You can find the most up-to-date technical documentation on the VMware Web site at:
http://www.vmware.com/support/
The VMware Web site also provides the latest product updates.
If you have comments about this documentation, submit your feedback to:
docfeedback@vmware.com
Create a Source Virtual Machine in Fusion Pro 38
Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX) 40
Install the Mirage Client In a Source Virtual Machine 42
Prepare a Source Virtual Machine to Join an Active Directory Domain 43
Compress a Source Virtual Machine Package 44
Register a Source Virtual Machine with the Horizon FLEX Policy Server 44
Creating Policies and Entitlements 45
  Configure a General Policy for a Horizon FLEX Image 46
  Configure a USB Device Policy for a Horizon FLEX Image 47
  Configure a Custom USB Device Policy for a Horizon FLEX Image 48
  Update a Policy for a Deployed Horizon FLEX Image 50
  Entitle a Horizon FLEX Image 50
  Create a Virtual Machine Name Pattern 52
Create a URI to Deploy a Horizon FLEX Virtual Machine 53

6 Managing Horizon FLEX Virtual Machines 55
  Manage Horizon FLEX Virtual Machines 55

7 Maintaining the Horizon FLEX System 57
  Upgrade from Previous Horizon FLEX Versions 57
  Horizon FLEX System Logs 58

Index 59
The *VMware Horizon FLEX Administration Guide* describes how to install and administer VMware Horizon® FLEX™.

**Intended Audience**

This information is intended for anyone who wants to install Horizon FLEX. The information is written for experienced Windows system administrators who are familiar with virtual machine technology.
Introducing Horizon FLEX

Horizon FLEX is a policy-based, containerized desktop solution that enables IT administrators to create, secure, and manage local desktops for end users. End users work within a restricted virtual machine, called a Horizon FLEX virtual machine, on their own computers. Because Horizon FLEX virtual machines are stored locally, on end-user computers, corporate applications are accessible to offline users.

This chapter includes the following topics:

- “Horizon FLEX Components,” on page 7
- “Horizon FLEX Architecture,” on page 8
- “Horizon FLEX System Requirements,” on page 10
- “Horizon FLEX Server System Requirements,” on page 10
- “Horizon FLEX Network Requirements,” on page 11
- “Supported Host and Guest Operating Systems,” on page 12

Horizon FLEX Components

Horizon FLEX is a combination of VMware components, including Mirage, Fusion Pro, and Workstation Player.

**VMware Mirage® for Horizon FLEX**

The Mirage Server that is used by Horizon FLEX. The server provides Horizon FLEX virtual machine management. You can manage, back up, and patch virtual machines by using the Mirage for Horizon FLEX layering technology. Use of Mirage for Horizon FLEX is optional. You can also use other image management tools to manage Horizon FLEX virtual machines.

**Horizon FLEX Policy Server**

The standard Mirage server with an extension that includes Horizon FLEX-specific functionality. The Horizon FLEX Policy Server is activated after you apply the Horizon FLEX license to Mirage for Horizon FLEX.

**Horizon FLEX Admin Console**

The Web management user interface for the Horizon FLEX Policy Server. The Horizon FLEX Admin Console is located in the Mirage Web Manager component. You use the Horizon FLEX Admin Console to perform virtual machine management tasks, including the following:

- Manage an inventory of virtual machines
- Browse a list of users and groups in the Active Directory service
- Entitle users and groups to one or more virtual machines
- Specify virtual machine policies for a given entitlement
- Prevent users from accessing virtual machines by using remote lock
- Examine virtual machine details and status at any time

**Horizon FLEX Client**
The client software that end users use to download the Horizon FLEX virtual machines to their local computers. The clients include VMware Fusion Pro® Pro for Mac computers and VMware Workstation Player™ for Windows computers. Fusion Pro and Workstation Player are included in the Horizon FLEX package. One license key is provided for both Fusion Pro and Workstation Player.

**Horizon FLEX Virtual Machine**
The virtual machine that end users run on their own computers. You use Fusion Pro to create source virtual machines for Horizon FLEX virtual machines. Fusion Pro is included in the Horizon FLEX package. A Horizon FLEX server can support up to 10,000 users.

**NOTE** You can also use VMware Workstation Pro™ to create source virtual machines. Workstation Pro is not included in the Horizon FLEX package.

---

### About Mirage
Mirage is integral to the operation and use of Horizon FLEX virtual machines.
Horizon FLEX uses a subset of the features available in Mirage:
- Mirage Server
  - Mirage Management Server
- Mirage Web Manager
  - Mirage Management Console

This document does not describe all of the information pertaining to Mirage. For complete information about Mirage, see the Mirage documentation at [https://www.vmware.com/support/pubs/mirage_pubs.html](https://www.vmware.com/support/pubs/mirage_pubs.html).

### Horizon FLEX Architecture
A typical Horizon FLEX deployment includes the Horizon FLEX server, a file server, an HTTPS proxy, a read-only domain controller (RODC), and offsite and onsite end-user systems.

**Figure 1-1** shows the relationships between the major components of a Horizon FLEX deployment.
The Horizon FLEX server is composed of the Horizon FLEX Admin Console and the Horizon FLEX Policy Server. The Horizon FLEX server provides the following functionality.

- Assigns Horizon FLEX virtual machines to users and groups from a directory service
- Maintains a record of Horizon FLEX virtual machines in use by individual users
- Provides security certificate management to ensure the secure and trusted communication between the deployed Horizon FLEX virtual machines and the Horizon FLEX server.
- Enforces policy settings to the client
- Enables modification of policy settings for a given user and Horizon FLEX virtual machine combination
- Monitors Horizon FLEX virtual machine status

The Mirage Management Console is the graphical user interface used for scalable maintenance, management, and monitoring of deployed endpoints. The Mirage Web Manager mirrors Mirage Management Console functionality.

