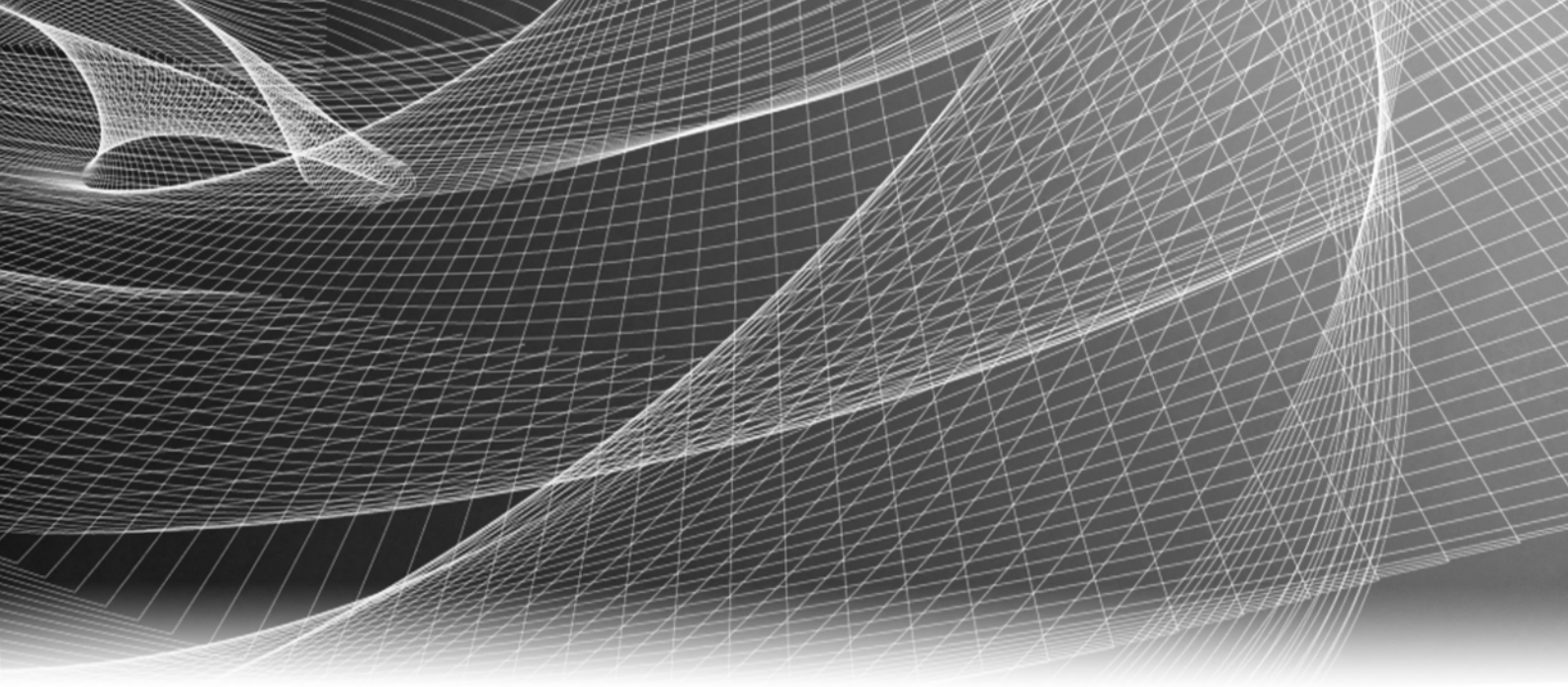

EMC® Avamar® 6.1 for VMware

User Guide

P/N 300-013-353
REV 09

EMC²

Published April, 2013

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TABLES

PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software, and hardware. Therefore, some functions described in this document might not be supported by all versions of the software, or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC representative if a product does not function properly, or does not function as described in this document.

Note: This document was accurate at publication time. New versions of this document might be released on the EMC online support website. Check the EMC online support website to ensure that you are using the latest version of this document.

Purpose

This publication describes various methods and strategies for protecting VMware virtual machines.

Audience

The information in this publication is intended for system administrators familiar with:

- Basic Avamar system administration principles, and procedures found in the *EMC Avamar Administration Guide*
- Other Avamar client software information (primarily installation, and configuration procedures) found in various Avamar client guides

A comprehensive discussion of basic Avamar system administration concepts and principles, such as clients, datasets, schedules, retention policies, groups, and group policy, is beyond the scope of this publication. The *EMC Avamar Administration Guide* provides detailed information.

Revision history

The following table presents the revision history of this document.

Table 1 Revision history

Revision	Date	Description
09	April 17, 2013	Revised "File-level restore limitations" on page 77 to explain that VMware Tools is required.
08	March 1, 2013	Revised: • "Minimum required vCenter user account privileges" on page 26. Added: • "Backup snapshot errors" on page 68. • "Version 8 or 9 virtual machines with disks on multiple datastores" on page 72.
07	December 13, 2012	Revised the list of minimum required user account privileges in "Create dedicated vCenter user account" on page 26.

Table 1 Revision history

Revision	Date	Description
06	November 1, 2012	Revised "File-level restore limitations" on page 77 to clarify that ACLs are not restored.
05	October 25, 2012	Updates for release 6.1 Service Pack 1. Revised: • "File-level restore limitations" on page 77 to clarify lack of support for extended partitions. • "Restoring the full image or selected drives to a different (existing) virtual machine" on page 81 to include new post-restore options. • "Restoring the full image or selected drives to a new virtual machine" on page 84 to include new post-restore options. • "Restoring specific folders or files" on page 87 to include new post-restore options.
04	July 31, 2012	Revised: • "Where to get help" on page 10. • "Create dedicated vCenter user account" on page 26 to include Virtual machine › Provisioning › Allow disk access permission. • "File-level restore limitations" on page 77 to include partitioning limitations.
A03	June 30, 2012	Added "Enable support for multiple vCenters" on page 21. Revised "File-level restore limitations" on page 77 to include Logical Volume Manager (LVM) limitations.
A02	June 15, 2012	Added the following topics: • "Server software upgrades require proxy reboots" on page 76 • "Guidelines for performing image restores versus file-level restores" on page 78 Updated "File-level restore limitations" on page 77 to note that symbolic links cannot be restored or browsed.
A01	April 25, 2012	First release of Avamar 6.1.

Related documentation

The following EMC publications provide additional information:

- *EMC Avamar Compatibility and Interoperability Matrix*
- *EMC Avamar Release Notes*
- *EMC Avamar Administration Guide*
- *EMC Avamar Operational Best Practices*
- *EMC Avamar Product Security Guide*
- *EMC Avamar Backup Clients User Guide*
- *EMC Avamar for Exchange Guide*
- *EMC Avamar for IBM DB2 User Guide*

- *EMC Avamar for Lotus Domino User Guide*
- *EMC Avamar for Microsoft SharePoint Guide*
- *EMC Avamar for Oracle User Guide*
- *EMC Avamar for SQL Server User Guide*

Conventions used in this document

EMC uses the following conventions for special notices:

⚠DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death, or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death, or serious injury.

⚠CAUTION

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor, or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

Note: A note presents information that is important, but not hazard-related.

IMPORTANT

An important notice contains information essential to software, or hardware operation.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for: • Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus • Names of resources, attributes, pools, Boolean expressions, buttons, SQL statements, keywords, clauses, environment variables, functions, and utilities • URLs, pathnames, filenames, directory names, computer names, links, groups, service keys, file systems, and notifications
Bold	Used in running (nonprocedural) text for names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system calls, and man pages Used in procedures for: • Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus • What the user specifically selects, clicks, presses, or types

Italic	Used in all text (including procedures) for: • Full titles of publications referenced in text • Emphasis, for example, a new term • Variables
`Courier`	Used for: • System output, such as an error message, or script • URLs, complete paths, filenames, prompts, and syntax when shown outside of running text
`Courier bold`	Used for specific user input, such as commands
`Courier italic`	Used in procedures for: • Variables on the command line • User input variables
< >	Angle brackets enclose parameter, or variable values supplied by the user
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections — the bar means “or”
{ }	Braces enclose content that the user must specify, such as x, or y, or z
...	Ellipses indicate nonessential information omitted from the example

Where to get help

The Avamar support page provides access to licensing information, product documentation, advisories, and downloads, as well as how-to and troubleshooting information. This information may enable you to resolve a product issue before you contact EMC Customer Service.

To access the Avamar support page:

1. Go to https://support.EMC.com/products.
2. Type a product name in the **Find a Product** box.
3. Select the product from the list that appears.
4. Click the arrow next to the **Find a Product** box.
5. (Optional) Add the product to the **My Products** list by clicking **Add to my products** in the top right corner of the **Support by Product** page.

Documentation

The Avamar product documentation provides a comprehensive set of feature overview, operational task, and technical reference information. Review the following documents in addition to product administration and user guides:

- Release notes provide an overview of new features and known limitations for a release.
- Technical notes provide technical details about specific product features, including step-by-step tasks, where necessary.
- White papers provide an in-depth technical perspective of a product or products as applied to critical business issues or requirements.

Knowledgebase

The EMC Knowledgebase contains applicable solutions that you can search for either by solution number (for example, esgxxxxxx) or by keyword.

To search the EMC Knowledgebase:

1. Click the **Search** link at the top of the page.
2. Type either the solution number or keywords in the search box.
3. (Optional) Limit the search to specific products by typing a product name in the **Scope by product** box and then selecting the product from the list that appears.
4. Select **Knowledgebase** from the **Scope by resource** list.
5. (Optional) Specify advanced options by clicking **Advanced options** and specifying values in the available fields.
6. Click the search button.

Live chat

To engage EMC Customer Service by using live interactive chat, click Join Live Chat on the Service Center panel of the Avamar support page.

Service Requests

For in-depth help from EMC Customer Service, submit a service request by clicking Create Service Requests on the Service Center panel of the Avamar support page.

Note: To open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

To review an open service request, click the Service Center link on the Service Center panel, and then click View and manage service requests.

Facilitating support

EMC recommends that you enable ConnectEMC and Email Home on all Avamar systems:

- ConnectEMC automatically generates service requests for high priority events.
- Email Home emails configuration, capacity, and general system information to EMC Customer Service.

Your comments

Your suggestions help us to continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to:

BSGDocumentation@emc.com

Please include the following information:

- Product name and version
- Document name, part number, and revision (for example, 01)
- Page numbers
- Other details that will help us address the documentation issue

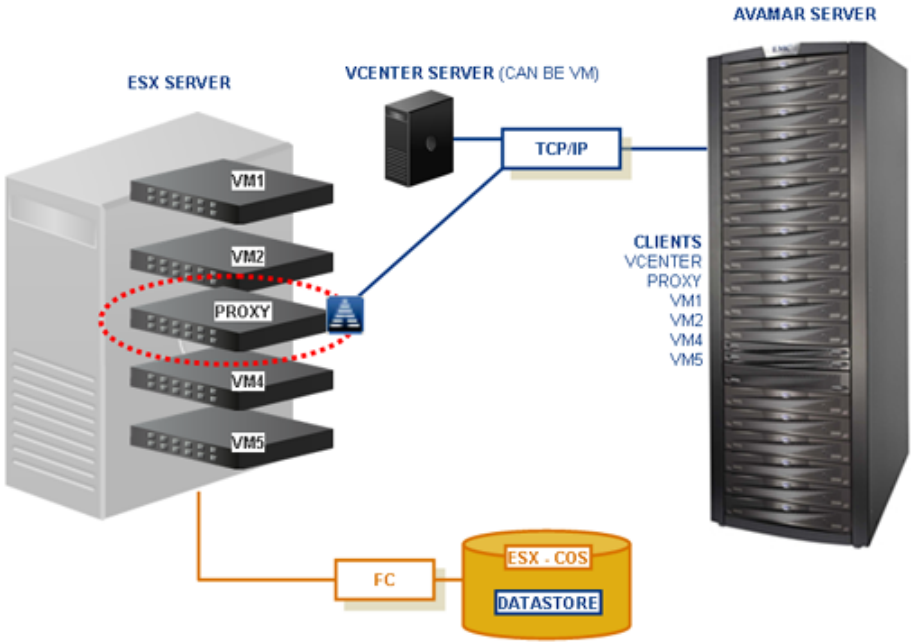
CHAPTER 1
Introduction

This chapter discusses the following:

Avamar for VMware image backup and restore

Avamar for VMware image backup and restore is built on the VMware vStorage API for Data Protection (VADP).

Avamar for VMware image backup and restore is fully integrated with VMware vCenter Server to provide easy detection of virtual machine clients within the vCenter, and enable efficient centralized management of backup jobs.



Backups and restores require the use of proxy virtual machine clients. Each proxy virtual machine client provides all of the following capabilities:

- Backup of Microsoft Windows and Linux virtual machines (entire images or specific drives)
- Restore of Microsoft Windows and Linux virtual machines (entire images or specific drives)
- Selective restore of individual folders and files to Microsoft Windows and Linux virtual machines

Proxies run Avamar software inside a Linux virtual machine, and are deployed using an appliance template (.ova) file.

Guest backup and restore

Guest backup and restore is another way to protect virtual machine data. It is implemented by installing Avamar client software in a virtual machine just as if it were a physical machine, then registering and activating that client with an Avamar server. No special configuration is required.

NOTICE

When registering virtual machine clients protected by guest backup, do not register them to a vCenter domain. Doing so will prevent you from locating or managing that virtual machine in Avamar Administrator. Instead register any virtual machine clients protected by guest backup to some other domain or subdomain (for example, /clients).

The following Avamar client guides provide details about installing Avamar client software in virtual machines:

Table 2 Avamar client guides

Client	Client guide
IBM AIX filesystems	*EMC Avamar Backup Clients User Guide*
Linux filesystems: • CentOS • Debian • Red Hat • SUSE • Ubuntu	*EMC Avamar Backup Clients User Guide*
Novell NetWare filesystems	*EMC Avamar Backup Clients User Guide*
UNIX filesystems: • FreeBSD • HP-UX • SCO Open Server and UnixWare • Sun Solaris	*EMC Avamar Backup Clients User Guide*
IBM DB2 databases hosted on IBM AIX, Red Hat and SUSE Linux, and Microsoft Windows	*EMC Avamar for IBM DB2 User Guide*
Lotus Domino databases	*EMC Avamar for Lotus Domino User Guide*
Mac OS X filesystems	*EMC Avamar Backup Clients User Guide*
Microsoft Exchange databases	*EMC Avamar for Exchange Guide*
Microsoft Office SharePoint implementations	*EMC Avamar for Microsoft SharePoint Guide*
Microsoft SQL Server databases	*EMC Avamar for SQL Server User Guide*
Microsoft Windows filesystems	*EMC Avamar Backup Clients User Guide*
Oracle databases hosted on IBM AIX, Red Hat, and SUSE Linux, Sun Solaris, and Microsoft Windows	*EMC Avamar for Oracle User Guide*

Choosing a data protection method

This topic explores the various advantages and considerations associated with image backup and restore versus guest backup and restore.

Note: A virtual machine can be protected by both guest backup and image backup. For example, a daily guest backup might be used to protect selective files, and a less frequent or on-demand full image backup might be used to protect the full machine. This scheme accommodates scenarios with limited backup windows.

Types of virtual machines

Guest backup is generally the preferred strategy for protecting application servers such as Microsoft Exchange, Microsoft Office SharePoint, Microsoft SQL Server, and Oracle. The reason that guest backup is particularly suited for this is that the Avamar agent gracefully quiesces applications prior to backup, ensuring a true “application consistent” backup.

Guest backup and restore is also the only way to back up virtual machines, such as desktops and laptops, that are not hosted within a vCenter.

Avamar for VMware image backup and restore is generally the preferred strategy for protecting any non-application intensive virtual machines that are hosted within a vCenter. Avamar's integration with vCenter enables multiple virtual machines to be protected with the least amount of effort. Managing backups from these virtual machines is exceptionally easy.

Ease of implementation

Guest backup and restore:

- Supports any virtual machine running an operating system for which Avamar client software is available
- Supports applications such as DB2, Exchange, Oracle, and SQL Server databases
- Easily fits into most existing backup schemes; day-to-day backup procedures do not change
- Avamar client software must be individually installed, and managed inside each virtual machine

Avamar for VMware image backup and restore:

- Can leverage vCenter to discover virtual machines, and add them to the Avamar server in batches
- Requires moderate amount of initial setup and configuration

Efficiency

Guest backup and restore:

- Offers highest level of data deduplication efficiency
- Backups do not consume ESX server CPU, RAM, and disk resources
- Backups consume small amounts of guest virtual machine CPU, RAM, and disk resources when backups are occurring

Avamar for VMware Image backup and restore:

- Moderate deduplication efficiency
- Backups do not consume guest virtual machine CPU, RAM, and disk resources
- Backups consume ESX server CPU, RAM, and disk resources when backups are occurring

Backup and restore

Guest backup and restore:

- Applications are gracefully quiesced prior to each backup, ensuring a true “application consistent” backup
- Backups are highly optimized (temp files, swap files, and so forth not included)
- Backups are highly customizable (supports full range of include and exclude features)
- Database backups support transaction log truncation, and other advanced features
- Unused filesystem space is not backed up
- Individual file and directory (folder) restores supported
- Backup and restore jobs can execute pre- and post-processing scripts
- Virtual machines must have a network connection to Avamar server
- Virtual machines must be running for backups to occur

Avamar for VMware Image backup and restore:

- Image backups are supported for all machines that are currently supported by VMware
- Individual file and directory (folder) restores supported for both Windows and Linux virtual machines
- Virtual machines need not have a network connection to Avamar server
- Virtual machines need not be running for backups to occur
- Unused filesystem space is backed up
- Backups not optimized (temp files, swap files, and so forth are included)
- Backups can comprise an entire virtual machine image (all drives) or selected drives (vmdk files)

Required VMware knowledge

Guest backup and restore requires no advanced scripting or VMware knowledge.

Avamar for VMware Image backup and restore requires moderate VMware knowledge. Integrators should have working knowledge of actual vCenter topology in use at that customer site (that is, which ESX servers host each datastore, and which datastores store each virtual machine's data), and the ability to log in to vCenter with administrator privileges.

Changed block tracking

Changed block tracking is a VMware feature that tracks which specific filesystem blocks on a virtual machine have changed between backups.

Changed block tracking identifies unused space on a virtual disk during the initial backup of the virtual machine, and also empty space that has not changed since the previous backup. Avamar data deduplication performs a similar function. However, using this feature provides valuable I/O reduction earlier in the backup process. Changed block tracking dramatically improves performance if SAN connectivity is not available.

