running on the host server.
Note 2: If the virtual machine backup was previously instantly restored, and is now running or registered from backup storage, it must first be powered-off and removed inventory before completing these steps.

Restoring Virtual Machine from Backup Located on Local Accessible Backup Repository

Instantly Restoring Virtual Machine from Backup Using VMware Workstation or VMware Player

Virtual machine backups created by Thinware vBackup are compatible with VMware Workstation and VMware Player products. Virtual machine backups can be launched in VMware Workstation or VMware Player for the purposes of testing or for instant restore when there is inadequate time available to complete a full restore to a VMware ESXi host server. Complete the following steps to instantly restore a virtual machine backup using VMware Workstation or VMware Player:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and click Open
4. The backup's file system folder will be opened in Windows Explorer, right-click the virtual machine configuration (VMX) file and click Open with > VMware Workstation (or VMware Player)

Note 1: To be compatible with instantly restoring using VMware Workstation or VMware Player the virtual machine backup's virtual disk file(s) must be saved in hosted disk format.
Note 2: Virtual machine backups launched for testing or instant restore are protected from expiration and automatic deletion. To manually delete a virtual machine backup, simply right-click the backup and click "Delete from Disk".
Note 3: Virtual machine backups launched for testing or instant restore can be later powered-off and restored to a VMware ESXi host server (see "Restoring Virtual Machine from Backup Located on Host Server Accessible Backup Repository

Instantly Restoring Virtual Machine from Backup Using VMware vSphere Client or VMware Host Client

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be instantly restored using VMware vSphere Client or VMware Host Client. Complete the following steps to instantly restore a virtual machine from backup using VMware vSphere Client or VMware Host Client:

8. Open VMware vSphere Client (desktop) or VMware Host Client (web) and login to the host server

9. Use the datastore browser to locate the backup you wish to restore
10. Right-click the virtual machine's configuration (VMX) file in the backup directory and click "Register VM" (note: in the desktop version of VMware vSphere Client this menu item reads "Add to Inventory")
11. Locate the virtual machine in inventory and power-on, the virtual machine will now be running from backup storage
12. In Thinware vBackup Client, from the View menu, choose Inventory
13. Select the virtual machine the backup is for in the inventory tree on the left
14. On the virtual machine's Backups tab, right-click the backup and click "Remove from Inventory"

Note 1: To be compatible with instantly restoring using VMware vSphere Client the virtual machine backup's virtual disk file(s) must be saved in managed disk format.
Note 2: Virtual machine backups registered and powered-on for instant restore can be later powered-off and restored to production storage (see "Restoring Virtual Machine from Backup Using VMware vSphere Client" on page 26 or "Restoring Virtual Machine from Backup Using VMware ESXi Shell" on page 26 for instructions).

Restoring Virtual Machine from Backup Using VMware vSphere Client or VMware Host Client

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be restored using VMware vSphere Client or VMware Host Client. Complete the following steps to restore a virtual machine from backup using VMware vSphere Client or VMware Host Client:

9. Open VMware vSphere Client (desktop) or VMware Host Client (web) and login to the host server
10. Use the datastore browser to locate the backup you wish to restore
11. Right-click the backup directory and click Move, select new location for virtual machine data folder on production storage
12. Once the backup directory is moved to production storage, right-click the virtual machine's configuration (VMX) file (located in the new data folder location) and click "Register VM" (note: in the desktop version of VMware vSphere Client this menu item reads "Add to Inventory")
13. Locate the VM in inventory and power-on, the virtual machine will now be running from production storage
14. In Thinware vBackup Client, from the View menu, choose Inventory
15. Select the virtual machine the backup is for in the inventory tree on the left
16. On the virtual machine's Backups tab, right-click the backup and click "Remove from Inventory"

Note 1: To be compatible with restoring using VMware vSphere Client the virtual machine backup's virtual disk file(s) must be saved in managed disk format.

Note 2: If the virtual machine backup was previously instantly restored, and is now running or registered from backup storage, it must first be powered-off and removed inventory before completing these steps.