By default, port 7443 is used by the Horizon FLEX Policy Server for external access, and port 8443 is used by the Mirage Management Server to communicate with the Horizon FLEX Policy Server. You must configure your firewall policies to allow the required ports. For a complete list of ports used by Mirage, see the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

File Server

A file server stores the TAR files that contain the source virtual machine files for Horizon FLEX virtual machines. The file server can be on any server that a client user can access without entering credentials. The file server is located inside the DMZ in this example but that is not required.
HTTPS Proxy
An HTTPS proxy enables offsite end-user systems to reach the Mirage Management Console and get policy updates.

RODC
An RODC enables office end-user systems to log in to their Horizon FLEX virtual machines and join the Active Directory domain for the first boot up of the VM. An RODC is required only if you are allowing outside users to log in without using a VPN. The RODC is inside the DMZ.

Load Balancing
Horizon FLEX supports load balancing using multiple policy servers. Set up an active/passive Windows server set for fault tolerance for your Horizon FLEX topology.

Horizon FLEX System Requirements
Each product in the Horizon FLEX package has certain system requirements.

Horizon FLEX Server and Mirage Server Requirements
For more information, see “Horizon FLEX Server System Requirements,” on page 10.

Mirage for Horizon FLEX
The system requirements for Horizon FLEX 1.7 are the same as for Mirage 5.6. See the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

Horizon FLEX Client for Mac
Fusion Pro 8.1 is the Horizon FLEX Client for Mac for Horizon FLEX 1.7.
For Fusion Pro hardware and software requirements, see the VMware Horizon FLEX Client User Guide.

Horizon FLEX Client for Windows
Workstation Player 12.1 is the Horizon FLEX Client for Windows for Horizon FLEX 1.7. For more information about Workstation Player, see the Workstation Player for Windows documentation at https://www.vmware.com/support/pubs/player_pubs.html.
For Workstation Player hardware and software requirements, see the VMware Horizon FLEX Client User Guide.

Workstation Pro
You can use Workstation Pro 12.1 to create and open a source virtual machine, but Workstation Pro cannot download a Horizon FLEX virtual machine.
Workstation Pro is not included in the Horizon FLEX installation package.
For Workstation Pro hardware and software requirements, see the Workstation Pro documentation at https://www.vmware.com/support/pubs/ws_pubs.html.

Horizon FLEX Server System Requirements
The Horizon FLEX environment includes system requirements for both the Horizon FLEX server and the Mirage server.

Horizon FLEX Server System Requirements
- Minimum CPU: 1 Quad-Core Processor or 2 vCPU
- 2.26 GHz Intel core speed or equivalent
- Minimum RAM: 512 MB with 4 GB recommended
- Minimum disk space: 10 GB+, 40 GB+ recommended
- Windows Server 2008 R2, Windows Server 2012 or later
- .NET 4.5.1 and later
- IIS 7.0+ with IIS6 Management Compatibility, with ASP and ASP.NET
- Active Directory: Administrator account with permissions to add computer objects to the domain
- Any of the following Microsoft SQL server versions (required for Mirage installation):
  - Microsoft SQL server 2008 64-bit R2 Express, Standard or Enterprise edition
  - Microsoft SQL server 2012 64-bit SP1 Express, Standard or Enterprise edition
  - Microsoft SQL server 2014 64-bit Express, Standard or Enterprise edition
- HTTP file share or IIS virtual directory with available space for source virtual machines
- Firewall ports for the Horizon FLEX Admin Console
  - IIS and Horizon FLEX Web App default ports: HTTP - 7080, HTTPS - 7443 (Calls directed to the HTTP port are redirected to the HTTPS port.)
  - Mirage Management Server listens to Windows Communication Foundation (WCF) requests on the following port: HTTP - 8443
- A certificate is required for the Horizon FLEX Server if using SSL.

**Mirage Server Requirements**
- Minimum CPU: 4 vCPU with 8 vCPU recommended
- Minimum RAM: 8 GB with 16 GB recommended
- 146 GB free disk space
- Windows 2008 R2, Windows 2012 or later
- .NET 4.5.1 and later

**Horizon FLEX Network Requirements**
Horizon FLEX enables end users to run corporate applications even when they are disconnected from the network. Horizon FLEX virtual machines are stored locally for a complete desktop experience that does not require a network connection.

A network connection is required between the Horizon FLEX Policy Server and the Horizon FLEX Client in the following circumstances:
- For the initial download of the Horizon FLEX virtual machine to the user's local computer.
- To register a Horizon FLEX virtual machine that was provided on a USB device or deployed on the user's local computer.
- To receive Horizon FLEX virtual machine restriction and policy updates.

When you register a source virtual machine for a Horizon FLEX virtual machine, you specify a download location URL for virtual machine package. The download folder must be accessible to end user computers for end users to download virtual machines.
**Supported Host and Guest Operating Systems**

The local computer on which end users use the Horizon FLEX Client must have a supported host operating system. A Horizon FLEX virtual machine must use a supported guest operating system.

**Supported Host Operating Systems**

Your end users can run the Horizon FLEX Client and access their Horizon FLEX virtual machine by using a physical computer that has one of the following operating systems.