If changed block tracking is not enabled, each virtual machine filesystem image must be fully processed for each backup, possibly resulting in unacceptably long backup windows, and excessive back-end storage read/write activity.

Changed block tracking can also reduce the time required to restore ("roll back") a virtual machine to a recent backup image by automatically eliminating unnecessary writes during the restore process.

Additional VMware resources

A comprehensive discussion of VMware technology is beyond the scope of this publication. The following VMware documentation provides additional details:

- *Introduction to VMware vSphere*
- *Getting Started with ESX*
- *ESX, and vCenter Server Installation Guide*
- *Basic System Administration*
- *vSphere Web Access Administrator's Guide*
- *ESX Configuration Guide*
- *Resource Management Guide*

CHAPTER 2
Configuration and Setup

This chapter provides essential configuration and setup procedures for both vCenter and Avamar environments that must be performed before Avamar for VMware image backup and restore can be used to protect virtual machine data. Topics in this chapter include:

Task road map

Successfully configuring Avamar for VMware image backup and restore comprises the following tasks, which must be performed in this specific order:

- "Enable support for multiple vCenters" on page 21 only required if Avamar server was upgraded from a previous version)
- "Download and install vSphere client software" on page 21
- "Download and install Avamar Administrator software" on page 22
- For each vCenter, "Configure vCenter-to-Avamar authentication" on page 24, one of the following:
  - "Option 1: Install an authentication certificate on the Avamar MCS" on page 24
  - "Option 2: Turn off certificate authentication for all vCenter-to-Avamar MCS communications" on page 25
- For each vCenter, "Create dedicated vCenter user account" on page 26
- For each vCenter, "Add vCenter client in Avamar Administrator" on page 28
- "Deploy proxy clients" on page 30, all of the following:
  - "Add DNS Entries" on page 30
  - "Download proxy appliance template file" on page 31
  - "Deploy proxy appliance in vCenter" on page 32
  - "Register and activate proxy with Avamar server" on page 39
  - "Configure proxy settings in Avamar Administrator" on page 41

Enable support for multiple vCenters

Avamar for VMware image backup and restore supports protecting up to 5 vCenters from a single Avamar server. Beginning with Avamar 6.0, support for multiple vCenters is enabled by default during new Avamar server software installations. However, if your Avamar server was upgraded to from the previous version, you might need to perform the following manual configuration in order to enable support for multiple vCenters.

To enable support for multiple vCenters, perform the following:

1. Open a command shell and log in using one of the following methods:
   - To log in to a single-node server, log in to the server as admin.
   - To log in to a multi-node server, log in to the utility node as admin.
2. Change directories by typing:

   cd /usr/local/avamar/var/mc/server_data/prefs
3. Open mcserver.xml in a UNIX text editor.
4. Find the com.avamar.mc.vmware.max_number_of_vcenters node, as shown below:

```
<root type="system">
   <node name="com">
      <node name="avamar">
         <node name="mc">
            <node name="vmware">
               <entry key="max_number_of_vcenters" value="1" />
```

   Note: Substantial portions of mcserver.xml have been omitted for clarity.
5. Change the max_number_of_vcenters entry to an integer value between 2 and 5.

   This value must be equal to or greater than the maximum number of vCenters you will be using with this Avamar server. Currently, the absolute maximum number of vCenters that can be supported by a single MCS is 5.
6. Save your changes.
7. Restart the MCS by typing:

   dpnctl stop mcs
   dpnctl start mcs
8. Close the command shell.

Download and install vSphere client software

If you have not already done so, download and install vSphere client software by performing the following:

1. From a Windows computer, point your web browser at the vSphere server by typing the following URL:

   HTTPS://VSPHERE

   where VSPHERE is your actual vSphere server network hostname as defined in DNS, or IP address.

Note: This URL must be a secure (HTTPS) web address.

The vSphere Welcome page appears.

2. Click **Download vSphere Client**.

   Your browser might prompt you to either open the file "in-place" (on the server) or save it to your local computer. Either method is acceptable. However, if you save the file to your local computer, you must open (double-click) that installation file to continue with this procedure.

3. Either open the installation file in place (on the server), or double-click the downloaded installation file.

   The installation wizard appears.

4. Follow the on-screen instructions.

5. When prompted, click **Finish** to complete the installation procedure.

   The installation wizard closes.

Download and install Avamar Administrator software

If you have not already done so, download and install Avamar Administrator software by performing the following:

1. From a Windows computer, point your web browser at the Avamar server by typing the following URL:

   `http://AVAMARSERVER`

   where AVAMARSERVER is your actual Avamar server network hostname as defined in DNS, or IP address.

   You will be automatically redirected to the Avamar secure web server.

   Depending on your browser security settings, a security alert dialog box might appear.

2. If a security alert dialog box appears, click **Yes**, or **OK** to allow redirection to the Avamar secure web server.

   The Secure Log On page appears.

3. Page down until the **Documents and Downloads** link is visible.

4. Click **Documents and Downloads**.

   The Documents and Downloads page appears.

5. Page down until the Windows for x86 (32 bit) section is visible.

6. Click the **Microsoft Windows XP, 2003, Vista, 2008, 7** link.

   The Downloads for Microsoft Windows XP, 2003, Vista, 2008, 7 page appears.

7. Click the **AvamarConsoleMultiple** install package.

Your browser might prompt you to either open the file “in-place” (on the server) or save it to your local computer. Either method is acceptable. However, if you save the file to your local computer, you must open (double-click) that installation file to continue with this procedure.

8. Either open the installation file in place (on the server), or double-click the downloaded installation file.

   The installation wizard appears.

9. Follow the on-screen instructions.
10. When prompted, click **Finish** to complete the installation procedure.

    The installation wizard closes.

Configure vCenter-to-Avamar authentication

Avamar VMware Image Backup will not work unless:

- A valid authentication certificate is present on the Avamar Management Console Server (MCS).
- Certificate authentication for all MCS-to-vCenter communications is turned off.

NOTICE

You must perform this task for each vCenter you intend to protect.

Option 1: Install an authentication certificate on the Avamar MCS

Avamar VMware Image Backup will not work unless a valid authentication certificate is present on the MCS. For security reasons, Avamar intentionally does not provide one. You must either obtain your own authentication certificate, or use the default certificate provided with vCenter, then install either certificate using this procedure.

This procedure assumes that you are installing the default certificate provided with vCenter.

The procedure uses the java **keytool** command, a utility that manages certificate keys. The **keytool** command is located in the Java bin directory (/usr/java/jreVERSION/bin), where VERSION is the specific Java Runtime Environment (JRE) version currently installed on the MCS. If this directory is not in your path, you can either add it to the path, or specify the complete path when using **keytool**.

1. Open a command shell, and log in:
   - If logging into a single-node server, log in to the server as admin.
   - If logging into a multi-node server, log in to the utility node as admin.
2. Stop the MCS by typing:

   ```
   dpnctl stop mcs
   ```

3. Switch user to root by typing:

   ```
   su -
   ```

4. Copy rui.crt from the vCenter machine to /tmp on the utility node or single-node server.

   The default certificate provided with vCenter is:
   - Windows 2008: C:\ProgramData\VMware\VMware VirtualCenter\SSL\rui.crt
   - Other Windows versions: C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\SSL\rui.crt
   - Linux: /etc/vmware-vpx/ssl/rui.crt
5. Create a temporary version of the MCS keystore by copying the live keystore to /tmp by typing:

   ```
   cp /usr/local/avamar/lib/rmi_ssl_keystore /tmp/
   ```

6. Add the default vCenter certificate to the temporary MCS keystore file by typing:

   ```
   cd /tmp
   $JAVA_HOME/bin/keytool –import –file rui.crt -alias ALIAS
    -keystore rmi_ssl_keystore
   ```

   where ALIAS is a user-defined name for this certificate, which can often be the file name.

7. When prompted for a password, type the root password.

   The following appears in the command shell:

   ```
   Trust this certificate?
   ```

8. Type **yes**, and press **Enter**.

9. Back up the live MCS keystore by typing:

   ```
   cd /usr/local/avamar/lib
   cp rmi_ssl_keystore rmi_ssl_keystore.DATE
   ```

   where DATE is today's date.

10. Copy the temporary MCS keystore to the live location by typing:

    ```
    cp /tmp/rmi_ssl_keystore /usr/local/avamar/lib/
    ```

11. Exit the root subshell, and restart the MCS by typing:

    ```
    exit
    dpnctl start mcs
    ```

Option 2: Turn off certificate authentication for all vCenter-to-Avamar MCS communications

1. Open a command shell, and log in:
   - If logging into a single-node server, log in to the server as admin.
   - If logging into a multi-node server, log in to the utility node as admin.
2. Stop the MCS by typing:

   ```
   dpnctl stop mcs
   ```

3. Open /usr/local/avamar/var/mc/server_data/prefs/mcserver.xml in a UNIX text editor.
4. Locate the ignore_vc_cert preference.
5. Change the ignore_vc_cert preference setting to true.

   For example:

   ```
   <entry key="ignore_vc_cert" value="true" />
   ```

6. Save your changes.
7. Restart the MCS by typing:

   ```
   dpnctl start mcs
   ```

Create dedicated vCenter user account

EMC strongly recommends that you set up a separate vCenter user account that is strictly dedicated for use with Avamar. Use of a generic user account such as "Administrator" might hamper future troubleshooting efforts because it might not be clear which "Administrator" actions are actually interfacing, or communicating with the Avamar server. Using a separate vCenter user account ensures maximum clarity if it becomes necessary to examine vCenter logs.

NOTICE

You must perform this task for each vCenter you intend to protect.

This vCenter user account must have the following minimum privileges:

Table 3 Minimum required vCenter user account privileges (page 1 of 2)

Setting	Minimum required privileges
Datastore	• Allocate space • Browse datastore • Low level file operations • Move datastore • Remove datastore • Remove file • Rename datastore
Folder	• Create Folder
Global	• Cancel task • Disable methods • Enable methods • Licenses • Log event • Settings
Network	• Assign network • Configure
Resource	• Assign virtual machine to resource pool
Sessions	• Validate session
Tasks	• Create task • Update task
vApp	• Export

Table 3 Minimum required vCenter user account privileges (page 2 of 2)

Setting	Minimum required privileges
Virtual machine › Configuration	• Add existing disk • Add new disk • Add or Remove device • Advanced • Change CPU count • Change Resource • Disk change Tracking • Disk Lease • Host USB device • Memory • Modify device setting • Raw device • Reload from path • Remove disk • Rename • Reset guest information • Settings • Swapfile placement • Upgrade virtual hardware • Extend Virtual disk
Virtual machine › Guest Operations	• Guest Operation Modifications • Guest Operation Program Execution • Guest Operation Queries
Virtual machine › Interaction	• Acquire guest control ticket • Console interaction • Power Off • Power On • Reset • VMware Tools install
Virtual machine › Inventory	• Create new • Register • Remove • Unregister
Virtual machine › Provisioning	• Allow disk access • Allow read-only disk access • Allow virtual machine download • Mark as Template
Virtual machine › State	• Create snapshot • Remove Snapshot • Revert to snapshot

Add vCenter client in Avamar Administrator

The vCenter must exist, and be operational before this type of client can be added. Avamar Administrator attempts to make a connection with the vCenter.

If the vCenter client is already registered as a normal client (for example, to support guest level backup), adding that same vCenter client again will fail because the system will not allow you to register the same client twice. If this occurs, you must retire the existing client instance in Avamar Administrator, add the vCenter client (using the following procedure), then re-invite the vCenter client as a normal client to support guest level backup from the vCenter server.

NOTICE

You must perform this task for each vCenter you intend to protect.

Adding a vCenter client in Avamar Administrator automatically:

- Adds the vCenter client to the Default Group.

  However, this client is not activated as normal Avamar clients are. Therefore, no backups are performed for it on behalf of the Default Group.
- Creates a default vCenter server with the same name as the vCenter's fully qualified hostname.
- Creates a VirtualMachines subdomain within that vCenter server.
- Creates a Default Virtual Machine Group.

  This group performs scheduled backups for the target virtual machines. This group cannot be deleted without first deleting the virtual center domain.

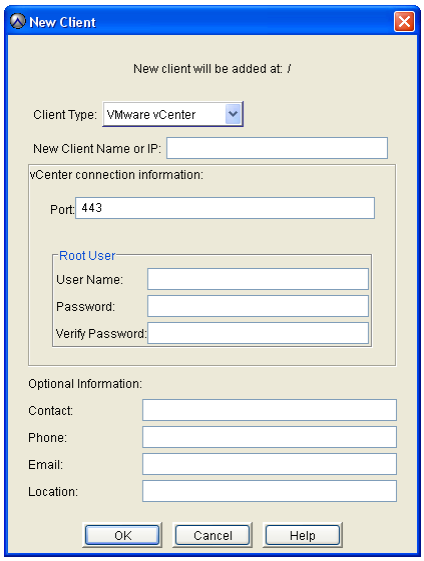
To add a vCenter client:

1. In Avamar Administrator, click the **Administration** launcher button.

   The Administration window appears.
2. Click the **Account Management** tab.
3. In the tree, select the top-level (root) domain.
4. Select **Actions** › **Account Management** › **New Client...**

   The New Client dialog box appears.

5. For **Client Type**, select **VMware vCenter**.



6. Complete the following settings:

Table 4 New vCenter client settings

Setting	Description
New Client Name or IP	Fully-qualified DNS name, or IP address of the vCenter.
Port	vCenter web services listener port. Default setting is port 443.
User Name	vCenter user account name you previously created.
Password	Password for the vCenter user account you previously created.
Verify Password	Type the password again.
Contact	Optional contact name.
Phone	Optional contact telephone number.
Email	Optional contact email address.
Location	Optional contact location.

7. Click **OK**.

   The New Client dialog box closes.

Deploy proxy clients

Backups and restores require deployment of proxy virtual machine clients. Once deployed, each proxy virtual machine client provides all of the following capabilities:

- Backup of Microsoft Windows and Linux virtual machines (entire images or specific drives)
- Restore of Microsoft Windows and Linux virtual machines (entire images or specific drives)
- Selective restore of individual folders and files to Microsoft Windows and Linux virtual machines

Proxies run Avamar software inside a Linux virtual machine, and are deployed using an appliance template (.ova) file.

Proxy clients are allowed in any part of Avamar Administrator account management tree except the vCenter server domain or subdomains.

Although it is possible to restore across datacenters (that is, use a proxy deployed in one datacenter to restore files to a virtual machine in another datacenter), restores will take noticeably longer than if the proxy and the target virtual machine are both located in the same datacenter. Therefore, for best performance, deploy at least one proxy on each datacenter you are protecting.

For best results, always register and activate proxies from the client during deployment (as described in "Register and activate proxy with Avamar server" on page 39). Using the alternative method of inviting the proxy client to register with the Avamar server from Avamar Administrator is known to have unpredictable results.

Add DNS Entries

During "Deploy proxy appliance in vCenter" on page 32, you will be asked to assign a unique IP address to each proxy. vCenter performs a reverse DNS lookup of that IP address to ensure that it is resolvable to a hostname. For best results, configure all required DNS entries for proxies you plan to deploy before proceeding with the remainder of this procedure.

Download proxy appliance template file

NOTICE

If adding more than one proxy, you only need to perform this task once.

Download the proxy appliance template file by performing the following:

1. From your Windows computer, point your web browser at the Avamar server by typing the following URL:

   `http://AVAMARSERVER`

   where AVAMARSERVER is your actual Avamar server network hostname as defined in DNS, or IP address.

   You are automatically redirected to the Avamar secure web server.

   Depending on your browser security settings, a security alert dialog box might appear.

2. If a security alert dialog box appears, click **Yes**, or **OK** to allow redirection to the Avamar secure web server.

   The Secure Log On page appears.

3. Page down until the **Documents and Downloads** link is visible.

4. Click **Documents and Downloads**.

   The Documents and Downloads page appears.

5. Page down until the VMware vSphere section is visible.

6. Click the **EMC Avamar VMware Image Backup/FLR Appliance** link.

   The Downloads for EMC Avamar VMware Image Backup Appliance page appears.

7. Click the **AvamarCombinedProxy-linux-sles11_64-VERSION.ova** link.

   where VERSION is the specific version Avamar software you are installing.

   The File Download dialog box appears.

8. Click **Save** to save the appliance template file to a convenient location on your computer (for example, your desktop or C:\Temp).

Deploy proxy appliance in vCenter

Deploy the proxy appliance in the vCenter as follows:

1. From your Windows computer, launch the vSphere client application and log in to the vCenter server.

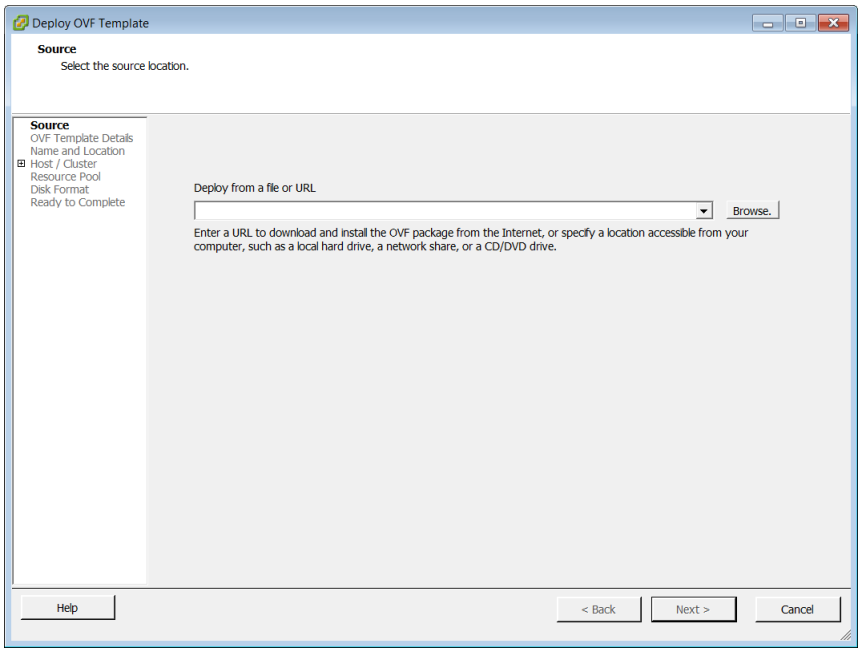
   The vSphere Client window appears.

2. Switch to Hosts and Clusters view by clicking **View** › **Inventory** › **Hosts and Clusters**.

3. Select **File** › **Deploy OVF Template**.

   The Deploy OVF Template wizard appears.