Restoring Virtual Machine from Backup Using VMware ESXi Shell

When located on host server accessible backup repositories virtual machine backups created by Thinware vBackup can be restored using VMware ESXi Shell. Restoring virtual machines from backup using VMware ESXi Shell provides more options than using VMware vSphere Client or VMware Host Client, but may be more complicated for users without more advanced knowledge of VMware ESXi. Complete the following steps to restore a virtual machine from backup using VMware ESXi Shell:

11. Access VMware ESXi Shell (local or remote) and login to the host server
12. Create directory for virtual machine data folder on production storage using **`mkdir`** command

    Syntax: `mkdir %directory-path%`

    Example: `mkdir /vmfs/volumes/datastore1/vm01`
13. Obtain list of virtual machine backup's files using **`ls`** command, the list of file names will be used in steps 4, 5 and 6

    Syntax: `ls %directory-path%`

    Example: `ls /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001`

    Note 1: Make a note of the .vmx, .nvram and .vmdk file names

    Note 2: Ignore VMDK files ending with "-flat.vmdk" or "-s###.vmdk", these files will not be used

    Note 3: If the virtual machine backup was created before the virtual machine was powered-on for the first time a non-volatile RAM (NVRAM) file may not exist in the backup directory
14. Copy virtual machine backup's configuration (VMX) file to directory to directory created in step 2 using **cp** command

    Syntax: `cp %source-vmx-path% %destination-vmx-path%`

    Example: `cp /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.vmx /vmfs/volumes/datastore1/vm01/vm01.vmx`
15. Copy virtual machine backup's non-volatile RAM (NVRAM) file to directory created in step 2 using **cp** command

    Syntax: `cp %source-nvram-path% %destination-nvram-path%`

    Example: `cp /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.nvram /vmfs/volumes/datastore1/vm01/vm01.nvram`

    Note: If the virtual machine backup was created before the virtual machine was powered-on for the first time a non-volatile RAM (NVRAM) file may not exist in the backup directory
16. Copy virtual machine backup's virtual disk (VMDK) file(s) to directory created in step 2 using **`vmkfstools`** command

    Syntax: `vmkfstools –i %source-vmdk-path% %destination-vmdk-path% -d %disk-format%`

    Disk format options: `thin, zeroedthick or eagerzeroedthick`

    Example: `vmkfstools /vmfs/volumes/nas1-backup/vm-backup/vm01/180531_060001/vm01.vmdk /vmfs/volumes/datastore1/vm01/vm01.vmdk –d zeroedthick`

Note 1: Do not copy the VMDK files ending with "-flat.vmdk", these files will be created in the destination directory automatically

Note 2: Do not copy the VMDK files ending with "-s###.vmdk", these files will not be used

17. If different source and destination file names were used in steps 4, 5 and 6 use **`vi`** command to edit file name references in machine configuration (VMX) file created in step 4

    Syntax: `vi %vmx-path%`

    Example: `vi /vmfs/volumes/datastore1/vm01/vm01.vmx`

    Note: When finished editing, press ESC, type `:wq` and press Enter
18. Register restored virtual machine using **`vim-cmd solo/registervm`** command and virtual machine configuration (VMX) file created in step 4

    Syntax: `vim-cmd solo/registervm %vmx-path%`

    Example: `vim-cmd solo/registervm /vmfs/volumes/datastore1/vm01/vm01.vmx`
19. Obtain restored virtual machine's VMID using **`vim-cmd vmsvc/getallvms`** command, the VMID will be used to power-on the restored virtual machine in step 10

    Syntax: `vim-cmd vmsvc/getallvms`

    Note: The VMID is listed in the first column, make a note of this
20. Power-on restored virtual machine using **`vim-cmd vmsvc/power.on`** command and restored virtual machine's VMID obtained in step 9

    Syntax: `vim-cmd vmsvc/power.on %vmid%`

    Example: `vim-cmd vmsvc/power.on 54`

Note 1: Restoring a virtual machine using VMware Shell requires ESXi Shell (for local shell) or SSH (for remote shell) service to be running on the host server.

Note 2: If the virtual machine backup was previously instantly restored, and is now running or registered from backup storage, it must first be powered-off and removed inventory before completing these steps.

Restoring Virtual Machine from Backup " on page 25 or "**Error! Reference source not found.**" on page **Error! Bookmark not defined.** for instructions).