<table>
<thead>
<tr>
<th>Supported Host Operating Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workstation Player for Windows</td>
</tr>
<tr>
<td>Windows 7</td>
</tr>
<tr>
<td>Windows 8.1 Enterprise</td>
</tr>
<tr>
<td>Windows Server 2012 R2</td>
</tr>
<tr>
<td>Windows 8</td>
</tr>
<tr>
<td>Windows 8.1 Pro</td>
</tr>
<tr>
<td>Windows 10</td>
</tr>
<tr>
<td><strong>Note</strong>: Workstation Player supports only 64-bit operating systems.</td>
</tr>
<tr>
<td>Fusion Pro</td>
</tr>
<tr>
<td>Mac OS X 10.11</td>
</tr>
<tr>
<td>Mac OS X 10.10</td>
</tr>
<tr>
<td>Mac OS X 10.9</td>
</tr>
</tbody>
</table>

**Supported Guest Operating Systems**

A Horizon FLEX virtual machine can contain one of the following guest operating systems.

- Windows 10
- Windows 8.1
- Windows 7
- Windows XP
- Windows Server 2012 R2
- Ubuntu 14.04
- Ubuntu 15.10
The Horizon FLEX installation involves installing the Horizon FLEX server and client components, creating folders to store Horizon FLEX virtual machines, preparing Active Directory, setting up certificates, and creating and deploying Horizon FLEX virtual machines.

This chapter includes the following topics:

- “Horizon FLEX Installation Overview,” on page 13
- “Installing and Configuring Mirage Components for the Horizon FLEX Server,” on page 14
- “Create a Download Folder for Horizon FLEX Virtual Machine Packages,” on page 15
- “Configure Active Directory Settings,” on page 15
- “Test the Horizon FLEX Admin Console Connection,” on page 16
- “Installing the Horizon FLEX Client for End Users,” on page 16

Horizon FLEX Installation Overview

Horizon FLEX is a combination of VMware components, including Mirage, Fusion Pro, and Workstation Player. The Horizon FLEX installation involves installing each of these components and performing additional Horizon FLEX-specific tasks. For a successful Horizon FLEX deployment, you must understand the sequence of required tasks.

Before you install Horizon FLEX, verify that it meets all of the hardware and software requirements, that you have valid licenses, and that you have downloaded the Horizon FLEX component installers from the VMware Horizon FLEX product download page.

You install the Horizon FLEX by performing these steps:

1. Install the Mirage system.
   

2. Set up certificates for the Horizon FLEX Server.
   

3. Set up certificates for Horizon FLEX virtual machines.
   
   See Chapter 4, “Setting Up Certificates for Horizon FLEX Virtual Machines,” on page 25.

4. Create a download folder for storing your Horizon FLEX virtual machine packages.
   
   See “Create a Download Folder for Horizon FLEX Virtual Machine Packages,” on page 15.

5. Add a virtual directory in IIS for your Horizon FLEX virtual machine download folder and edit the site bindings.

6 (Optional) Configure Horizon FLEX to synchronize entities in only a selected Active Directory organizational unit (OU).


7 Test the connection to the Horizon FLEX Admin Console.

See “Test the Horizon FLEX Admin Console Connection,” on page 16.

8 Install a Horizon FLEX Client on each end-user host, or instruct end users to install a Horizon FLEX Client on their own computers.

See “Installing the Horizon FLEX Client for End Users,” on page 16.

9 Create and deploy Horizon FLEX virtual machines.

See Chapter 5, “Creating and Deploying Horizon FLEX Virtual Machines,” on page 35.

Installing and Configuring Mirage Components for the Horizon FLEX Server

The first Horizon FLEX installation step is to install and configure the Mirage system.

The Horizon FLEX server package includes the following components:

- VMware Mirage for Horizon FLEX (the Mirage Core Software)
- Mirage PowerCLI for Windows
- Mirage Gateway Appliance Software

**NOTE** The Mirage Core Software is required for the Horizon FLEX server. The Mirage PowerCLI for Windows and Mirage Gateway Appliance Software are only required if you will use Mirage to manage the Horizon FLEX virtual machines.

Download the installation files from the Horizon FLEX Server product download page.

The Mirage deployment involves the installation of the following components.

1 Mirage Management Server
2 Mirage Server
3 Mirage Management Console
4 Mirage Web manager

To install and configure the Mirage system, follow the installation instructions in the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

When you install the Mirage system, you must select certain options for the Horizon FLEX server to operate correctly.

- The Mirage Server and Mirage console are only required if you are installing the Mirage client in the source virtual machines.
- If placing the virtual machine images on the same system as the Horizon FLEX Server, place the images in the IIS "Default Web" server.
- The Web Management Server and the Mirage Management Server can be installed on the same server, but installing them on different servers improves scalability. The SQL server should be installed on a separate server from the Web Management Server and the Mirage Management Server.
During Mirage server installation, choose SSL for the Mirage server transport. SSL is required to use the Mirage Gateway feature for external access and management of Horizon FLEX systems. Before configuring the Mirage Server for SSL, you must install the server SSL certificate.

Before you install the Mirage Web Manager, verify that .NET Framework 4.5.1 is installed on the server.

The Mirage Management Server must run as a user who has Active Directory read permissions. If you plan to join Horizon FLEX virtual machines to an Active Directory domain, the Mirage Management Server must run as a user who has domain join permissions.

Create a Download Folder for Horizon FLEX Virtual Machine Packages

During the Horizon FLEX virtual machine deployment process, you compress your source virtual machine packages into TAR (.tar) format so that end users can easily download their Horizon FLEX virtual machines. You must create a download folder for storing these TAR files.

Procedure

1. Create the download folder on the Horizon FLEX server or on another server.
   
   The download folder does not need to be on the Horizon FLEX server, but the files it contains must be downloadable without any authentication challenge. If you create the download folder on the same IIS server as the Horizon FLEX server, you can create the folder under the default IIS document root folder of the Default Web site. Do not create the download folder under the VMware Mirage Management Web site.

2. Assign permissions to the download folder so that users can download the files that it contains.

3. (Optional) Share the download folder with an administrative group, such as Horizon FLEX Admins. This can be an administrative group for users to manage Horizon FLEX deployments.