4. In the **Source** screen, complete the following:



   a. Select **Deploy from file or URL** and click **Browse**.

      The Open dialog box appears.

   b. Select **Ova files (*.ova)** from the **Files of Type** list.

   c. Browse to the appliance template file that was previously downloaded in "Download proxy appliance template file" on page 31.

   d. Select the appliance template file and click **Open**.

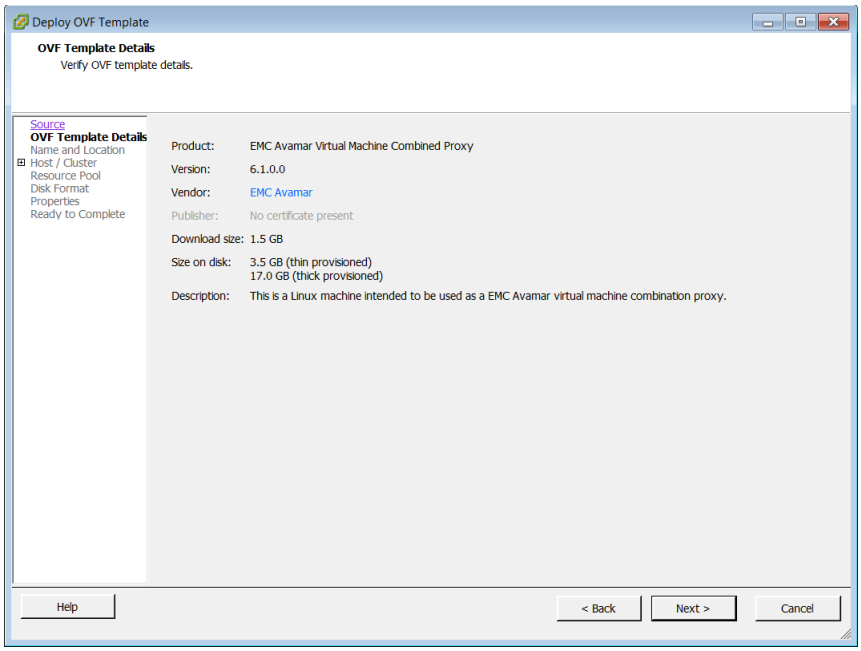
      The Open dialog box closes.

      The full path to the appliance template file appears in the Deploy from file field.

   e. Click **Next**.

   The OVF Template Details screen appears.

5. In the **OVF Template Details** screen, complete the following:

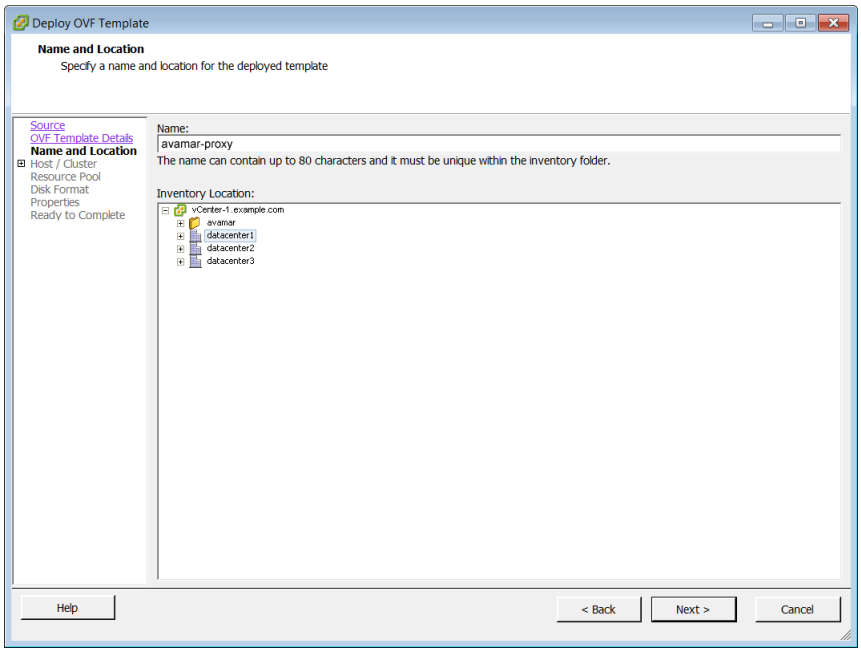


a. Ensure that the template information is correct.

b. Click **Next**.

The Name and Location screen appears.

6. In the **Name and Location** screen, complete the following:



a. Type a unique fully-qualified hostname in the **Name** field.

A proxy can potentially have three different names:

- The name of the virtual machine on which the proxy runs. This is also the name managed and visible within vCenter.
- The DNS name assigned to the proxy virtual machine.
- The Avamar client name after the proxy registers and activates with server.

NOTICE

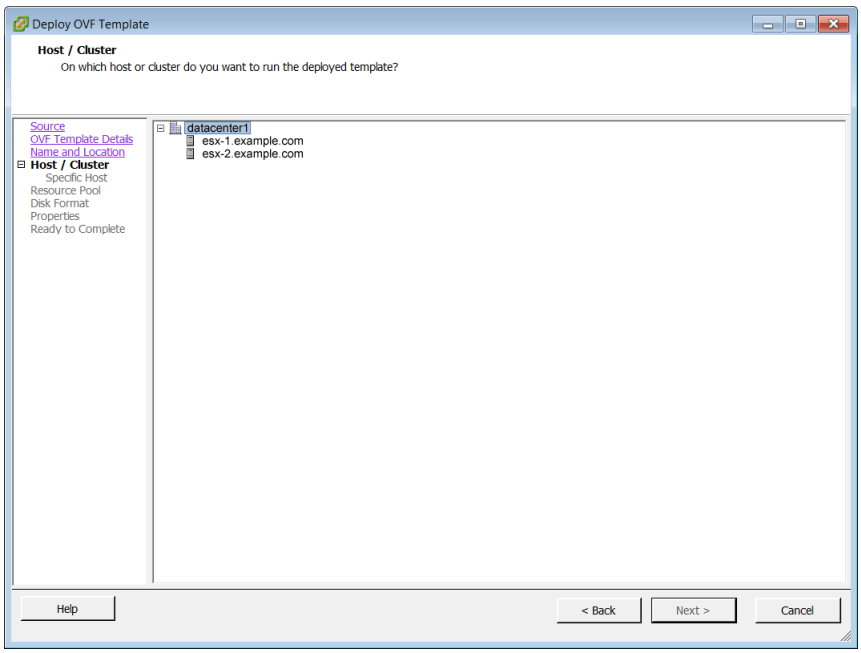
In order to avoid confusion and potential problems, EMC strongly recommends that you consistently use the same fully-qualified hostname for this proxy in all contexts.

b. Select a datacenter and folder location for this proxy in the Inventory tree.

c. Click **Next**.

The Host / Cluster screen appears.

7. In the **Host / Cluster** screen, complete the following:

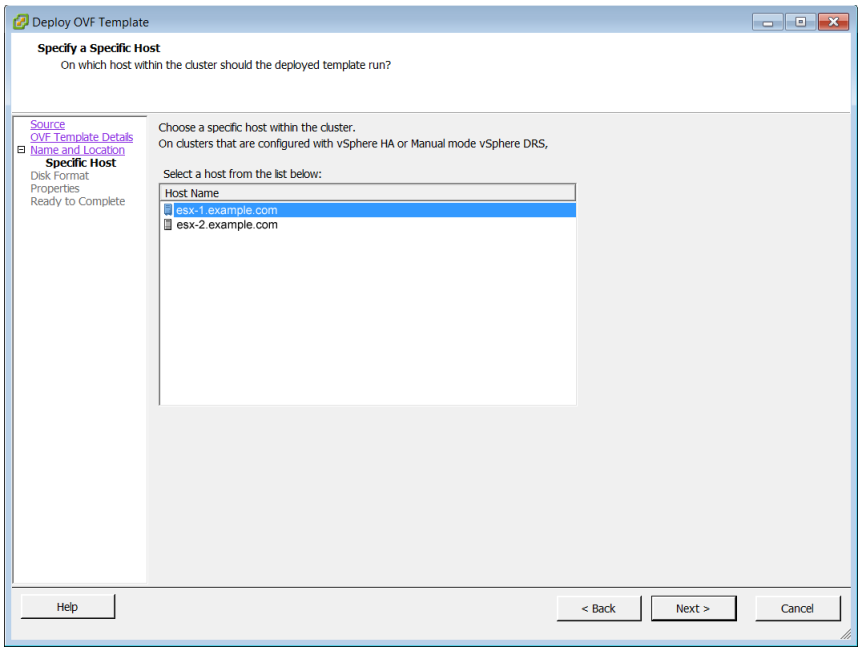


a. Select an ESX server or cluster.

b. Click **Next**.

If you selected a cluster, the Specific Host screen appears.

8. In the **Specific Host** screen, complete the following:

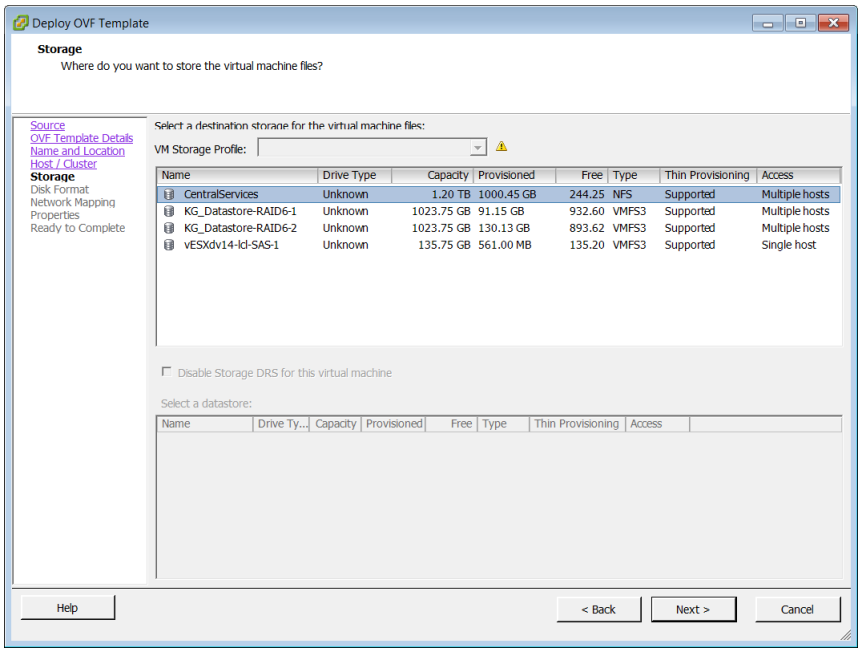


a. Select a specific ESX server from the **Host Name** list.

b. Click **Next**.

The Storage screen appears.

9. In the **Storage** screen, complete the following:

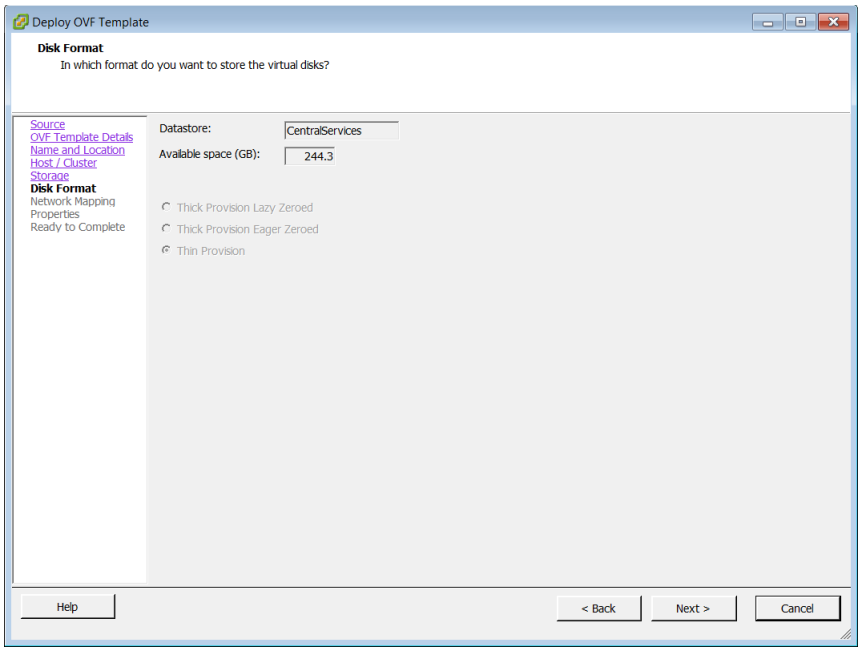


a. Select a storage location for this proxy.

b. Click **Next**.

The Disk Format screen appears.

10. In the **Disk Format** screen, complete the following:

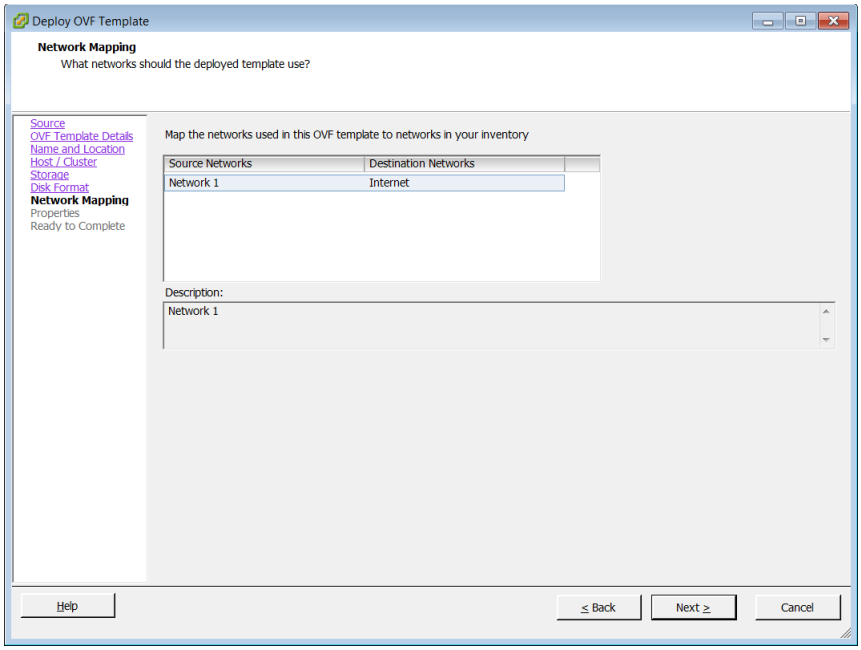


a. Accept the suggested default setting for **Available Space (GB)**.

b. Accept the suggested default provisioning setting (**Thin Provision**).

c. Click **Next**.

The Network Mapping screen appears.



11. In the **Network Mapping** screen, complete the following:
    a. Select a destination network from list.
    b. Click **Next**.

    The networking Properties screen appears.

12. In the networking **Properties** screen, complete the following:

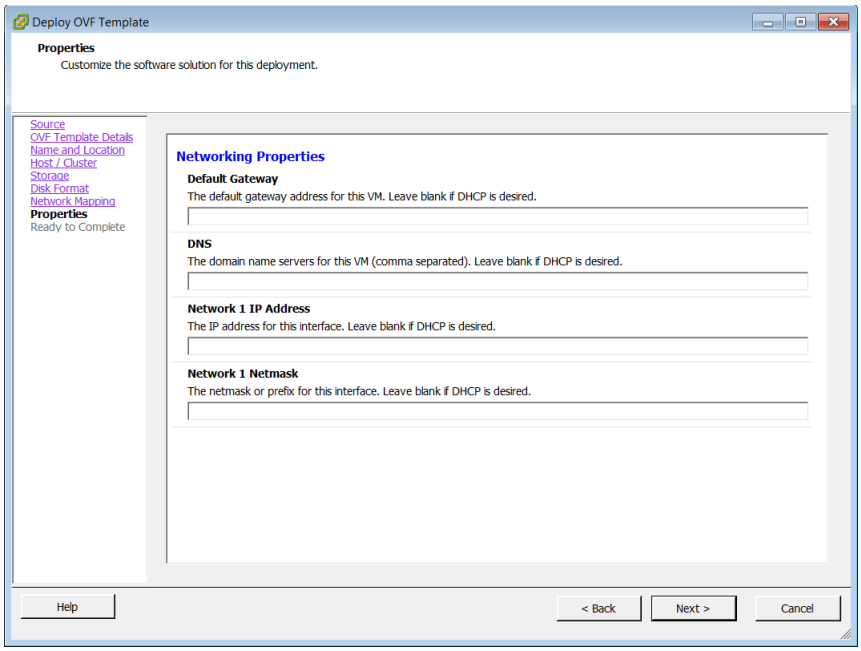
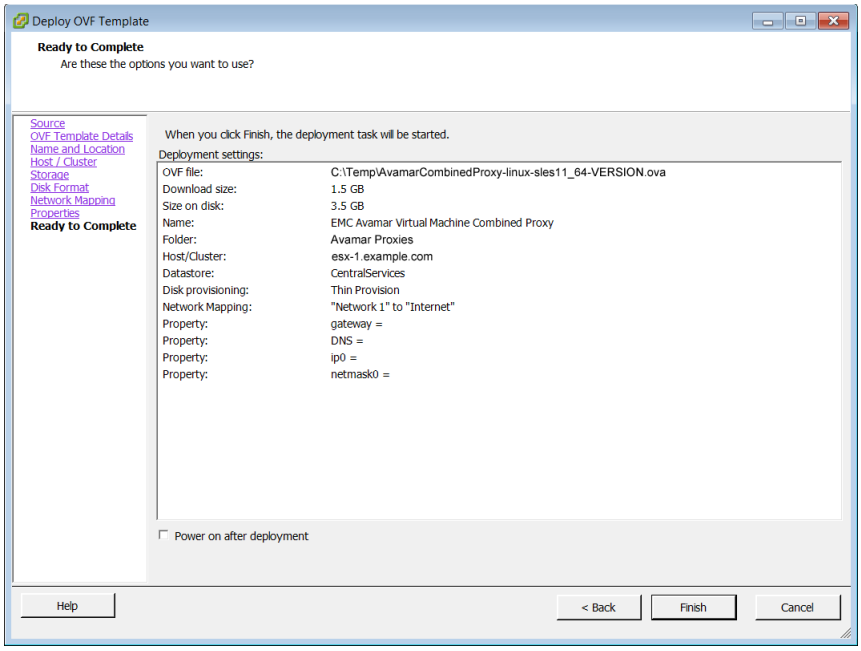


Table 5 Proxy Network Property Settings

Field	Setting/Description
Default Gateway	Enter the default gateway IP address for your network.
DNS	If not using DHCP, enter one or more Domain Name Server (DNS) hostnames or IP addresses. Separate multiple entries with commas.
Network IP Address	If not using DHCP, enter a valid routable IP address on your network.
Network Netmask	Set to 255.255.255.0.

a. Click **Next**.