Restoring Virtual Machine from Backup Using Thinware vBackup Client

Virtual machine backups created by Thinware vBackup can be restored using the Restore Backup wizard in Thinware vBackup Client. Complete the following steps to restore a virtual machine backup using Thinware vBackup Client:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and click "Restore…"
4. On the Restore Backup Wizard, enter a name for the new virtual machine, select the host server and datastore to create it on and click Next
5. Review the virtual machine summary and click Next
6. Select appropriate options for the restoration process and click Next
7. Review the wizard summary and click Restore to begin the restoration process

8. Once the restoration process completes, review the process summary and click Close to close the Restore Backup wizard

Note: The use of the Restore Backup wizard in Thinware vBackup Client requires the SSH service to be running on the host server.

Restoring Virtual Machine from Backup Using VMware vCenter Converter Standalone

Virtual machine backups created by Thinware vBackup are created in native VMware format, meaning you don't necessarily need to use Thinware vBackup Client to restore them. If you are more familiar or more comfortable with using VMware vCenter Converter Standalone, this works just as well as the Restore Backup wizard in Thinware vBackup Client. Complete the following steps to restore a virtual machine backup using VMware vCenter Converter Standalone:

1. In VMware vCenter Converter Standalone, from the File menu choose New > "Convert machine…"
2. Select "Backup image or third-party virtual machine" for source type, select the VMX file (example: D:\Backup\vlab5vm01\130120_040644\vlab5vm01.vmx) in the virtual machine backup's folder for Virtual machine file and click Next
3. Select "VMware Infrastructure virtual machine" for destination type, enter connection information for VMware Infrastructure server and click Next
4. Enter a name for the new virtual machine and click Next
5. Select the datastore, host and virtual machine version and click Next
6. Set parameters for the conversion task as needed and click Next
7. Review the conversion summary and click Finish to begin the restoration process

Recovering Individual Files and Folders from Backup Located on Local Accessible Backup Repository

Recovering Individual Files and Folders from Backup Using Thinware vBackup Client

Virtual disks contained in virtual machine backups created by Thinware vBackup can be mounted as a separate drive in Windows to facilitate recovery of files and folders using the Mount Disks feature in Thinware vBackup Client. Complete the following steps to mount a virtual machine backup's virtual disk and recover individual files and folders using Thinware vBackup Client:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and choose "Mount Disks…"
4. On the Mount Disks form, select the disk you wish to mount and click "Mount…"
5. On the Mount Disk form, enter the volume number you wish to mount, choose the drive letter to be used and click OK

6. You will be directed back to the Mount Disks form and the volume and drive letter will be indicated next to all disks that are currently mounted
7. When done, select the disk you wish to unmount and click Unmount or simply close the Mount Disks form to unmount all mounted disks

Recovering Individual Files and Folders from Backup Using VMware Disk Mount

Virtual disks contained in virtual machine backups created by Thinware vBackup are compatible with the VMware Disk Mount utility. VMware Disk Mount is installed with VMware Virtual Disk Development Kit and allows you to mount a virtual disk as a separate drive in Windows. Complete the following steps to mount a virtual machine backup's virtual disk and recover individual files and folders using VMware Disk Mount:

1. In Thinware vBackup Client, from the View menu, choose Inventory
2. Select the virtual machine the backup is for in the inventory tree on the left
3. On the virtual machine's Backups tab, right-click the backup and choose Open
4. Make a note of the virtual disk's name that you wish to mount (example: vlab5vm01.vmdk)
5. Open Command Prompt (Windows Start menu > All Programs > Accessories > Command Prompt)
6. Mount the virtual disk as a drive by executing a command based on the following syntax:

   Syntax: `vmware-mount %drive-letter%: %vmdk-path% /v:%volume-number% /m:n`

   Example:
   ```
   "C:\Program Files (x86)\VMware\VMware Virtual Disk Development Kit\bin\vmware-mount.exe" X: D:\Backup\vlab5vm01\130120_040644\vlab5vm01.vmdk /v:1 /m:n
   ```
7. Open the drive mounted in step 6 and restore individual files and folders as needed
8. When done, remove the mounted drive by executing a command based on the following syntax:

   Syntax: `vmware-mount %drive-letter%: /d`

   Example:
   ```
   "C:\Program Files (x86)\VMware\VMware Virtual Disk Development Kit\bin\vmware-mount.exe" X: /d
   ```