   This step can make it easier to register your source virtual machines with the Horizon FLEX Policy Server.

What to do next

See “Configure the IIS SSL Server Certificate for the Horizon FLEX Server,” on page 23.

Configure Active Directory Settings

When you entitle a Horizon FLEX virtual machine, you add users and groups from your existing Active Directory infrastructure to the entitlement. By default, Horizon FLEX synchronizes your entire Active Directory infrastructure with the Horizon FLEX database. You can optionally configure Horizon FLEX to synchronize only a specific organization unit (OU).

Prerequisites


Procedure

1. Start the Horizon FLEX Admin Console.

   a. In a Web browser, enter https://WebManagerServer:7443/rvm, where WebManagerServer is the DNS name or IP address of the host where the Mirage Web Manager is installed.

   b. Enter the user name and password of a domain account that has access to Mirage.

   c. Click Login.

2. In the Horizon FLEX Admin Console, click the General System Settings icon and click Active Directory Settings.
3 Type the OU to synchronize in the Organizational Unit text box.

As you begin to type in the text box, the available OUs in your Active Directory infrastructure appear in a drop-down menu and you can select the appropriate OU.

4 Click OK to save the OU setting.

The Horizon FLEX server validates the OU to verify that it exists and is accessible.

The Horizon FLEX server synchronizes the Active Directory entities that belong only to the OU that you selected, including entities that belong to any child OUs of the selected OU.

Any time you configure a new OU, the Horizon FLEX server deletes the previously synchronized entities from the database and starts a new full synchronization process.

You can configure the policy for client virtual machines so that the power-on password matches the user’s Active Directory password after first startup. See “Configure a General Policy for a Horizon FLEX Image,” on page 46.

Test the Horizon FLEX Admin Console Connection

You can verify your Horizon FLEX deployment by testing the Horizon FLEX Admin Console connection.

**Prerequisites**


**Procedure**

1 Start the Horizon FLEX Admin Console.
   a In a Web browser, enter `https://WebManagerServer:7443/rvm`, where `WebManagerServer` is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b Enter the user name and password of a domain account that has access to Mirage.
   c Click Login.

2 Verify that the Horizon FLEX Admin Console page appears correctly.

   The Images, Policies, Entitlements, and Virtual Machines buttons should be visible in the left navigation panel.

**Installing the Horizon FLEX Client for End Users**

End users must have the Horizon FLEX Client software installed on their local computers before they can download the Horizon FLEX virtual machines. Supported clients included in the Horizon FLEX package are Fusion Pro for Mac OS X machines and Workstation Player for Windows machines.

You can create a mass deployment to install the Horizon FLEX Client on many systems at one time, or you can instruct end users to obtain the Horizon FLEX Client from the VMware Web site and install it themselves. You can also run an unattended Workstation Player installation on multiple Windows machines.
Create a Mass Deployment Package to Install Fusion Pro

You can create a Fusion Pro mass deployment package to install Fusion Pro on any number of end-user Macs. You can use standard package deployment tools, including Apple Remote Desktop Admin, to deploy the mass deployment package.

When you configure the mass deployment package, specify your Horizon FLEX license key in the [Volume License] section of the Deploy.ini file and place a copy of the Fusion Pro application in the 00Fusion_Deployment_Items folder.

You can use the optional connectAtStartupURL parameter in the [Locations] section of the Deploy.ini file to specify a user name and the host name of your Horizon FLEX server, for example:

```
connectAtStartupURL = vmware-rvm://johndoe@yourflexserver.com:7443
```

If no virtual machines are installed on the user’s Mac when the user launches Fusion Pro, the Connect dialog box opens and the Server and Username text boxes are prepopulated with the host name and user name that you specified in the connectAtStartupURL parameter.

For step-by-step information about creating a mass deployment package, see the VMware knowledge base article at http://kb.vmware.com/kb/2058680.

Provide a Workstation Player Installation Package to End Users

You can install Workstation Player on end user machines using a command line and specify the Horizon FLEX server connection settings by using a uniform resource identifier (URI). When installation of Workstation Player is complete, the end user is prompted to connect to a server and download a Horizon FLEX virtual machine.

Prerequisites

- Give the end user a password for the server and the Workstation Player license key for use with Horizon FLEX.

Procedure

- Construct a URI to create a customized Workstation Player installation and deployment package.

  The command line has the following structure:

  ```
  VMware-player-x.x.x-xxxxxxx.exe /v PLAYER_RVM_URI="vmware-rvm://username@myserver.com:7443"
  ```

  Specify the version and build number of the Workstation Player .exe file. `username` is the user’s login name and `myserver.com` is the host name of the server. You must include `vmware-rvm://` and `:7443` in the server address. Do not include http or https in the server address.

Run an Unattended Workstation Player Installation

You can use the unattended installation feature of the Microsoft Windows Installer (MSI) to install Workstation Player on several Windows hosts without having to respond to wizard prompts. This feature is convenient in a large enterprise.

Prerequisites

- Verify that the host system meets the host system requirements.

- Verify that the host computer has version 2.0 or later of the MSI runtime engine. This version of the installer is available from Microsoft. See the Microsoft Web site for more information.
Procedure

1 Log in to the host system as the administrator user or as a user who is a member of the local Administrators group.

   If you log in to the domain, the domain account must also be a local administrator.

2 Extract the administrative installation image from the Workstation Player setup file.

   The setup filename is similar to `VMware-player-xxx-xxxx.exe`, where `xxx-xxxx` is the version and build number.

   For example: `setup.exe /s /e install_temp_path`

3 Enter the installation command on one line.

   These examples show options that you can add to the command.