The Ready To Complete screen appears.



b. Ensure that the information is correct.

c. Click **Finish**.

The Deploy OVF Template wizard closes.

13. Wait for the deployment operation to complete.

    This might take several minutes.

    A confirmation message appears.

14. Click **Close** to dismiss the confirmation message.

Register and activate proxy with Avamar server

NOTICE

For best results, always register and activate proxies as described in this task. Using the alternative method of inviting the proxy from Avamar Administrator is known to have unpredictable results.

1. From the **vSphere Client** window, locate and select a Avamar image backup proxy that was previously deployed in "Deploy proxy appliance in vCenter" on page 32.
2. Power on the new proxy virtual machine by right-clicking the proxy and selecting **Power** › **Power On**.
3. Open a console to the proxy by right-clicking it and selecting **Open Console**.

   The Console window appears.

4. Wait for the Main Menu to appear.

5. Register the proxy with an Avamar server by typing **1**.

   The following appears in the console window:

   ```
   Enter the Administrator server address (DNS text name, or numeric IP
   address, DNS name preferred):
   ```

6. Type the actual network hostname as defined in DNS of the Avamar server from which you want to initiate, and manage backups and restores.

7. Press **Enter**.

   The following appears in the console window:

   ```
   Enter the Avamar server domain [clients]:
   ```

   The default domain is "clients." However, your Avamar system administrator may have defined other domains, and subdomains. Consult your Avamar system administrator for the specific domain you should use when registering this client.

   Note: If typing a subdomain (for example, clients/MyClients), do not include a slash (/) as the first character. Including a slash as the first character will cause an error, and prevent you from registering this client.

8. Press **Enter** to accept the default domain (clients).

   In order to implement file-level restore, this proxy requires the Avamar server root password.

   The following appears in the console window:

   ```
   Has the Avamar server software root password changed since last
   running this utility? [no]
   ```

9. Do one of the following:

   - If the Avamar server software root password has not changed since you last ran this utility, press **Enter** and go directly to step 11.
   - If the Avamar server software root password has changed since you last ran this utility, type **y** and press **Enter**, then go to step 10.

   The following appears in the console window:

   ```
   Enter the Avamar server software root password:
   ```

10. Enter the Avamar server software root password and press **Enter**.

11. Wait for the Main Menu to appear.

12. Type **2** and press **Enter** to quit.

Configure proxy settings in Avamar Administrator

1. In Avamar Administrator, click the **Administration** launcher button.

   The Administration window appears.

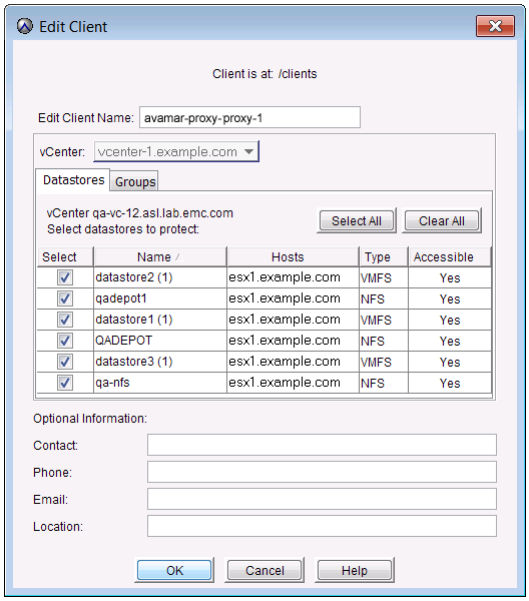
2. Click the **Account Management** tab.

   NOTICE

   Proxy names in Avamar Administrator have “proxy-1” appended to the hostname you defined in “Deploy proxy appliance in vCenter” on page 32. For example, the example vCenter proxy hostname “avamar-proxy” appears as “avamar-proxy-proxy-1” in Avamar Administrator.

3. In the tree, select the proxy you registered in the “Register and activate proxy with Avamar server” on page 39 and select **Actions** › **Account Management** › **Client Edit...**

   The Edit Client dialog box appears.



4. Click the **Datastores** tab, then select all vCenter datastores that host virtual machines you want to protect with this proxy.
5. Click the **Groups** tab, then assign this proxy to one, or more existing groups by selecting the **Select** checkbox next to each group.
6. (Optional) complete the following settings:

Table 6 New proxy client settings

Setting	Description
Contact	Optional contact name.
Phone	Optional contact telephone number.
Email	Optional contact email address.
Location	Optional contact location.

7. Click **OK**.

   The Edit Client dialog box closes.

Upgrading Avamar proxy software

Perform the following procedure when a newer version of the Avamar 6.1 proxy software is available for download from the Avamar server.

NOTICE

This procedure cannot be used to upgrade an Avamar 6.0 proxy. Instead, use the upgrade procedure in the *EMC Avamar 6.0 for VMware Guide*.

1. From your Windows computer, point your web browser at the Avamar server by typing the following URL:

   `http://AVAMARSERVER`

   where AVAMARSERVER is your actual Avamar server network hostname as defined in DNS, or IP address.

   You are automatically redirected to the Avamar secure web server.

   Depending on your browser security settings, a security alert dialog box might appear.

2. If a security alert dialog box appears, click **Yes** or **OK** to allow redirection to the Avamar secure web server.

   The Secure Log On page appears.

3. Page down until the **Documents and Downloads** link is visible.

4. Click **Documents and Downloads**.

   The Documents and Downloads page appears.

5. Page down until the **VMware vSphere** section is visible.

6. Click the **EMC Avamar VMware Image Backup/FLR Appliance** link.

   The Downloads for EMC Avamar VMware Image Backup Appliance page appears.

7. Click the **AvamarCombinedProxy-linux-x86-VERSION.iso** link.

   where VERSION is the specific version Avamar software you are installing.

   The File Download dialog box appears.

8. Click **Save** to save the ISO file to a convenient location on your computer (for example, your desktop, or C:\Temp).

9. From your Windows computer, launch the vSphere client application, and log in to the vCenter server.

   The vSphere Client window appears.

10. Switch to Hosts and Clusters view by clicking **View** › **Inventory** › **Hosts and Clusters**.

11. Locate and select the ESX server that hosts the proxy you want to update.

12. Click the **Summary** tab.

13. In the **Resources** pane, select a datastore in the **Datastore** list.

    This datastore is where you will upload the ISO file.

    Note: If you are performing multiple upgrades, you should select a datastore that is accessible to the greatest number of proxies.

14. Right click the datastore and select **Browse Datastore**.

    The Datastore Browser window appears.

15. In the Folder tree, select a folder.

    This folder is where you will upload the ISO file.

16. Click **Upload files to this datastore**, then select **Upload file**.

    The Upload Items dialog box appears.

17. Browse to the ISO file that you downloaded in step 8.

18. Select the ISO file and click **Open**.

    The Upload Items dialog box closes.

19. If an Upload/Download Operation Warning appears, click **Yes** to dismiss the warning and continue with the upload.

20. Wait for the upload to complete.

21. Switch to vSphere Client window VMs and Templates view by clicking **View** › **Inventory** › **VMs and Templates**.

22. In the left pane, locate and select the proxy you want to upgrade.

23. Right click **Edit Settings**.

    The Virtual Machine Properties dialog box appears.

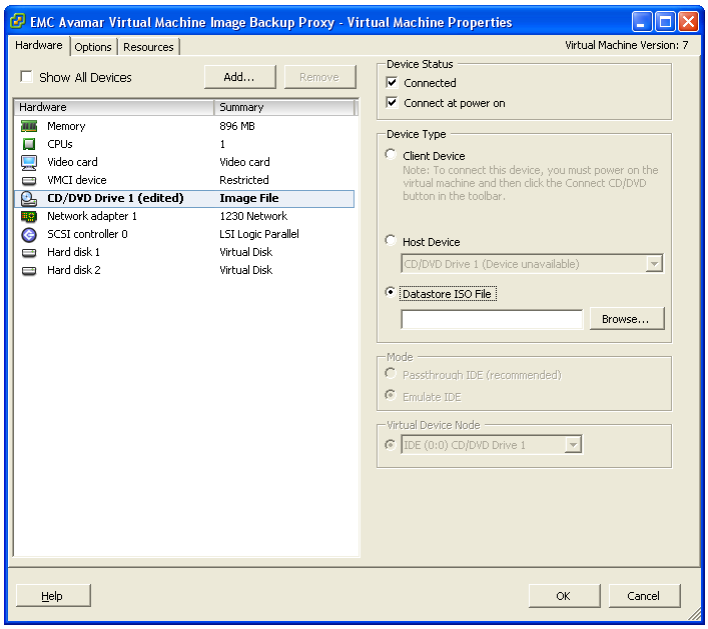
24. In the **Hardware** list, select **CD/DVD Drive 1**.

25. Set the following options:

    a. In **Device Status**, select **Connected**.

    b. In **Device Status**, select **Connect at power on**.

c. In **Device Type**, select **Datastore ISO File**.



26. Click **Browse**.

    The Browse Datastores dialog box appears.

27. Locate and select the ISO file you uploaded in steps 11–20.

28. Click **Open**.

    The Browse Datastores dialog box closes.

29. Switch to **Virtual Machine Properties** dialog box and click **OK**.

    The Virtual Machine Properties dialog box closes.

    The ISO file is mounted on the proxy.

    The proxy automatically waits until no backups are running, then updates itself. Because the polling interval is set to 30 minutes, it make take up to 30 minutes after the last backup completes for the upgrade to begin.

    NOTICE

    When you reboot the proxy VM, it updates its software. Backups that are running during the reboot fail. You should only reboot when you are absolutely certain the proxy is not being used for backups.

30. Switch to vSphere Client window VMs and Templates view by clicking **View › Inventory › VMs and Templates**.

31. In the left pane, locate and select the proxy you just upgraded.

32. Right click **Edit Settings**.

    The Virtual Machine Properties dialog box appears.

33. In the **Hardware** list, select **CD/DVD Drive 1**.

34. In **Device Status**, clear the **Connected** option.
35. Click **OK**.

    The Virtual Machine Properties dialog box closes.
36. Repeat steps 21–35 to upgrade additional proxies.

Protecting virtual machines with both guest and image backup

You can protect a virtual machine using both guest backup and image backup. For example, a daily guest backup to frequently protect selective files, and an infrequent or on-demand full image backup protects the full machine. This scheme accommodates scenarios with limited backup windows.

However, if you decide to use both methods simultaneously on one or more virtual machines, complete the following configuration steps:

1. Open a command shell, and log in:
   - If logging into a single-node server, log in to the server as admin.
   - If logging into a multi-node server, log in to the utility node as admin.
2. Stop the MCS by typing:

   ```
   dpnctl stop mcs
   ```
3. Open /usr/local/avamar/var/mc/server_data/prefs/mcserver.xml in a UNIX text editor.
4. Locate the **allow_duplicate_client_names** preference.
5. Change the **allow_duplicate_client_names** preference setting to true.

   For example:

   ```
   <entry key="allow_duplicate_client_names" value="true" />
   ```
6. Save your changes.
7. Restart the MCS by typing:

   ```
   dpnctl start mcs
   ```

CHAPTER 3
Administration

This chapter provides instructions for administering an operational Avamar for VMware image backup and restore environment. Topics in this chapter include:

Basic client administration

This topic describes how to add and manage VMware image proxy, and virtual machine clients.

NOTICE

Although this publication makes every attempt to present complete and relevant information for every topic, a comprehensive discussion of basic system administration concepts and principles is beyond the scope of this publication. The *EMC Avamar Administration Guide* provides detailed information.

How VMware clients appear in Avamar Administrator

In order to differentiate between the various types of clients in a typical vCenter environment, Avamar Administrator uses the following icons to communicate client type and state:

Table 7 How VMware clients appear in Avamar Administrator (page 1 of 2)

Icon	Description
vCenter server	
	Activated. This is the same icon used to show nonvirtual machine clients.
	Replicated. This icon is only visible in REPLICATE domain.
	Unactivated. **Note:** Unless you are also protecting the vCenter server with guest backup (which is highly recommended), vCenter servers are not typically activated as normal Avamar clients. Therefore, in some circumstances, this is the normal state for a vCenter server.
Proxy **Notice:** Proxy names in Avamar Administrator have "proxy-1" appended to the hostname you defined in "Deploy proxy appliance in vCenter" on page 32. For example, the example vCenter proxy hostname "avamar-proxy" appears as "avamar-proxy-proxy-1" in Avamar Administrator.	
	Activated and enabled.
	Disabled.
	Replicated. This icon is only visible in REPLICATE domain.
	Unactivated.

Table 7 How VMware clients appear in Avamar Administrator (page 2 of 2)

Icon	Description
Virtual machines	
	Virtual machine.
	Powered on.
	Template.

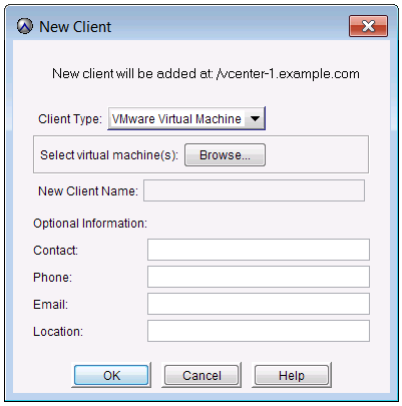
Adding virtual machine clients

Adding virtual machine clients to a vCenter server or a lower subdomain automatically adds the client to the Default Virtual Machine Group.

You can add either a single virtual machine client or multiple virtual machine clients.

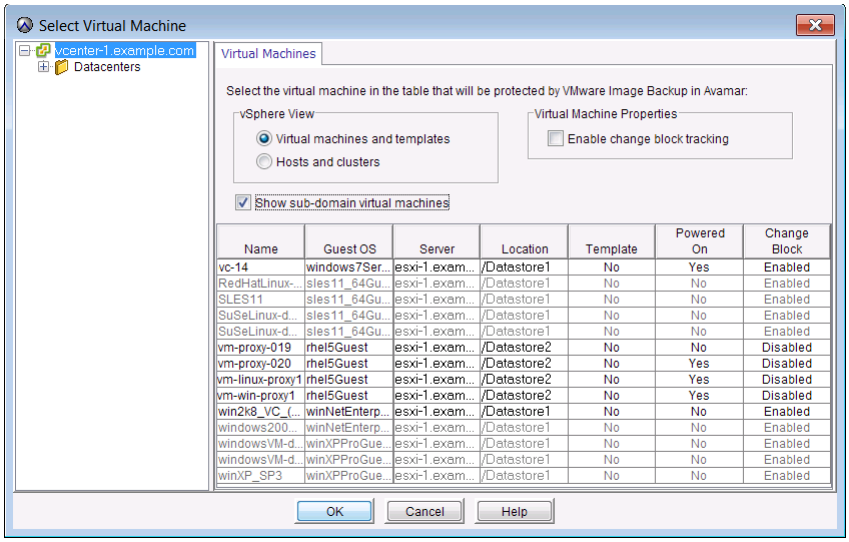
Adding a single virtual machine client

1. In Avamar Administrator, click the **Administration** launcher button.
   The Administration window appears.
2. Click the **Account Management** tab.
3. In the tree, select a vCenter server or a lower subdomain.
4. Select **Actions** › **Account Management** › **New Client...**
   The New Client dialog box appears.
5. Select **VMware Virtual Machine** from the **Client Type** list.



6. Click **Browse**.

   The Select Virtual Machine dialog box appears.



7. Expand the tree until you can view the desired virtual machine node.

   The Virtual Machines tab at right displays all available virtual machines administered by vCenter.

   Virtual machines for which a client already exists in Avamar are disabled.

   Proxy client virtual machines cannot be selected because they are prevented from backing themselves up with VMware Image plug-in.

   For each virtual machine, the following information is shown:

Table 8 Virtual machine information in Avamar Administrator

Column	Description
Name	Virtual machine name.
Guest OS	Virtual machine operating system.
Server	ESX Server or cluster hostname.
Location	Folder location.
Template	Whether or not the virtual machine is a template.
Powered On	Whether or not the virtual machine is currently powered on.
Change Block	Whether or not changed block tracking is turned on for this virtual machine.

The options at the top of the Select Virtual Machine dialog box perform the following functions:

Table 9 Select Virtual Machine dialog box functions

Option	Description
vSphere View - Virtual machines and template views	The view is representative of vCenter's Virtual Machines and Template views.
vSphere View - Hosts and Clusters view	The view is representative of vCenter's Hosts and Clusters view.
Show sub-domain virtual machines	Displays all virtual machines in the vCenter. If a virtual machine is already being protected with guest backup, it is shown as disabled in this view.
Virtual Machine Properties - Enable changed block tracking	If selected, the changed block tracking is enabled. **Note:** If changed block tracking is not enabled, the virtual machine image must be fully processed for each backup, which might result in unacceptably long backup windows, and excessive back-end storage read/write activity. This feature is enabled by default. EMC strongly recommends that you leave this feature enabled for all virtual machines you will be protecting with Avamar VMware image backup.

8. Select a virtual machine.
9. To enable changed block tracking for this client, select **Enable changed block tracking**.

   NOTICE

   Turning on changed block tracking will not take effect until any of the following actions occur: power on, resume after suspend, migrate, snapshot create, delete, or revert.

10. Click **OK**.

    The new client name apears in the New Client dialog box with the fully-qualified name of the selected virtual machine.

11. If desired, type the following optional information:

Table 10 New virtual machine client settings

Setting	Description
Contact	Optional contact name.
Phone	Optional contact telephone number.
Email	Optional contact email address.
Location	Optional contact location.

12. Click **OK**.

    The New Client dialog box closes and a Client added confirmation message appears.

13. Click **OK**.

    The Client added confirmation message closes.