   ```
   VMware-player-full-x.x.x-xxxxxx.exe /s /pass /v/qn REBOOT=ReallySuppress "EULAS_AGREED=1 INSTALLDIR=""path_to_program_directory"" ADDLOCAL=ALL SERIALNUMBER=""xxxxx-xxxxx-xxxxx-xxxxx-xxxxx""
   ``

   ```
   VMware-player-full-x.x.x-xxxxxx.exe /s /v/qn EULAS_AGREED=1 SERIALNUMBER=""xxxxx-xxxxx-xxxxx-xxxxx-xxxxx"
   ``

   ```
   VMware-player-full-x.x.x-xxxxxx.exe /s /v/qn PLAYER_RVM_URI="vmware-rvm://username@myserver.com:7443"
   ``

   You can use the optional INSTALLDIR property to specify a file path for the installation that is different from the default location.

   **Note:** The quotation marks around the file path are important. All the MSI arguments are passed with the `/v` option. The outer quotation marks group the MSI arguments and the inner quotation marks put a quotation mark in that argument.

   You can use the optional REMOVE property to skip the installation of certain features.

Workstation Player Unattended Installation Properties

When you perform an unattended installation of Workstation Player, you can customize the installation by specifying installation properties in the installation command.

To specify an installation property in the installation command, use the format `Property property= "value"`. A value of 1 means true and a value of 0 means false.

**Table 2-1. Installation Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTHD_PORT</td>
<td>Specifies which port the ’VMware Authorization Service’ communicates through.</td>
<td>902</td>
</tr>
<tr>
<td>AUTOSOFTWAREUPDATE</td>
<td>Enables automatic upgrades for Workstation Player when a new build becomes available.</td>
<td>1</td>
</tr>
<tr>
<td>DATACOLLECTION</td>
<td>Sends user experience information to VMware.</td>
<td>1</td>
</tr>
<tr>
<td>DESKTOP SHORTCUT</td>
<td>Adds a shortcut on the desktop when Workstation Player is installed.</td>
<td>1</td>
</tr>
<tr>
<td>ENABLE_VIRTUAL_PRINTING</td>
<td>Enables support for ThinPrint virtual printing on the Windows host after installing.</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 2-1. Installation Properties (Continued)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EULAS_AGREED</td>
<td>Allows you to silently accept the product EULA's. Set to 1 to complete the installation or upgrade.</td>
<td>0</td>
</tr>
<tr>
<td>INSTALL_DIR</td>
<td>Install Workstation Player in a directory that is different from the default Workstation Player location.</td>
<td>C:\Program Files (86)\VMware\VMware Player</td>
</tr>
<tr>
<td>KEEP_LICENSE</td>
<td>Specifies whether to keep or remove license keys when Workstation Player is installed.</td>
<td>1</td>
</tr>
<tr>
<td>KEEP_SETTINGFILES</td>
<td>Specifies whether to keep or remove settings files when Workstation Player is uninstalled.</td>
<td>1</td>
</tr>
<tr>
<td>PLAYER_RVM_URI</td>
<td>Specifies the uniform resource identifier (URI) for the Horizon FLEX server.</td>
<td>VMware-player-full-x.x.x-xxxxxxx.exe /s /v/qn PLAYER_RVM_URI=&quot;vmware-rvm://username@myserver.com:7443&quot;</td>
</tr>
<tr>
<td>SERIALNUMBER</td>
<td>Lets you enter the license key when Workstation Player is installed. Enter the license key with hyphens, for example “xxxxx-xxxxx-xxxxx-xxxxx-xxxxx”.</td>
<td></td>
</tr>
<tr>
<td>SIMPLIFIEDUI</td>
<td>Turn on or off certain UI features of Workstation Player.</td>
<td>0</td>
</tr>
<tr>
<td>SOFTWAREUPDATEURL</td>
<td>Specifies a custom URL for managing software updates (separate from vmware.com).</td>
<td></td>
</tr>
<tr>
<td>STARTMENU_SHORTCUT</td>
<td>Adds a Start menu item when Workstation Player is installed.</td>
<td>1</td>
</tr>
<tr>
<td>SUPPORTURL</td>
<td>Set a support URL or email alias specifically for your users to contact with product issues through the Workstation Player Help menu.</td>
<td></td>
</tr>
</tbody>
</table>

**REMOVE Property Values**

When you perform an unattended installation of Workstation Player, you can skip the installation of certain features by specifying the REMOVE property in the installation command.

To specify a REMOVE property value in the installation command, use the format REMOVE=value. To skip multiple features, separate each value with a comma, for example, REMOVE=value,value.

Table 2-2. REMOVE Property Values

<table>
<thead>
<tr>
<th>Value</th>
<th>Skipped Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking</td>
<td>Networking components, including the virtual bridge and the host adapters for host-only networking and NAT networking. Do not remove this component if you want to use NAT or DHCP.</td>
</tr>
<tr>
<td>USB</td>
<td>The virtual USB driver.</td>
</tr>
<tr>
<td>Keyboard</td>
<td>The virtual keyboard driver.</td>
</tr>
<tr>
<td>ParPort</td>
<td>The parallel port driver.</td>
</tr>
</tbody>
</table>
You need to set up certificates for the Horizon FLEX server so the certificates can be used to authenticate the Horizon FLEX virtual machines.

This chapter includes the following topics:

- “Set Up a Certificate for the Horizon FLEX Server by Using OpenSSL,” on page 21
- “Configure the System Certificate Store for the Horizon FLEX Server,” on page 22
- “Configure the IIS SSL Server Certificate for the Horizon FLEX Server,” on page 23
- “Updating Trusted Certificates on the Horizon FLEX Server,” on page 23

### Set Up a Certificate for the Horizon FLEX Server by Using OpenSSL

You can create a self-signed certificate for the Horizon FLEX server by using OpenSSL.

---

**NOTE** If the certificate is commercially issued by a trusted root certificate authority or intermediate certificate authority, this task is not required.

---

**Prerequisites**

The OpenSSL configuration file is created on the Mirage Gateway Server. See the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

**Procedure**

1. At the OpenSSL command prompt, create a certificate: 
   
   ```
   $ openssl req -new -days expiration time -x509 -newkey rsa:2048 - keyout key filename -outcertificate filename -nodes
   ```
   
   *expiration time* represents the number of days that the certificate should be valid, *key filename* represents the filename for the key, and *certificate filename* represents the new certificate name.
   
   A self-signed certificate and a private key are generated. The certificate uses a 2048-bit RSA key and does not protect the key with a passphrase.

2. When prompted, enter the country name, state name, locality, organization name, and organizational unit name.

3. In the Common Name text box, enter the host name of the Horizon FLEX server to be protected.
   
   This text box must be completed.

4. Enter the email address.

   The self-signed certificate and associated private key are generated.
If the private key must be in .pfx format, enter the following command by using the certificate name and key filename generated in the previous steps:

```
$ openssl pkcs12 -export -out output pfx filename -inkey key filename -in certificate name
```

A new password-protected .pfx file is generated that can be deployed on any device that requires .pfx certificates instead of PEM certificates.

**Configure the System Certificate Store for the Horizon FLEX Server**

You must configure the system certificate store for the Horizon FLEX server to store the certificates used for the Horizon FLEX virtual machines.

NOTE If the certificate is commercially issued by a trusted root certificate authority or intermediate certificate authority, this task is not required.

**Prerequisites**


**Procedure**

1. On the Horizon FLEX server, start MMC (mmc.exe), add the Certificates snap-in for a computer account, and manage certificates for the local computer.

2. Select File > Add/Remove Snap-in.

3. Click the Certificates snap-in and click Add.

4. On Certificates snap-in display, select Computer account and click Next. The Horizon FLEX server requires this setting.

5. Select Local Computer, click Finish, and click OK.

6. In the left navigation pane, expand Certificates (Local Computer).

7. Right-click Trusted Root Certification Authorities and select All Tasks > Import.

8. Click Next.


10. Select Place all certificates in the following store: Trusted Root Certification Authorities, click Next, and click Finish.

11. Right-click Intermediate Certification Authorities and select All Tasks > Import.

   The Certificate Import Wizard opens.


13. Select Place all certificates in the following store: Intermediate Certification Authorities, click Next, and click Finish.

14. Repeat steps 12 and 13 for each intermediate certificate to be installed.

**What to do next**

Add the trusted certificates in the source virtual machine. See “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.
Configure the IIS SSL Server Certificate for the Horizon FLEX Server

You must configure the IIS SSL server certificate for the Horizon FLEX server to ensure secure communication between the Horizon FLEX client and the Horizon FLEX server.

The IIS SSL server certificate ensures that certificate authentication can proceed in the Horizon FLEX virtual machine.

VMware recommends that you use a certificate issued by a certificate authority (CA), such as Entrust or Go Daddy, or a trusted third-party certificate, on your Horizon FLEX server. If you are using a self-signed certificate or a certificate from an internal CA instead of a generally trusted certificate, you should take steps to ensure that the certificate is trusted on all end-user computers that will download and use Horizon FLEX virtual machines.

**Note** If setting up certificates for Horizon FLEX virtual machines, make sure the Horizon FLEX server IIS SSL server certificate is included in the certificate list.

Prerequisites

- Install the Server SSL Certificate on the Mirage server. See the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html

Procedure

1. Open IIS Manager.
2. Navigate to the root node, the connection node defined for the Mirage server.
3. On the Mirage Home page under IIS, double click **Server Certificates**.
   - The IIS SSL server certificates window opens.
4. Click **Import** in the right column.
   - This step imports the created SSL certificate and assigns a key to identify the certificate.
5. Select **VMware Mirage Management Web Site** and click **Edit Bindings** in the right column.
6. Set the HTTPS port to use your Horizon FLEX server certificate and click **OK**.

Updating Trusted Certificates on the Horizon FLEX Server

You need to update trusted certificates before they expire to ensure continued client access to the Horizon FLEX server.

When a certificate expires, and a new certificate has an expiration date that is set far into the future, you can add the new certificate as a second certificate to the trusted certificates list in the Horizon FLEX Policy Server.

Adding the new certificate to the trusted certificates list enables all Horizon FLEX virtual machines to download the new certificate. Then, when the certificate switch occurs, all of the Horizon FLEX virtual machines that received the new list of certificates can connect to the Horizon FLEX server and you can remove the old trusted certificate from the policy file.
To import, export or delete certificates in the Horizon FLEX Admin Console, click the **General Systems Settings** icon and select **Certificates**.

**CAUTION** When updating certificates, verify that the updated certificates are valid before propagating them to the virtual machine instances using a policy update. If you install an invalid certificate on the Horizon FLEX Admin Console, virtual machines with embedded certificates inherit the invalid certificate. As a result, these virtual machines will be unable to connect to the Horizon FLEX server.

When updating certificates, you should follow these guidelines:

- Update certificates before the existing ones expire.
- Add the new certificate from the Horizon FLEX Admin Console. Make sure that the trusted certificate list, including the old certificates and the new certificates, can be synchronized to the clients. See “Configure the System Certificate Store for the Horizon FLEX Server,” on page 22.
  