Adding multiple virtual machine clients

1. In Avamar Administrator, click the **Administration** launcher button.

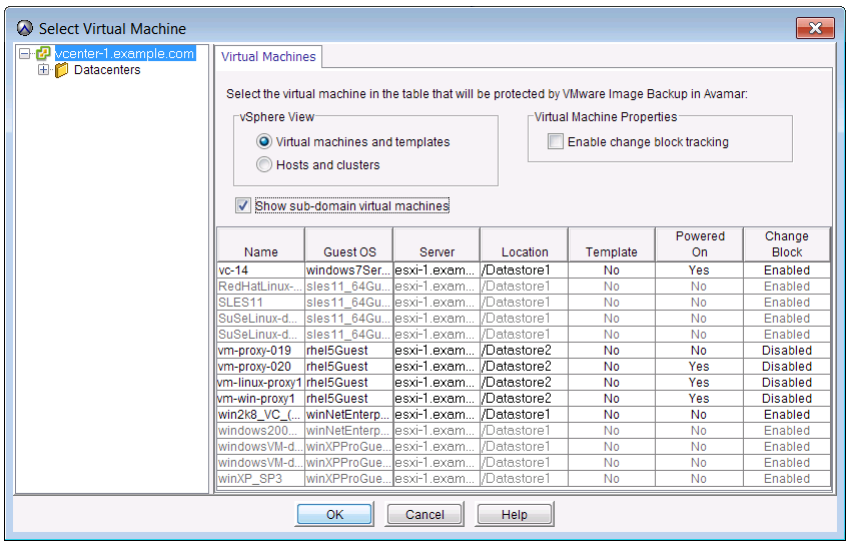
   The Administration window appears.

2. Click the **Account Management** tab.

3. In the tree, select the location (that is, the vCenter server or a lower subdomain) to which you want to add the new clients.

4. Select **Actions** › **Account Management** › **Import Multiple Clients**.

   The Select Virtual Machine dialog box appears.



5. Expand the tree until you can view the desired virtual machine nodes.

   The Virtual Machines tab displays all available virtual machines administered by vCenter.

   Virtual machines for which a client already exists in Avamar are disabled.

   Proxy client virtual machines cannot be selected because they are prevented from backing themselves up with VMware Image plug-in.

For each virtual machine, the following information is shown:

Table 11 Virtual machine information in Avamar Administrator

Column	Description
Name	Virtual machine name.
Guest OS	Virtual machine operating system.
Server	ESX Server or cluster hostname.
Location	Folder location.
Template	Whether or not the virtual machine is a template.
Powered On	Whether or not the virtual machine is currently powered on.
Change Block	Whether or not changed block tracking is turned on for this virtual machine.

The options at the top of the Select Virtual Machine dialog box perform the following functions:

Table 12 Select Virtual Machine dialog box functions

Option	Description
vSphere View - Virtual machines and template views	The view is representative of vCenter's Virtual Machines and Template views.
vSphere View - Hosts and Clusters view	The view is representative of vCenter's Hosts and Clusters view.
Show sub-domain virtual machines	Displays all virtual machines in the vCenter. If a virtual machine is already being protected with guest backup, it is shown as disabled in this view.
Virtual Machine Properties - Enable changed block tracking	If selected, the changed block tracking is enabled. **Note:** If changed block tracking is not enabled, the virtual machine image must be fully processed for each backup, which might result in unacceptably long backup windows, and excessive back-end storage read/write activity. This feature is enabled by default. EMC strongly recommends that you leave this feature enabled for all virtual machines you will be protecting with Avamar VMware image backup.

6. Select one or more virtual machines.
7. To enable changed block tracking, select **Enable changed block tracking**.

   NOTICE

   Turning on changed block tracking will not take effect until any of the following actions occur: power on, resume after suspend, migrate, snapshot create, delete, or revert.

8. Click **OK**.
9. Confirm the number of virtual machines selected.
10. Click **OK**.

The Progress and Adding Virtual Machine Clients dialog boxes appear.

11. Wait for the **Progress** dialog box to close.
12. Switch to **Adding Virtual Machine Clients** dialog box.

    NOTICE

    Click **Save As** to save the displayed results in a text file.

13. Click **Close**.

    The Adding Virtual Machine Clients dialog box closes.

Editing existing VMware clients

Editing VMware clients is similar to editing other Avamar clients. The primary difference is that when editing client properties from the Policy window, each Edit Client dialog box includes an additional VMware tab that contains client properties relating to vCenter, proxy, or virtual machine clients. This tab is not shown for nonvirtual clients.

Contents of the VMware tab differ according to the type of client:

- When editing a vCenter server, editable credentials are shown.
- When editing a proxy client, two tabs are shown:
  - The Datstores tab is used to select all vCenter datastores that host virtual machines you want to protect with this image proxy client.
  - The Groups tab is used to assign an image proxy client to one or more existing groups.

  "Editing proxy datastore and group settings" on page 64 provides detailed information.
- When editing a virtual machine client, datastores on which that virtual machine resides are shown.

Renaming a vCenter client

If an existing vCenter client's DNS name changes, the Avamar server will lose its connection to that vCenter. This will prevent any interaction with that vCenter, including scheduled backups, from occurring. If this occurs, you must manually rename that vCenter client in Avamar Administrator.

NOTICE

This is the only context in which you should ever rename a vCenter client. In Avamar Administrator, the vCenter client name must always be the fully qualified DNS name or a valid IP address.

To rename an existing vCenter client:

1. Ensure that vCenter-to-Avamar authentication is working as described in "Configure vCenter-to-Avamar authentication" on page 24.
2. In Avamar Administrator, click the **Administration** launcher button.

The Administration window appears.

3. Click the **Account Management** tab.
4. In the tree, select the vCenter client.
5. Select **Actions** › **Account Management** › **Edit Client**.

   The Edit Client dialog box appears.
6. In the **New Client Name or IP** field, enter the new fully qualified DNS name.
7. Click **OK**.

   The Edit Client dialog box closes.
8. Open a command shell and log in using one of the following methods:
   - To log in to a single-node server, log in to the server as admin.
   - To log in to a multi-node server:
     a. Log in to the utility node as admin, and then load the admin OpenSSH key by typing:

        ```
        ssh-agent bash
        ssh-add ~admin/.ssh/admin_key
        ```

     b. When prompted, type the admin_key passphrase and press **Enter**.
9. Restart the MCS by typing:

   ```
   dpnctl stop mcs
   dpnctl start mcs
   ```

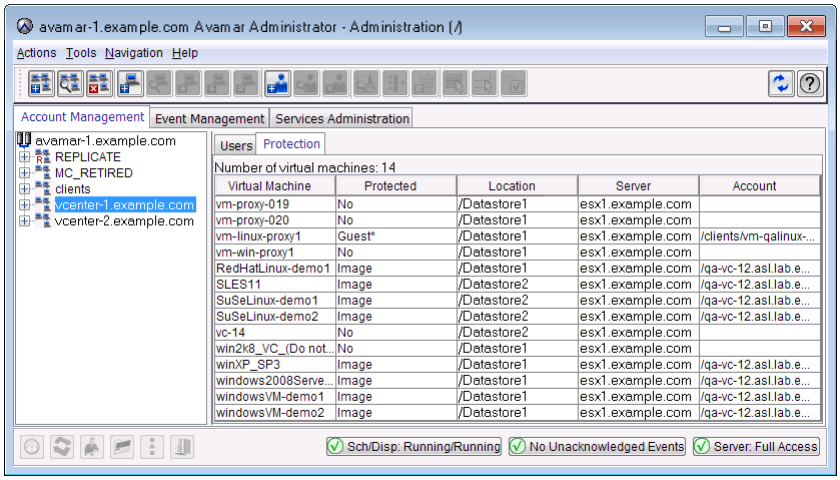
10. Reboot Avamar proxies as follows:
    a. From your Windows computer, launch the vSphere client application and log in to the vCenter server.

       The vSphere Client window appears.
    b. Switch to Hosts and Clusters view by clicking **View** › **Inventory** › **Hosts and Clusters**.
    c. Locate an Avamar proxy.
    d. Right-click **Power** › **Power Off**.
    e. Right-click **Power** › **Power On**.
    f. Repeat step c – step e for each Avamar proxy.

Viewing protected virtual machines

To view protected virtual machines:

1. In Avamar Administrator, click the **Administration** launcher button.
   The Administration window appears.
2. Click the **Account Management** tab.
3. Click the **Protection** tab.



You can view the backup protection state for all virtual machines from the Protection tab. You cannot take any actions on this tab.

All the virtual machines in the vCenter are listed on the Protection tab.

Virtual machines protected by guest have Avamar client software installed and are running backup agents in the guest operating system.

Virtual machines protected by image backup are backed up using the Avamar VMware Image Backup feature.

Those protected by both are protected by using both methods.

Viewing replicated virtual machine name

The View Information feature is used to view the virtual machine name of any virtual machine in the REPLICATE domain.

This feature is disabled anywhere other than in the REPLICATE domain.

If you try to view information for a nonvirtual machine client, the following message appears: No Information.

1. In Avamar Administrator, click the **Administration** launcher button.
   The Administration window appears.
2. Click the **Account Management** tab.
3. In the tree, browse to the REPLICATE domain and select a client.
4. Select **Actions** › **Account Management** › **View Information**.

A dialog box appears, which shows the virtual machine name.

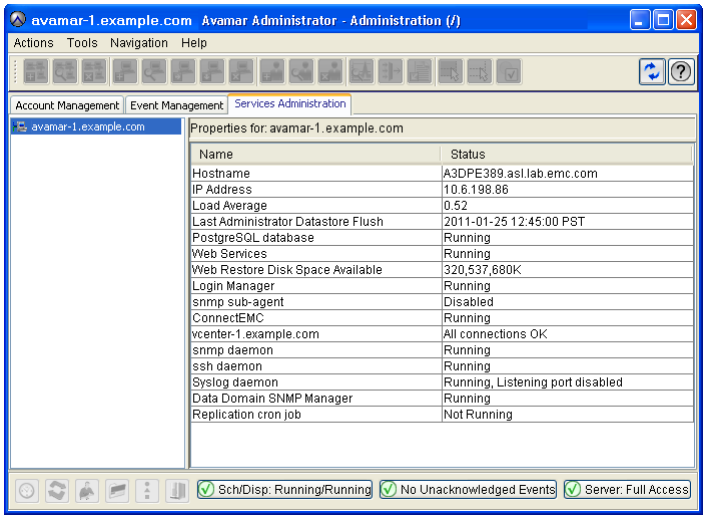
If you selected a nonvirtual machine client in step 4, the following message appears: No Information.

5. Click **OK**.

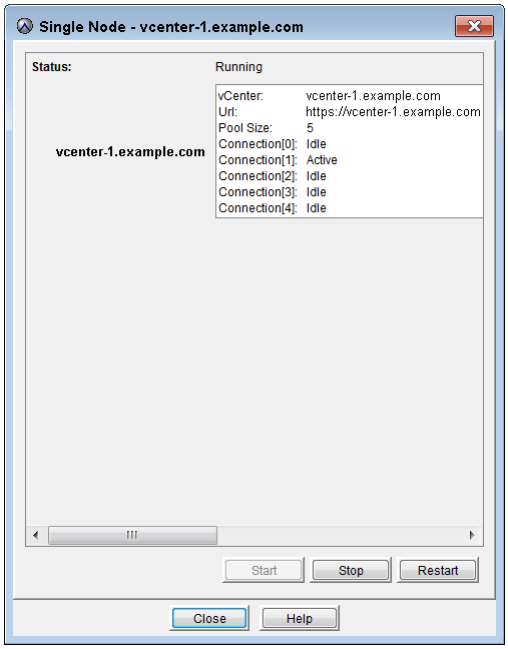
   The dialog box closes.

vCenter connection monitor

Avamar Administrator maintains a pool of connections to the vCenter. As with other essential services, the Administration window Services Administration tab provides continuous status for the vCenter connection.



To open the VMware vCenter Connection Monitor dialog box, double-click the VMware vCenter Connection Monitor.



Valid connection states are Active and Idle.

Connections to the vCenter can be stopped, started, and restarted. Stop the connections for vCenter upgrades, and start them when the upgrade has completed. If vCenter is shutdown, connections become invalid and must be reestablished. If this occurs, windows such as the New Client dialog box do not display vCenter structure or virtual machines.

Groups and policy management

This topic discusses how to use Avamar groups, and policy management features to manage the Avamar for VMware Image backup and restore feature.

Groups and group behavior

This topic discusses special groups and important behavioral differences related to Avamar for VMware image backup and restore.

Default Proxy Group

By default, the Default Proxy Group is where proxies reside. This group cannot be deleted. Enabling the Default Proxy Group does not conflict with scheduled backups performed by other plug-ins configured on the proxy client.

Default Virtual Machine Group

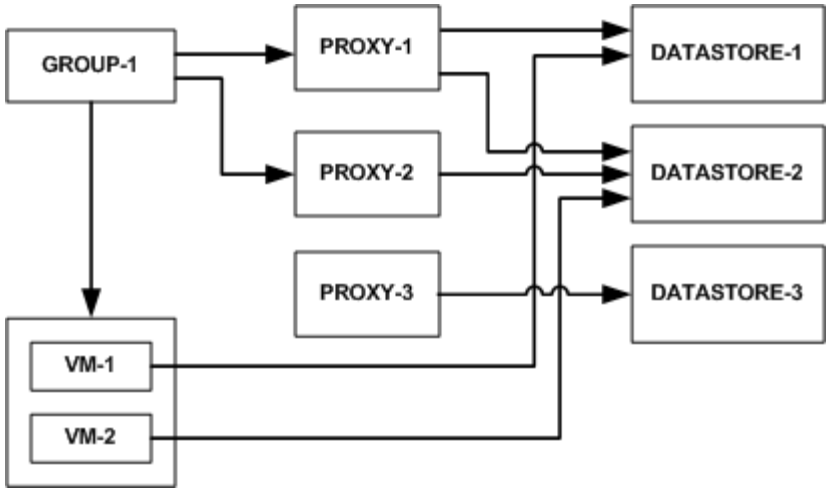
By default, the Default Virtual Machine Group is where new virtual machine clients are automatically added when they are registered. This group cannot be manually deleted but is automatically deleted if the vCenter domain is deleted.

vCenter groups

Any group created under a vCenter server automatically becomes a “vCenter” group. This group behaves similar to non-vCenter groups except that it also provides to ability to specify which proxies are assigned to perform backups on behalf of its group members.

Virtual machine and proxy client relationships within vCenter groups

Consider the following simplified example configuration:



Virtual machines VM-1 and VM-2 store their data in DATASTORE-1 and DATASTORE-2, respectively.

Within Avamar Administrator, proxies have been assigned to protect vCenter datastores as follows:

- PROXY-1 has been assigned to DATASTORE-1 and DATASTORE-2
- PROXY-2 has been assigned to DATASTORE-2
- PROXY-3 has been assigned to DATASTORE-3

Datastore assignments are made at the proxy client level in the Edit Client dialog box.

A vCenter is group (GROUP-1) is created, to which virtual machine clients VM-1 and VM-2 are added.

In order to protect these Virtual machines, proxy clients must also be added to the vCenter group as follows:

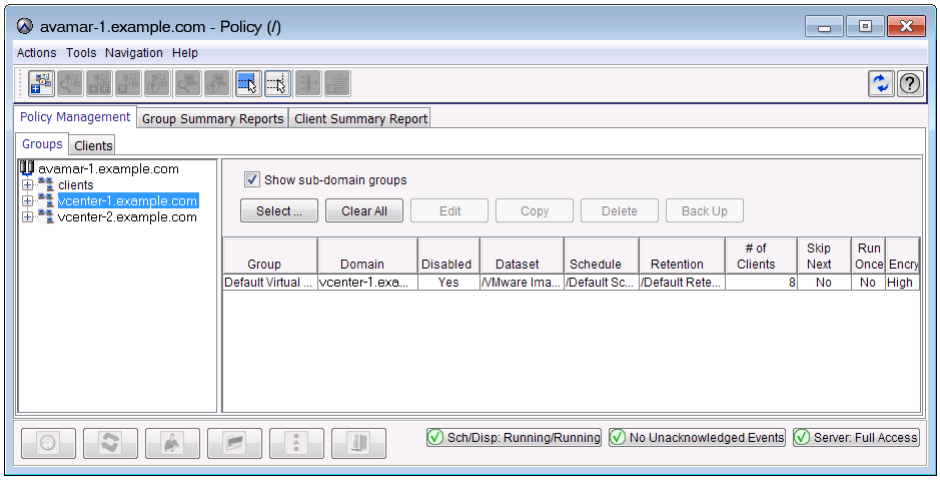
- PROXY-1, by way of its assignment to both DATASTORE-1 and DATASTORE-2, can protect both VM-1 and VM-2 virtual machine clients.
- PROXY-2, because it is only assigned to DATASTORE-2, is optional as long as Proxy-1 exists in the vCenter group.
- PROXY-3, because it is only assigned to DATASTORE-3, cannot protect either VM-1 or VM-2.

NOTICE

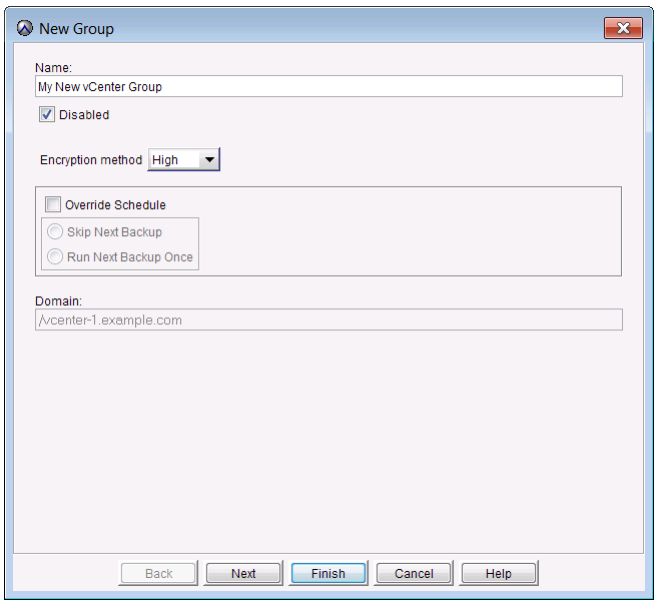
Every vCenter group must include enough proxies to support all the datastores assigned to every client. Otherwise, when a backup is initiated and a proxy cannot be located to perform the backup, the backup will fail with an Activity monitor status of “no proxy.”

Adding a vCenter group

1. In Avamar Administrator, click the **Policy** launcher button.
   The Policy window appears.
2. Click the **Policy Management** tab.
3. Click the **Groups** tab.
4. In the tree, select a vCenter server.
   The data table lists the Default Virtual Machine Group, as well as any other vCenter groups that have been added.



5. Select **Actions** › **New Group**.
   The New Group dialog box appears.



6. Complete the settings as described in the following table.

Table 13 New vCenter group settings

Setting	Description
Name	Type a name for the group. Do not use any of the following characters in the group name: ~!@$^%(){}[]|,`;#\/:*?<>'"&.
Disabled	This option is selected by default. Clear this option to immediately enable regularly scheduled group backups.
Encryption Method	Encryption method used for client/server data transfer. Choices are: • High — Strongest available encryption setting for that specific client platform. • Medium — Medium strength encryption. • None — No encryption. The exact encryption technology and bit strength used for any specific client-server connection depends on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides detailed information.
Override Schedule	Select this option to override the assigned schedule for the group. You can also skip the next scheduled backup entirely (**Skip Next Backup**) or perform the next scheduled backup one time only (**Run Next Backup Once**).
Domain	vCenter server name. This field is read-only.

The remaining wizard screens are used to select a dataset, schedule, and retention policy, as well as build a client list, and assign proxies for this vCenter group.

You can click **Finish** at any time. Doing so will cause the new group to be created using system default settings, empty client, and proxy lists. You can change those settings by editing the vCenter group.

7. Click **Next**.

   The next New Group wizard screen appears.

8. Select a dataset from the **Select An Existing Dataset** list.

   NOTICE

   You cannot edit dataset properties from this screen. Detailed dataset properties are shown so that you can review them before you make a selection. The *EMC Avamar Administration Guide* provides detailed information about editing datasets.

9. Click **Next**.

   The next New Group wizard screen appears.

10. Select a schedule from the **Select An Existing Schedule** list.

    NOTICE

    You cannot edit schedules from this screen. Detailed schedule properties are shown so that you can review them before you make a selection. The *EMC Avamar Administration Guide* provides detailed information about editing schedules.

11. Click **Next**.

    The next New Group wizard screen appears.

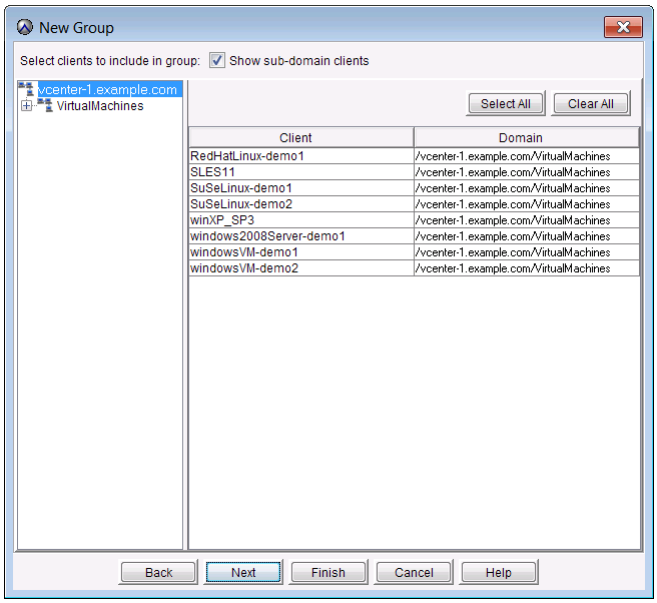
12. Select a retention policy from the **Select An Existing Retention Policy** list.

    NOTICE

    You cannot edit retention policies from this screen. Detailed retention policy properties are shown so that you can review them before you make a selection. The *EMC Avamar Administration Guide* provides detailed information about editing retention policies.

13. Click **Next**.

    The next New Group wizard screen appears.

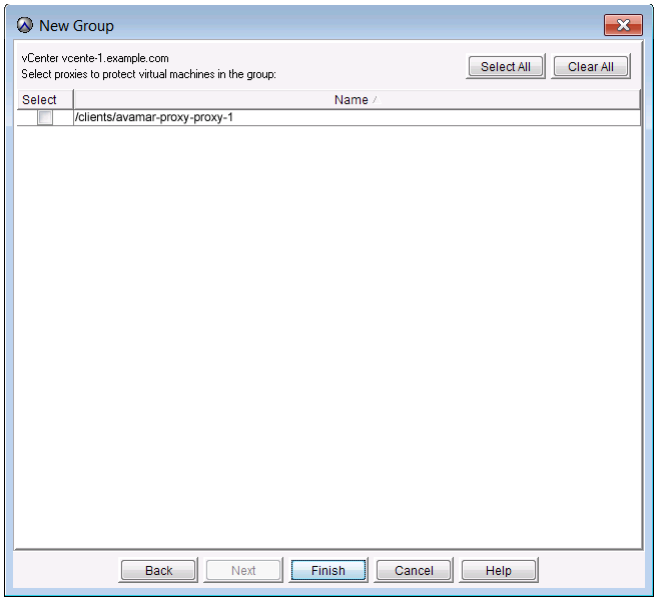


14. Select one or more virtual machine clients in the data table.

    Note: If you have created additional domains below your vCenter server, click **Show sub-domain clients** to show all available virtual machine clients.

15. Click **Next**.

    The next New Group wizard screen appears.



16. Select one or more proxies in the data table.
17. Click **Finish**.

    The New Group dialog box closes.

Editing a vCenter group

1. In Avamar Administrator, click the **Policy** launcher button.
   The Policy window appears.
2. Click the **Policy Management** tab.
3. Click the **Groups** tab.
4. Select a vCenter group and click **Edit**.

   The Edit Group dialog box appears.
5. Edit the group settings.

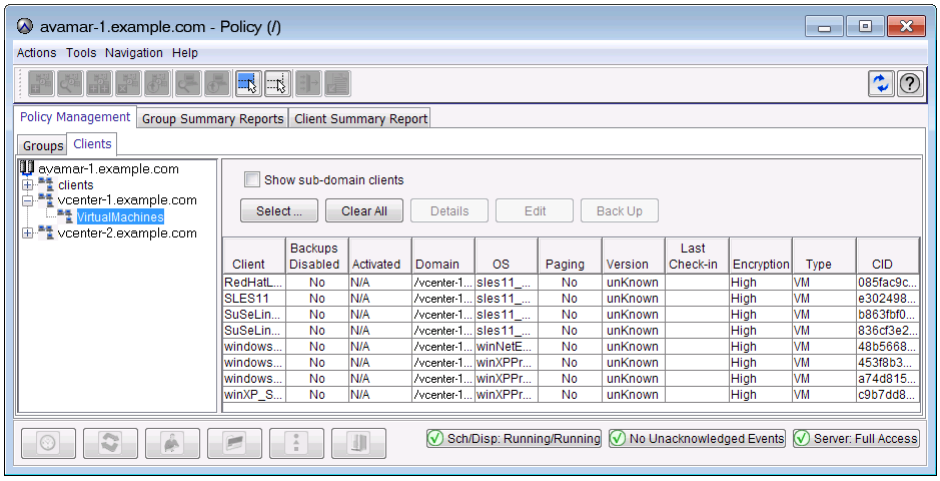
   "Adding a vCenter group" on page 60 provides detailed information about vCenter group settings.
6. Click **OK**.

   The Edit Group dialog box closes.

Editing proxy datastore and group settings

This topic describes how to change datastore and group settings for proxies. The *EMC Avamar Administration Guide* provides detailed information about editing other client policy settings.

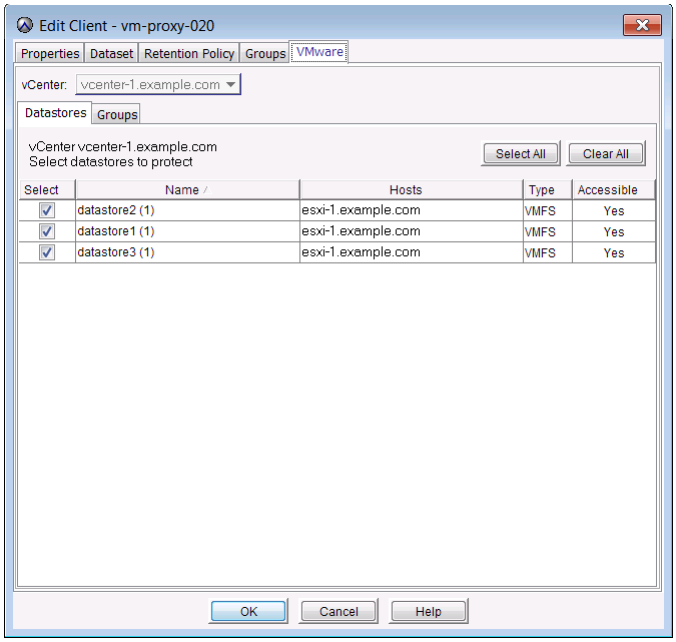
1. In Avamar Administrator, click the **Policy** launcher button.
   The Policy window appears.
2. Click the **Policy Management** tab.
3. Click the **Clients** tab.



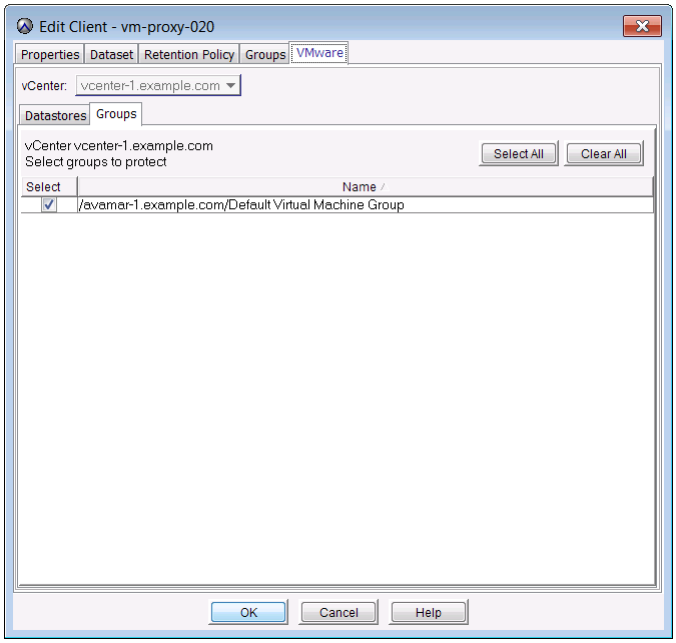
Note: Click **Show sub-domain clients** to show all available clients regardless of which domain you have selected.

4. Select a proxy and click **Edit**.
   The Edit Client dialog box appears.
5. Click the **VMware** tab.

6. Click the **Datastores** tab.



7. Select one or more datastores.
8. Click the **Groups** tab.

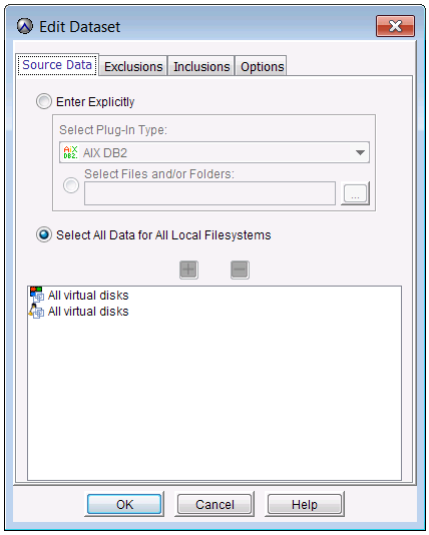


9. Select one or more groups containing virtual machine clients residing in the datastores selected in step 7.
10. Click **OK**.

    The Edit Client dialog box closes.

VMware Image Dataset

The VMware Image Dataset is the default dataset that is assigned to the Default Virtual Machine Group, and other vCenter groups when they are first added.



For the VMware Image Dataset:

- The only source data plug-ins shown are Linux and Windows virtual disks. Both are selected by default.
- The **Select Files and/or Folders** option, as well as the Exclusions and Inclusions tabs are disabled.
- Changed block tracking is enabled by default using an embedded **utilize_changed_block_list=true** plug-in option statement.

Note: When creating other datasets for use with the Avamar VMware image backup feature, copy this dataset so that you can reuse these recommended settings as the basis for other datasets. The *EMC Avamar Administration Guide* provides detailed information about adding and copying datasets.

Best practices

The following topics describe best practices to follow when configuring and using Avamar for VMware image backup and restore.

EMC Avamar Compatibility and Interoperability Matrix

Before upgrading the vCenter infrastructure, refer to the *EMC Avamar Compatibility and Interoperability Matrix* to ensure that Avamar supports that version.

Use 64-bit VMware vCenter

For best resuts, use 64-bit VMware vCenter whenever possible.

Verify ESX and vCenter certificates

Use properly registered certificates from a trusted provider that matches DNS names for ESX and vCenter.

Use fully-qualified ESX server hostnames

When adding new ESX servers to your vCenter environments, you should adhere to the VMware recommended practice of naming your ESX servers with fully-qualified hostnames (not an IP address, or simple hostname). Using anything other than a fully-qualified hostname can result in network connection failures due to incorrect SSL certificate handling.

Recommendations for high change-rate clients

Use the guest backup or Data Domain backend for high change-rate clients.

Changed block tracking recomendations

If a virtual machine contains over 10,000 changed blocks, it is generally faster to back up that client with changed block tracking disabled.

Use throttling parameters for group guest backups

When performing scheduled guest backups of virtual machines on the same ESX server, add throttling parameters to the Avamar dataset. The reason for doing this is that Avamar tries to initiate as many backups as possible, subject to certain load restrictions on the Avamar MCS. However, if multiple guest backups are attempted on virtual machines on the same ESX server, this can spike CPU usage, which will have an adverse effect on overall ESX server performance.

Edit the dataset as follows:

1. Start Avamar Administrator.
2. Select **Tools** › **Manage Datasets...**

   The Manage All Datasets window appears.
3. Select a dataset from the list and click **Edit**.

   The Edit Dataset dialog box appears.
4. Click the **Options** tab.
5. Click **Show Advanced Options**.

6. Type a non-zero in the **Network usage throttle (Mbps)** field.

   Begin with a low value such as 20. Then monitor your next backup session to verify that this has resolved any ESX server CPU usage issues.

7. Click **OK**.

   The Edit Dataset dialog box closes.

Troubleshooting

This topic describes how to resolve issues that might arise with Avamar for VMware image backup and restore.

Problems adding vCenter server as Avamar client

If you encounter problems adding a vCenter server as an Avamar client, ensure that:

- vCenter hostname, username, and password are correct.
- Port 443 is open between the Avamar server and vCenter system.

If that does not resolve the problem, try turning off certificate authentication for all vCenter-to-Avamar MCS communications as described on "Option 2: Turn off certificate authentication for all vCenter-to-Avamar MCS communications" on page 25.

Backup does not start

If a backup activity fails to start:

- Ensure that an Avamar Image Backup Proxy has been properly deployed as described in "Deploy proxy clients" on page 30.
- The datastore for the source virtual machine has been selected on a running proxy server.

If that does not resolve the problem, the account used to connect to vCenter might not have sufficient privileges. To verify account privileges, log in to the vSphere client with that username and password. Ensure that you can access datastores on that client. If you cannot, that account does not have the required privileges.

Backup snapshot errors

If backing up virtual machines with multiple disks hosted on different datastores on pre 5.x ESX servers, you might encounter the following error:

```
"Too many extra snapshot files (%d) were found on the VMs datastore.
   This can cause a problem for the backup or restore."
```

To resolve this condition, you must perform a new backup of the affected virtual machine and include the skip_datastore_check option in the Backup Options dialog box. This will force that backup operation to ignore the snapshot check, which will enable the backup to successfully complete.

To perform a backup using the skip_datastore_check plug-in option:

1. Initiate an on-demand backup of the affected virtual machin as described in "Performing an on-demand backup" on page 68.

2. When you reach the point in the procedure that instructs you to set backup options in the Backup Options dialog box, perform the following additional steps:

   a. Click **More Options**.

      The backup Command Line Options dialog box appears.

   a. Click **More**.

      The Enter Attribute and Enter Attribute Value fields appear.

   b. Type **[avvcbimage]skip_datastore_check** in the Enter Attribute field.

   c. Type **true** in the Enter Attribute Value field.

   d. Click **+**.

      [avvcbimage]skip_datastore_check=true appears in the plug-in options list.

   e. Click **OK**.

      The Backup Command Line Options dialog box closes.

3. Proceed with the remainder of the restore procedure.

Pre-existing snapshots cause restores to fail

Virtual machine restores will fail if a snapshot for that virtual machine already exists. When this occurs, the restore operation will return an error message similar to the following:

```
2011-12-07 09:30:26 avvcbimage FATAL <0000>: The pre-existing
   snapshots from VMX '[VNXe3300-Datastore1]
   vm-example/vm-example.vmx' will not permit a restore.

2011-12-07 09:30:26 avvcbimage FATAL <0000>: If necessary, use the
   '--skip_snapshot_check' flag to override this pre-existing snapshot
   check.

2011-12-07 09:30:26 avvcbimage Error <9759>: createSnapshot: snapshot
   creation failed
```

To resolve this condition, you must perform a new restore of the affected virtual machine and include the skip_snapshot_check plug-in option in the Restore Options dialog box. This will force that restore operation to overwrite the existing snapshot, which will allow the restore to successfully complete.

To perform a restore using the skip_snapshot_check plug-in option:

1. Initiate an image restore of the affected virtual machine as described in one of the following procedures:

   - “Restoring the full image or selected drives to the original virtual machine” on page 78
   - “Restoring the full image or selected drives to a different (existing) virtual machine” on page 81
   - “Restoring the full image or selected drives to a new virtual machine” on page 84

2. When you reach the point in the procedure that instructs you to set your restore options in the Restore Options dialog box, perform the following additional steps to add the skip_snapshot_check plug-in option in the Restore Options dialog box:
   a. Click **More Options**.

      The Restore Command Line Options dialog box appears.

   a. Click **More**.

      The Enter Attribute and Enter Attribute Value fields appear.

   b. Type **[avvcbimage]skip_snapshot_check** in the Enter Attribute field.

   c. Type **true** in the Enter Attribute Value field.

   d. Click **+**.

      [avvcbimage]skip_snapshot_check=true appears in the plug-in options list.

   e. Click **OK**.

      The Restore Command Line Options dialog box closes.
3. Proceed with the remainder of the restore procedure.

CHAPTER 4
Backup

This chapter provides instructions for backing up virtual machines. Topics in this chapter include:

Limitations

All backups must be initiated from Avamar Administrator

All VMware image backups must be initiated from Avamar Administrator. You cannot initiate backups from the virtual machine or proxy.

Changing virtual machine disk configuration forces a full backup

Changing a virtual machine's disk configuration (either adding or removing a disk), causes the next entire image backup to be processed as a full backup (that is, all virtual disks are processed and changed block tracking is not used), which will require additional time to complete. Backups of specific disks are not affected, unless that disk is previously unknown to Avamar.

Virtual machines with independent disks must not be suspended

If a virtual machine is configured with an independent disk, it must not be in a suspended state when a backup is initiated, or the backup will fail.

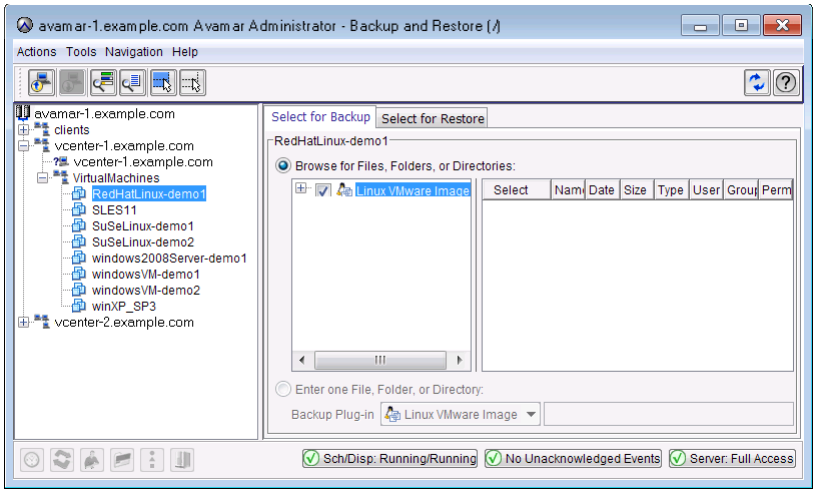
Version 8 or 9 virtual machines with disks on multiple datastores

If backing up a hardware version 8 or 9 virtual machine that has multiple disks residing on different datastores, not all datastores will be checked for orphaned snapshots. The backup will also complete without error even if some disks were not backed up.

The only known remedy is to reconfigure the virtual machine such that all virtual disks reside on the same datastore.

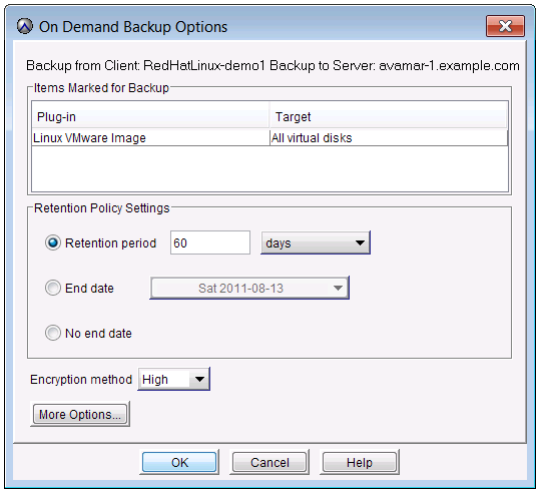
Performing an on-demand image backup

1. In Avamar Administrator, click the **Backup & Restore** launcher button.
   The Backup and Restore window appears.
2. Click the **Select for Backup** tab.
3. Select a virtual machine client in the clients tree.
4. In the **Browse for File, Folders, or Directories** pane, do one of the following:
   - Select the top (root) folder to back up the entire image.
   - Select one or more disks to only back up those specific virtual disks.



5. Select **Actions › Backup Now**.

   The On Demand Backup Options dialog box appears.



6. Review your backup settings.

   Clicking **Cancel** returns you to the Backup and Restore window where you can modify your backup selections.

7. Complete the settings as described in the following table:

Table 14 On-demand backup options

Setting	Description
Retention policy settings	Select one of the following retention policies for this backup: • Retention period — Automatically delete this backup from the Avamar server after a specific number of days, weeks, months, or years. Select this option, and type the number of days, weeks, months, or years. • End date — Automatically delete this backup from the Avamar server on a specific calendar date. Select this option and browse to that date on the calendar. • No end date — Keep this backup for as long as this client remains active in the Avamar server.

Table 14 On-demand backup options

Setting	Description
Encryption	Select one of the following encryption methods for client/server data transfer during this backup: • High — Strongest available encryption setting for that specific client platform. • Medium — Medium strength encryption. • None — No encryption. **Note:** The exact encryption technology and bit strength used for any given client/server connection is dependent on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides additional information.

8. Click **OK**.

   The On Demand Backup Options dialog box closes and the following status message appears: Backup initiated.

9. Click **Close**.

Scheduling backups

To schedule recurring VMware image backups:

1. Create a dataset for the backups.
2. Create a group for the backups. During the group creation process, you:
   a. Assign the new dataset to the new group.
   b. Assign a schedule to the new group.
   c. Assign a retention policy to the new group.
   d. Add virtual machine clients to the new group.
3. Enable scheduling for the group.

A thorough discussion of groups, group policy, datasets, schedules, and retention policies is beyond the scope of this guide. The *EMC Avamar Administration Guide* provides additional information.

CHAPTER 5
Restore

This chapter provides instructions for restoring a complete image, selected drives, or specific folders or files from an Avamar backup. Topics in this chapter include:

Overview

Avamar offers two levels of restore functionality:

- Image restore — restores an entire backup image or selected drives to the original virtual machine, another existing virtual machine, or a new virtual machine (which is created during the restore operation).
- File level restore — restores specific folders or files from an image backup.

The Avamar Administrator Backup and Restore window Restore tab displays two buttons above the Select for Restore contents pane, which are not shown if a normal (non-VMware Image) backup is selected:

Clicking the Browse for Image Restore button initiates an image restore, which enables you to restore an entire backup image, or selected drives to the original virtual machine, another existing virtual machine or a new virtual machine.

Clicking the Browse for Granular Restore button initiates a file level restore, which enables you to restore selected folders and files from an image backup.

When performing a VMware image restore, the Restore Options dialog box is slightly different from the normal (non-VMware Image) Restore Options dialog box. The primary differences are that virtual machine information is shown and three choices for restore destinations are offered:

- Original virtual machine
- Different (existing) virtual machine
- New virtual machine

Once the destination selection is made, each procedure varies slightly from that point forward.

When performing a file level restore, the procedure is substantially the same as restoring selected folders or files from a normal (non-VMware Image) backup.

Limitations

The following limitations apply to restore operations:

Server software upgrades require proxy reboots

All Avamar server software upgrades require that all proxies be rebooted. The server software upgrades primarily affect file-level restores (which will not complete until the proxy is rebooted), but is a good practice to immediately reboot all proxies following any server software upgrade.

All restores must be initiated from Avamar Administrator

All VMware image restores must be initiated from Avamar Administrator. It is not possible to initiate restores from the virtual machine or proxy client virtual machine.

Virtual machine power state

When performing an image restore, as described in "Restoring the full image or selected drives to the original virtual machine" on page 78, "Restoring the full image or selected drives to a different (existing) virtual machine" on page 81, and "Restoring the full image or selected drives to a new virtual machine" on page 84, the target virtual machine must be powered off.

When performing an file-level restore, as described in "Restoring specific folders or files" on page 87, the target virtual machine must be powered on.

File-level restore limitations

The following limitations apply to file-level restore as described in "Restoring specific folders or files" on page 87:

- VMware Tools must be installed on the target virtual machine. For best results, ensure that all virtual machines are running the latest available version of VMware Tools. Older versions are known to cause failures when browsing during the file-level restore operation.
- The following virtual disk configurations are not supported:
  - Unformatted disks
  - Dynamic disks
  - GUID Partition Table (GPT) disks
  - Ext4 filesystems
  - FAT16 filesystems
  - FAT32 filesystems
  - Extended partitions
  - Virtual disk with more than one partition
  - Two or more virtual disks mapped to single partition
  - Encrypted partitions
  - Compressed partitions
- ACLs are not restored
- Symbolic links cannot be restored or browsed
- You cannot restore more than 5,000 folders or files in the same restore operation
- The following limitations apply to logical volumes managed by Logical Volume Manager (LVM):
  - One physical volume (.vmdk) must be mapped to exactly one logical volume
  - Only ext2 and ext3 formatting is supported
- When partitions are created, the lower ordered indices must be filled first. That is, you cannot create a single partition and place it in the partition index 2, 3, or 4. That single partition must be at partition index 1.

Note: In some cases (most notably extended partitions), it may be possible to restore the entire backup image to a temporary virtual machine as described in "Restoring the full image or selected drives to a different (existing) virtual machine" on page 81 or "Restoring the full image or selected drives to a new virtual machine" on page 84, then selectively copy the folders or files you need.

Guidelines for performing image restores versus file-level restores

Avamar provides two distinct mechanisms for restoring virtual machine data:

- Image restores, which allow you to restore an entire image or selected drives
- File-level restores, which allow you to restore specific folders or files

Image restores are less resource intensive and are generally of restoring large amounts of data quickly.

File-level restores are more resource intensive and are best used to restore a relatively small amounts of data. Also, when performing any file-level restore, you cannot restore more than 5,000 folders or files in the same restore operation.

Therefore, if you must restore large numbers of folders or files, you will experience better performance if you restore an entire image or selected drives to a temporary location (for example, a new temporary virtual machine), then copy those files to the desired location following the restore.

Restoring the full image or selected drives to the original virtual machine

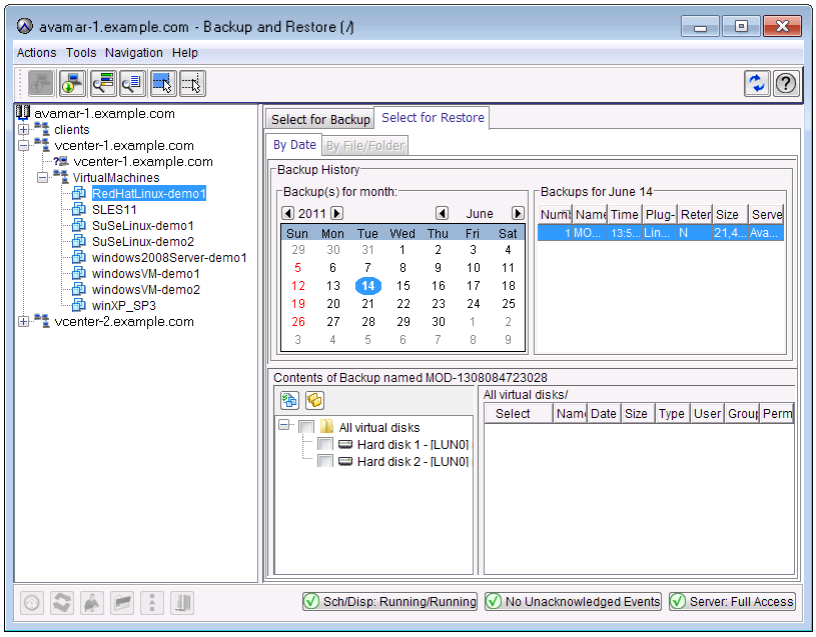
NOTICE

If restoring from a template backup, the Restore to original virtual machine destination is disabled.

To restore the full image or selected drives to the original virtual machine:

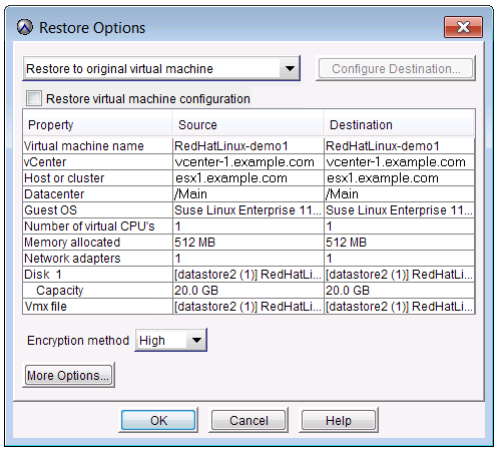
1. In the vSphere Client, ensure that the target virtual machine is powered off.
2. In Avamar Administrator, click the **Backup & Restore** launcher button.
   

   The Backup and Restore window appears.
3. Click the **Select for Restore** tab.
4. Select the original virtual machine in the clients tree.
5. Locate and select a backup.
   
6. Click the **Browse for Image Restore** button directly above the contents pane.
7. In the contents pane, do one of the following:
   - Select the **All virtual disks** folder checkbox to restore the entire image.
   - Select one or more drives to only restore those specific drives.



8. Select **Actions › Restore Now**.

   The Restore Options dialog box appears.



9. Select **Restore to original virtual machine** as the restore destination.

   Note: When restoring an image backup to the original virtual machine, the **Configure Destination** button is disabled.

10. (Optional) If you want to restore VMware configuration files, select **Restore virtual machine configuration**.

11. Select one of the following encryption methods for client/server data transfer during this restore:
    - **High** — Strongest available encryption setting for that specific client platform.
    - **Medium** — Medium strength encryption.
    - **None** — No encryption.

    Note: The exact encryption technology and bit strength used for any given client/server connection is dependent on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides additional information.

12. Click **More Options**.

    The Restore Command Line Options dialog box appears.

13. Select or clear **Use changed block tracking to increase performance**.
14. Select one of the following settings in the **Select Post Restore Options** list:
    - **Do not power on VM after restore**.
    - **Power on VM with NICs enabled**.
    - **Power on VM with NICs disabled**.
15. (Optional) To include plug-in options with this restore, configure the settings. "Plug-in Options" on page 97 provides detailed information.
16. Click **OK**.

    The Restore Options dialog box closes, and the following warning message appears:

    ```
    Hardware compatibility issues between source, and target
    destinations may result in a non-operational restored virtual
    machine.
    ```

    This message is advising you that the restored virtual machine might not boot if the virtual machine configuration has changed since the backup was taken.

17. Click **OK**.

    The previous message dialog box closes, and the following message appears:

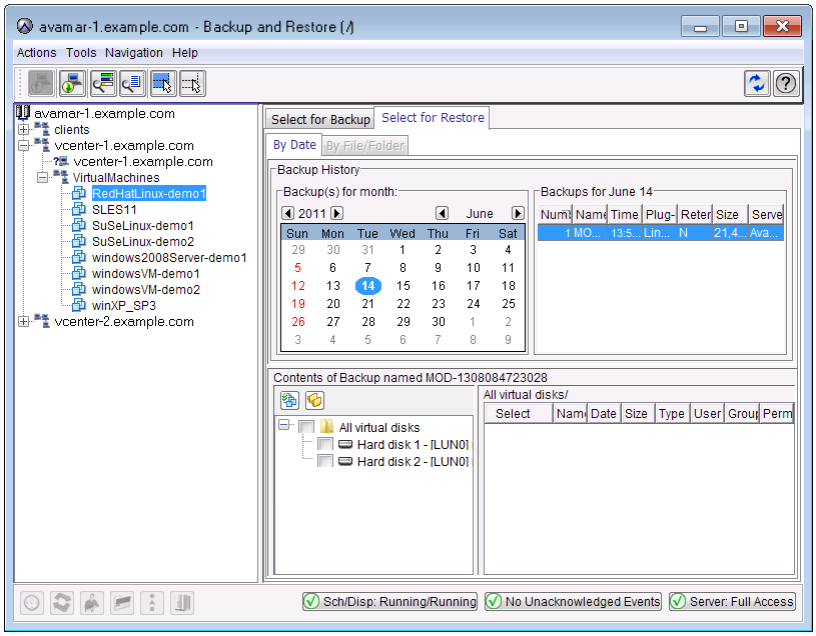
    ```
    Restore initiated.
    ```

18. Click **Close** to dismiss the message.

Restoring the full image or selected drives to a different (existing) virtual machine

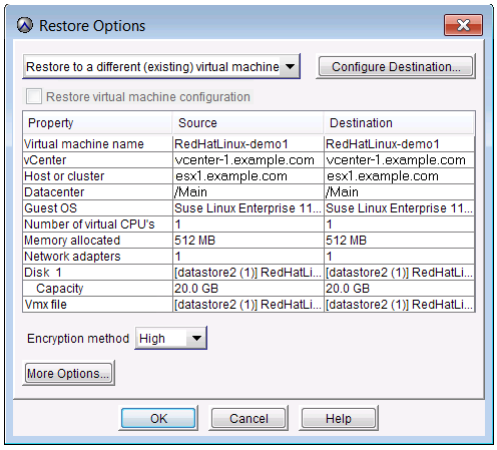
1. In the vSphere Client, ensure that the target virtual machine is powered off.
2. In Avamar Administrator, click the **Backup & Restore** launcher button.
   The Backup and Restore window appears.
3. Click the **Select for Restore** tab.
4. Select a virtual machine in the clients tree.

5. Locate and select a backup.
6. Click the **Browse for Image Restore** button directly above the contents pane.
7. In the contents pane:
   - Select the **All virtual disks** folder checkbox to restore the entire image.
   - Select one or more drives to only restore those specific drives.



8. Select **Actions** › **Restore Now**.

   The Restore Options dialog box appears.

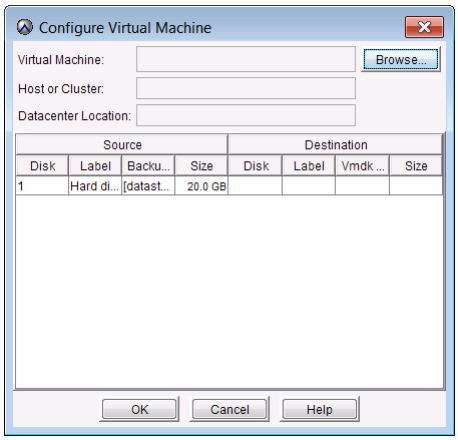


9. Select **Restore to a different (existing) virtual machine** as the restore destination.

   Note: When restoring an image backup to a different (existing) virtual machine, the **Restore virtual machine configuration** option is disabled.

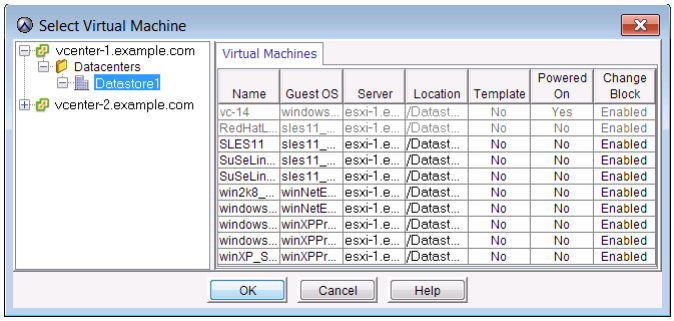
10. Click **Configure Destination**.

    The Configure Virtual Machine dialog box appears.



11. Click **Browse**.

    The Select Virtual Machine dialog box appears.



    Note: Only virtual machines that are powered off can be selected from the list; all others are disabled. You are also prevented from selecting the original virtual machine.

12. Select the destination virtual machine and click **OK**.

    The Select Virtual Machine dialog box closes.

13. Switch to **Configure Virtual Machine** dialog box and click **OK**.

    The Configure Virtual Machine dialog box closes.

14. Switch to **Restore Options** dialog box.

15. Select one of the following encryption methods for client/server data transfer during this restore:

    - **High** — Strongest available encryption setting for that specific client platform.
    - **Medium** — Medium strength encryption.
    - **None** — No encryption.

    Note: The exact encryption technology and bit strength used for any given client/server connection is dependent on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides additional information.

16. Click **More Options**.

    The Restore Command Line Options dialog box appears.

17. Select or clear **Use changed block tracking to increase performance**.

18. Select one of the following settings in the **Select Post Restore Options** list:

    - **Do not power on VM after restore**.
    - **Power on VM with NICs enabled**.
    - **Power on VM with NICs disabled**.

19. (Optional) To include plug-in options with this restore, configure the settings. "Plug-in Options" on page 97 provides detailed information.

20. Click **OK**.

    The Restore Options dialog box closes, and the following warning message appears:

    ```
    Hardware compatibility issues between source, and target
    destinations may result in a non-operational restored virtual
    machine.
    ```

    This message is advising you that the restored virtual machine might not boot if the target virtual machine configuration is incompatible with the backup.

21. Click **OK**.

    The previous message dialog box closes, and the following message appears:

    ```
    Restore initiated.
    ```

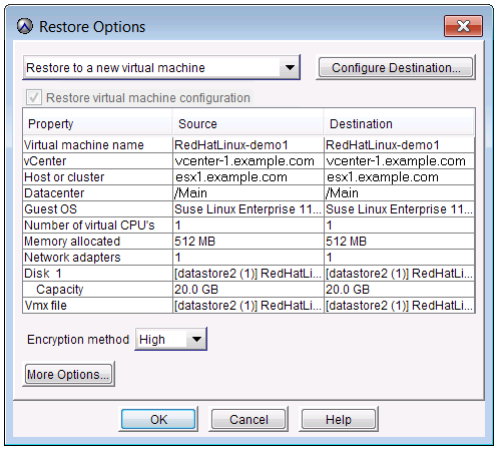
22. Click **Close**.

Restoring the full image or selected drives to a new virtual machine

1. In Avamar Administrator, click the **Backup & Restore** launcher button.
   The Backup and Restore window appears.
2. Click the **Select for Restore** tab.
3. Select a client in the clients tree.
4. Locate and select a backup.

5. Click the **Browse for Image Restore** button directly above the contents pane.
6. In the contents pane:
   - Select the **All virtual disks** folder checkbox to restore the entire image.
   - Select one or more drives to only restore those specific drives.
7. Select **Actions** › **Restore Now**.

   The Restore Options dialog box appears.

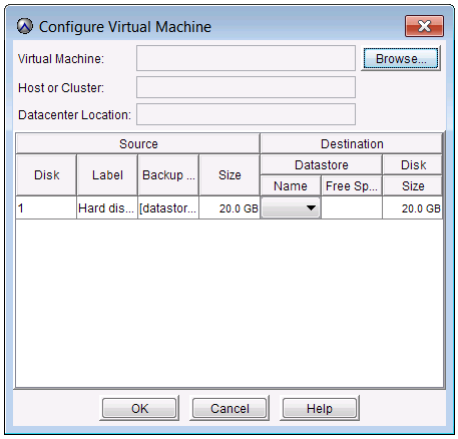


8. Select **Restore to a new virtual machine** as the restore destination.

Note: When restoring an image backup to a new virtual machine, the **Restore virtual machine configuration** option is selected and disabled becuase these configuration files are always required to configure the new virtual machine.

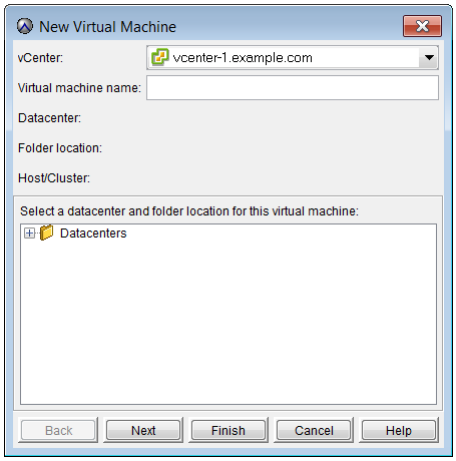
9. Click **Configure Destination**.

   The Configure Virtual Machine dialog box appears.



10. Click **Browse**.

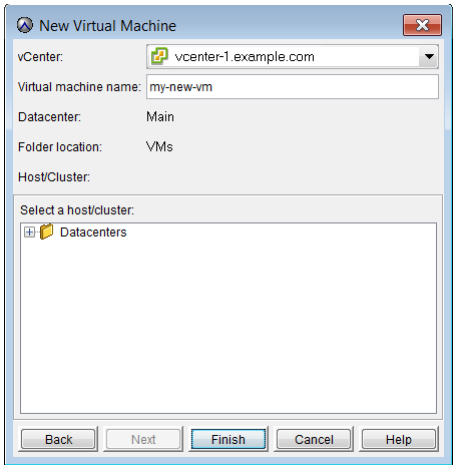
    The New Virtual Machine wizard appears.



11. Type a name for the new virtual machine in the **Virtual Machine Name** field.
12. In the tree, select a datacenter and folder location for this new virtual machine.

13. Click **Next**.

    The next New Virtual Machine wizard screen appears.



14. In the tree, select a host/cluster location for this new virtual machine.
15. Click **Finish**.

    The New Virtual Machine wizard screen closes.
16. Switch to **Configure Virtual Machine** dialog box and click **OK**.

    The Configure Virtual Machine dialog box closes.
17. Switch to **Restore Options** dialog box.
18. Select one of the following encryption methods for client/server data transfer during this restore:
    - **High** — Strongest available encryption setting for that specific client platform.
    - **Medium** — Medium strength encryption.
    - **None** — No encryption.

    Note: The exact encryption technology and bit strength used for any given client/server connection is dependent on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides additional information.
19. Click **More Options**.

    The Restore Command Line Options dialog box appears.
20. Select or clear **Use changed block tracking to increase performance**.
21. Select one of the following settings in the **Select Post Restore Options** list:
    - **Do not power on VM after restore**.
    - **Power on VM with NICs enabled**.
    - **Power on VM with NICs disabled**.

22. (Optional) To include plug-in options with this restore, configure the settings. "Plug-in Options" on page 97 provides detailed information.
23. Click **OK**.

    The Restore Options dialog box closes and the following message appears:

    ```
    Restore initiated.
    ```

24. Click **Close**.

Restoring specific folders or files

NOTICE

You cannot restore more than 5,000 folders or files in the same file-level restore operation. "Guidelines for performing image restores versus file-level restores" on page 78 provides details.

To selectively restore folders, and files from an existing VMware image backup:

1. In the vSphere Client, ensure that the target virtual machine is powered on and fully operational.

2. In Avamar Administrator, click the **Backup & Restore** launcher button.

   The Backup and Restore window appears.
3. Click the **Select for Restore** tab.
4. Select a client in the clients tree.
5. Locate and select a backup.

6. Click the **Browse for Granular Restore** button.
7. Select one or more folders or files you want to restore.
8. Select **Actions** › **Restore Now**.

   The Restore Options dialog box appears.
9. Select the target location for the restored data:
   a. Click **Browse** next to the **Absolute Destination** box.

      The Browse for Restore Client dialog box appears.
   b. Browse to and select the destination client.
   c. In the Browse for Folders or Directories pane, expand the tree by clicking **+**.

      The Log into Virtual Machine dialog box appears.
   d. Type virtual machine client login credentials in the User name and Password boxes.

      Note: These login credentials must have administration privileges on the virtual machine guest operating system.

   e. Click **Log On**.

The Log into Virtual Machine dialog box closes.

f. In the **Browse for Restore Client** dialog box, browse to and select the destination folder that will receive the restored data.

g. Click **OK**.

The Browse for Restore Client dialog box closes.

10. Switch to the **Restore Options** dialog box.
11. Select one of the following encryption methods for client/server data transfer during this restore:
    - **High** — Strongest available encryption setting for that specific client platform.
    - **Medium** — Medium strength encryption.
    - **None** — No encryption.

    Note: The exact encryption technology and bit strength used for any given client/server connection is dependent on a number of factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides additional information.
12. Click **More Options**.

    The Restore Command Line Options dialog box appears.
13. Select or clear **Use changed block tracking to increase performance**.
14. Select one of the following settings in the **Select Post Restore Options** list:
    - **Do not power on VM after restore**.
    - **Power on VM with NICs enabled**.
    - **Power on VM with NICs disabled**.
15. (Optional) To include plug-in options with this restore, configure the settings. "Plug-in Options" on page 97 provides detailed information.
16. Click **OK**.

    The Restore Options dialog box closes.

    The Restore Request dialog box appears and shows that a restore request has been initiated.
17. Click **Close**.

    The Restore Request dialog box closes.

CHAPTER 6
Protecting the vCenter Management Infrastructure

This chapter describes how to protect the vCenter management infrastructure with Avamar. Topics in this chapter include:

Overview

This chapter covers how to protect the actual vCenter management infrastructure (not the virtual machines within that environment).

Avamar provides support for backing up the following vCenter management infrastructure components:

- License files
- SSL certificates
- Audit logs
- Windows guest customization (sysprep) files
- Database-hosted configuration settings
- UpdateManager database
- Site Recovery Manager (SRM) database

The vCenter runs on a 32- or 64-bit Windows host. It also comprises a database server which can run on a different host. Some optional vSphere components require additional databases that can be hosted on the same host as vCenter or on different database server hosts.

The basic methodology for protecting vCenter management infrastructure is to implement either guest backup or VMware image backup on each virtual host using a custom dataset that only backs up important vCenter management infrastructure components.

Recovering vCenter management infrastructure using Avamar backups is a two-step process in which you first create a restore target virtual machine with a fresh operating system image, then restore the vCenter management infrastructure components from the latest Avamar backup.

One advantage to protecting your vCenter management infrastructure with Avamar is that you can also use the Avamar backup to facilitate vCenter upgrades (for example, upgrading the vCenter host from a 32-bit to a 64-bit Windows virtual machine).

Backing up the vCenter management infrastructure

As previously mentioned, the basic methodology for protecting vCenter management infrastructure is to implement either guest backup or VMware image backup on each virtual host using a custom dataset that only backs up important vCenter management infrastructure components.

You should then add the vCenter Avamar clients to a group and schedule these backups at regular intervals.

A comprehensive discussion of groups, group policy, datasets, schedules, and retention policies is beyond the scope of this publication. The *EMC Avamar Administration Guide* provides detailed information.

Task list

Protecting the vCenter management infrastructure comprises the following tasks, which should be performed in the following order:

- "Task 1: Implement guest backups or VMware image backups" on page 91
- "Task 2: Define a custom dataset for vCenter backups" on page 91
- "Task 3: Add a backup client for vCenter database hosts" on page 92

Task 1: Implement guest backups or VMware image backups

To protect the vCenter management infrastructure:

- Install and register Avamar Client for Windows software on the vCenter host as described in the *EMC Avamar Backup Clients User Guide*.
- Install and register the correct Avamar database software on each database host as described in various database-specific documentation such as the *EMC Avamar for SQL Server User Guide*.

Task 2: Define a custom dataset for vCenter backups

For best results, define a custom dataset strictly for use in backing up the following vCenter management infrastructure components:

Table 15 Important vCenter management infrastructure components

Component	Default Location
License files	The exact location depends on the specific VMware and Windows version, but is typically one of the following folders: • C:\Program Files(x86)\VMware\Infrastructure\VirtualCenter Server\licenses\site • C:\Program Files\VMware\VMware License Server\Licenses
SSL certificates	The exact location depends on the specific VMware and Windows version, but is typically one of the following folders: • C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\SSL • C:\ProgramData\VMWare\VMware VirtualCenter\SSL
Audit logs	The exact location depends on the specific VMware and Windows version, but is typically one of the following folders: • C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\Logs • C:\ProgramData\VMWare\VMware VirtualCenter\Logs
Windows guest customization (sysprep) files	The exact location depends on the specific VMware and Windows version, but is typically one of the following folders: • C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\sysprep • C:\ProgramData\VMWare\VMware VirtualCenter\sysprep

Use of a custom dataset will not only shorten backup and restore times, but will also allow you to use Avamar backups to facilitate vCenter upgrades (for example, upgrading the vCenter host from a 32-bit to a 64-bit Windows virtual machine).

1. Start Avamar Administrator.
2. Select **Tools** › **Manage Datasets**.

   The Manage All Datasets window appears.
3. Click **New**.

   The New Dataset dialog box appears.
4. Type a name for this new dataset (for example, vCenter).

   Note: ???????Do not use any of the following characters in your dataset name: ~!@$^%(){}[]|,`;#\/:*?‹›'"&.
5. Click the **Source Data** tab.

   The Source Data tab is where you define a list of source data plug-ins that contribute data to this dataset.
6. Select **Enter Explicitly** and select the **Windows File System** plug-in from the **Select Plug-In Type** list.
7. In the list of backup targets at the bottom of the dialog box, delete every entry except for the Windows File System plug-in by selecting an entry and clicking **-**.
8. Add each vCenter management infrastructure component to the dataset as follows:
   a. Select **Files and/or Folders** and click **...**

      The Select Files And/Or Folders dialog box appears.
   b. Browse to the correct license file folder and select it.
   c. Click **OK**.

      The Select Files And/Or Folders dialog box closes. The license file folder appears in the list of backup targets at the bottom of the New Dataset dialog box.
   d. Repeat step a –step c for the remaining important vCenter management infrastructure components (that is, the SSL certificates, audit logs, and windows guest customization (sysprep) files).
9. Click **OK**.

   The New Dataset dialog box closes.

Task 3: Add a backup client for vCenter database hosts

The location of the database used by vCenter, UpdateManage, SRM, and so forth can be determined by running the Windows Data Sources (ODBC) administrative tool.

Install Avamar database backup agents on the database hosts as described in the database-specific documentation, such as the *EMC Avamar for SQL Server User Guide*.

Configure a scheduled backup to protect the databases.

You should truncate vCenter database transaction logs after each backup. This can be done by selecting the SQL Server plug-in **Truncate database log** option. Truncating database transaction logs ensures that logs will not grow too large, and consume excessive amounts of space on the Avamar server.

Recovering vCenter management infrastructure from Avamar backups

Recovering vCenter management infrastructure from Avamar backups is a two-step process in which you first create a restore target virtual machine with a fresh operating system image, then restore the vCenter management infrastructure components from the latest Avamar backup. The *EMC Avamar Administration Guide* provides detailed information.

APPENDIX A
vSphere Data Ports

This appendix lists Avamar port usage in a typical vSphere environment. Topics in this chapter include:

Communication ports

All ports are TCP.

Table 16 vSphere communication ports

		VMware		Avamar	
		vCenter	ESX Server	Proxy Clients	Backup Clients
VMware	vCenter	n/a	*V	443‹	n/a
	ESX Server	*V	n/a	902‹	n/a
Avamar	Proxy Clients	n/a	n/a	n/a	n/a
	MCS	›443	n/a	›28002 28001‹	›28002 28001‹

Legend:
*V= Defined by VMware
‹ or › indicates port direction

Listen ports

All ports are TCP unless specifically designated as UDP.

Table 17 vSphere listen ports

		Initiator			
		VMware		Avamar	
		vCenter	ESX Server	Proxy	Utility Node
VMware	vCenter	n/a	*V	443	443
	ESX Server	*V	n/a	902	n/a
Avamar	Proxy	n/a	n/a	n/a	28002
	Utility Node	n/a	n/a	137 (UDP) 138 (UDP) 139 445 27000 28001 29000	n/a

Legend:
*V= Defined by VMware

APPENDIX B
Plug-in Options

The following topics provide information about backup and restore plug-in options for various Avamar for VMware image backup and restore plug-ins:

How to set plug-in options

Plug-in options enable you to control specific actions for on-demand backups, restores, and scheduled backups. The plug-in options that are available depend on the operation type and client plug-in type.

You specify plug-in options for on-demand backup or restore operations or when you create a dataset for a scheduled backup. You can set options by using the graphical controls and by typing options and values in the Enter Attribute and Enter Attribute Value fields.

NOTICE

No error checking or validation is performed on free text entries. In addition, free text entries override settings made using the graphical controls.

Detailed instructions on how to access and set plug-in options during a backup or restore are available in "Backup" on page 71 and "Restore" on page 75.

Linux VMware Image plug-in options

This topic describes the available options for the Avamar Linux VMware Image plug-in.

Table 18 Linux VMware image backup options

Setting	Description
Use changed block tracking to increase performance	If selected, the VMware changed block tracking feature is used to identify areas of the virtual machine filesystem that have changed since the last backup and only process those changed areas during the next backup. **Note:** Changed block tracking must be enabled at the virtual machine level in order for this feature to work.
Use Data Domain system	If this Avamar server is configured to support storing backups on a Data Domain system, selecting this option directs this backup to the selected Data Domain system.

Table 19 Linux VMware image restore options

Setting	Description
Use changed block tracking to increase performance	If selected, the VMware changed block tracking feature is used to identify areas of the virtual machine filesystem that have changed since the last backup and only process those changed areas during this restore operation. **Note:** Changed block tracking must enabled at the virtual machine level in order for this feature to work.

Windows VMware Image plug-in options

This topic describes the available options for the Avamar Windows VMware Image plug-in.

Table 20 Windows VMware image backup options

Setting	Description
Use changed block tracking to increase performance	If selected, the VMware changed block tracking feature is used to identify areas of the virtual machine filesystem that have changed since the last backup and only process those changed areas during the next backup. **Note:** Changed block tracking must be enabled at the virtual machine level in order for this feature to work.
Use Data Domain system	If this Avamar server is configured to support storing backups on a Data Domain system, selecting this option directs this backup to the selected Data Domain system.

Table 21 Windows VMware image restore options

Setting	Description
Use changed block tracking to increase performance	If selected, the VMware changed block tracking feature is used to identify areas of the virtual machine filesystem that have changed since the last backup and only process those changed areas during this restore operation. **Note:** Changed block tracking must enabled at the virtual machine level in order for this feature to work.

Linux VMware File-level Restore plug-in options

Backup operations are not supported by the Avamar Linux VMware File-level Restore plug-in, and no user-configurable restore options are available.

Windows VMware File-level Restore plug-in options

Backup operations are not supported by the Avamar Windows VMware File-level Restore plug-in, and no user-configurable restore options are available.

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