  Both the old and new certificates are now available in the virtual machine policy. If the Horizon FLEX server deploys both certificates, the client should continue to maintain access to the server.

- After the new certificate is added to the virtual machine policy, change the server from IIS Manager to bind the new certificate to the Mirage Management Web Site. For more information, see “Configure the IIS SSL Server Certificate for the Horizon FLEX Server,” on page 23.

  After the new certificate binds to the Mirage Management Web site, the client can continue accessing the server.
Setting Up Certificates for Horizon FLEX Virtual Machines

Before you create Horizon FLEX virtual machines, make sure certificates are properly configured to ensure that end users can successfully download and use their virtual machines.

The following guidelines apply to ensure security and to enable end user clients to access the Horizon FLEX server:

- VMware recommends that you use a certificate issued by a certificate authority (CA), such as Entrust or Go Daddy, or a trusted third-party certificate, on your Horizon FLEX server. If using a self-signed certificate or a certificate from an internal CA instead of a generally trusted certificate, you should ensure that the certificate is trusted on all end-user computers that will download and use Horizon FLEX virtual machines.

- While not required, creating a trusted certificates list in a source virtual machine enables certificate authorization with increased security on the end client host.

- Using self-signed or internal CA signed certificates might be less secure than using trusted certificates. If the certificate chain that verifies the secure connection to the Horizon FLEX server cannot be processed on the client's host, the client user receives the Invalid Security Certificate message. The client user must then select the Always Trust this host checkbox and click Connect Anyway when first connecting to the Horizon FLEX server. Allowing client users to select this option provides reduced security than other authorization methods.

For information about setting up certificates in Mirage for the Horizon FLEX Server, see the Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

- Creating a Trusted Certificates List in a Source Virtual Machine on page 25
  You can create a list of trusted certificates for Horizon FLEX virtual machines and import the list to the Horizon FLEX Policy Server. When you use a trusted certificates list, you do not need to install certificates on end-user hosts.

- Importing Certificates onto the Horizon FLEX Client Host on page 28
  You should import certain types of certificates onto the client host if they are not stored on the Horizon FLEX Policy Server or configured on the source virtual machine.

Creating a Trusted Certificates List in a Source Virtual Machine

You can create a list of trusted certificates for Horizon FLEX virtual machines and import the list to the Horizon FLEX Policy Server. When you use a trusted certificates list, you do not need to install certificates on end-user hosts.

Using a list of trusted certificates can prevent malicious users from creating their own self-signed certificates for the same hostname and adding those certificates to their host's list of trusted certificates.
When you configure the Horizon FLEX Policy Server to use a trusted certificates list, the client host ignores the host's list of certificates and uses the trusted certificates list to verify server connections instead. If the client host cannot verify a certificate by using the trusted certificates list, the server connection fails.

If the trusted certificates list is empty in the source virtual machine, Workstation Player and Fusion Pro authenticate against the host's list of trusted certificates.

To create the trusted certificates list, you export each certificate to a separate file and then concatenate all of the files into a single file. You use the Horizon FLEX Admin Console to import the concatenated certificates file to the Horizon FLEX Policy Server.

You must export certificates in Privacy Enhanced Mail (PEM) format. On Windows systems, the PEM certificate encoding is called Base-64 encoded X.509 (.CER). Only PEM-encoded certificates are supported. No other certificate format (DER, Serialized Certificate Store/ST, PKCS #12/PFX, PKCS #7/P7B) is accepted.

- **About the PEM Format** on page 26
  The PEM format is a standard certificate format that is Base64 encoded.

- **Creating PEM-Format Certificates** on page 27
  You can create PEM format certificates by downloading the certificate from the CA’s Web site or by exporting the certificates from a host system.

- **Create and Import the Trusted Certificates List File** on page 28
  After you export your PEM-format certificates, you must construct the trusted certificate list and import the certificates list file to the Horizon FLEX Policy Server.

### About the PEM Format

The PEM format is a standard certificate format that is Base64 encoded.

An example of a PEM-format certificate is as follows:

```
-----BEGIN CERTIFICATE-----
MIIDojCCAwugAwIBAgIJAMLM0CJRzPyzMA0GCSqGSIb3DQEBBQUAMIGTMQswCQYD
VQQGEwJVUzETMBEGA1UECBMKQ2FsaWZvcm5p5yYESMBAGAIUEBwMJUGFsbysybBBHRv
MS8wLQYDVQQKEwZtvhkmUsIEuYy4glSXB3jrc3RhGlvbi8TUwqVGzdGluzEeMcgaIUEAex
My29ya3N0YRpb24gQ2VydGlmaWNhdGUpXV0aG9yaXR5MB4X
DTExM2ExNTMzMDgyFm0xNTA0MDc4NjQ5MjA4MDk4MDAwMDk4MDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDAwMDA==
-----END CERTIFICATE-----
```
When you create a trusted certificates list, you concatenate multiple PEM-format certificates into a single file. Line endings are auto-detected. The following example shows the format of a concatenated certificates list that contains two certificates.

```
-----BEGIN CERTIFICATE-----
<base64 content here>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<base64 content here>
-----END CERTIFICATE-----
```

Creating PEM-Format Certificates

You can create PEM-format certificates by downloading the certificate from the CA’s Web site or by exporting the certificates from a host system.

For example, you can download certificates for Verisign from the Symantec Web site at https://www.symantec.com/page.jsp?id=roots.

Export a PEM-Format Certificate From a Mac

You can export a PEM-format certificate from a Mac.

Prerequisites

Become familiar with how to use Keychain Access on a Mac. For more information, see the Apple Support Web site at http://support.apple.com.

Procedure

2. From the sidebar, select System Roots.
3. Locate the certificate to export.
4. Select File > Export Items.
5. Select a location to save the certificate and select the Privacy Enhanced Mail (.pem) file format.

Export a PEM-Format Certificate From a Windows System

You can export a PEM-format certificate from a Windows system. On Windows, the PEM certificate encoding is called Base-64 encoded X.509 (.CER).

Prerequisites

Become familiar with how to use Certificate Manager on a Windows system. For more information, see the Microsoft TechNet Web site at http://technet.microsoft.com.

Procedure

2. Right-click the certificate to export and select All Tasks > Export.
3 Select options in the Certificate Export Wizard.
   a Select **Base-64 encoded X.509 (.CER)** for the file export format.
      For the certificate to work with Horizon FLEX, you must choose this option.
   b Provide a location to save the certificate and a file name.
   c Review the settings you selected and click **Finish**.
      The certificate file is saved to the location you indicated.

Create and Import the Trusted Certificates List File

After you export your PEM-format certificates, you must construct the trusted certificate list and import the certificates list file to the Horizon FLEX Policy Server.

**Prerequisites**

Export each certificate in PEM format. See “Creating PEM-Format Certificates,” on page 27.

**Procedure**

1 To create the trusted certificates list file, concatenate each PEM-format certificate file into a single file.
   You can use the `cat` command, or you can copy and paste the contents of the certificate files into a text file. You can safely edit Base64 content in a text editor.
   For example: $ cat mycert1.pem mycert2.pem mycert3.pem > list.pem

2 Start the Horizon FLEX Admin Console.
   a In a Web browser, enter `https://WebManagerServer:7443/rvm`, where `WebManagerServer` is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b Enter the user name and password of a domain account that has access to Mirage.
   c Click **Login**.

3 In the Horizon FLEX Admin Console, click the **General System Settings** icon and select **Certificates**.
   Click **Import**, browse to the trusted certificates list file, and click **Open** to import the file.

Importing Certificates onto the Horizon FLEX Client Host

You should import certain types of certificates onto the client host if they are not stored on the Horizon FLEX Policy Server or configured on the source virtual machine.

**NOTE** If the certificate is not imported on the Horizon FLEX client host, then the client user must select the **Always Trust this host** checkbox option when first connecting to the Horizon FLEX server. Even if a self-signed root certificate has been imported into the client's certificate store, the security warning might still display when first connecting to the Horizon FLEX server. In this case, the client user must select the **Always Trust this host** checkbox for the Horizon FLEX to work properly.

- **Importing Self-Signed Certificates** on page 29

   If you do not configure the self-signed certificate into the source virtual machine being prepared, you should import the certificate on each end-user host for Horizon FLEX virtual machines to function correctly.
If you use a certificate from an internal CA instead of from a commercial CA such as Entrust or Go Daddy, and you do not configure the certificate into the source virtual machine being prepared, you should import the root CA certificate on each end-user host for Horizon FLEX virtual machines to function correctly.

Importing Self-Signed Certificates

If you do not configure the self-signed certificate into the source virtual machine being prepared, you should import the certificate on each end-user host for Horizon FLEX virtual machines to function correctly.

If the list of certificates is empty in the policy file, Workstation Player and Fusion Pro will fall back to authenticating against the host's list of trusted certificates.

If you include the self-signed certificate of a source virtual machine on the Horizon FLEX Policy Server, and you configure or install the self-signed certificate for the Horizon FLEX Client (either in the source virtual machine's policy file or in the host's list of trusted certificates), you do not need to install the certificate on end-user hosts when certificate updates are required, for example, when a certificate expires.

For information about configuring certificates into a source virtual machine, see “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.

For information about creating a trusted certificates list and importing it to the Horizon FLEX Policy Server, see “Creating a Trusted Certificates List in a Source Virtual Machine,” on page 25.

For information about updating certificates, see “Updating Trusted Certificates on the Horizon FLEX Server,” on page 23.

Import a Self-Signed Certificate on a Windows Host

To import a self-signed certificate on a Windows host, you export the certificate from your Horizon FLEX server and import it to the Windows computer.

Prerequisites

Become familiar with how to install and use the MMC Certificates snap-in on a Windows system. For more information, go to the Windows TechNet Web site at http://technet.microsoft.com.

Install Windows IIS.

Procedure

1 Export the self-signed certificate from your Horizon FLEX server.
   a On the Horizon FLEX server, start MMC (mmc.exe), add the Certificates snap-in for a computer account, and manage certificates for the local computer.
   b Select File > Add/Remove Snap-in.
   c Click the Certificates snap-in and click Add.
   d On the Certificates snap-in display, select Computer account and click Next.
   This setting is required by the Horizon FLEX server.
   e Select Local Computer and click Finish and then OK.
   f In the left navigation pane, expand Certificates (Local Computer).
   g Right-click on Trusted Root Certification Authorities and select All Tasks > Import.
   The Certificate Import Wizard opens.
   h Click Next.
i  Browse for the root certificate file and click Next.

j  Select `Place all certificates in the following store: Trusted Root Certification Authorities` and click Next, then click Finish.

k  Navigate to `Trusted Root Certification Authorities > Certificates`.

l  Select and export the self-signed certificate.

Export the certificate in DER-encoded binary X.509 (.CER) format.

2  Copy the self-signed certificate to the client Windows computer.

3  Import the self-signed certificate to the client Windows computer.
   a  On the Windows computer, start MMC (`mmc.exe`).
   b  Add the Certificates snap-in for the computer account and manage certificates for the local computer.
   c  Import the self-signed certificate into `Trusted Root Certification Authorities > Certificates`.

The self-signed certificate is now trusted for all users.

### Import a Self-Signed Certificate on a Mac Host

To import a self-signed certificate on a Mac host, you export the certificate from your Horizon FLEX server and import it to the Mac.

#### Prerequisites

- Become familiar with how to install and use the MMC Certificates snap-in on a Windows system. For more information, go to the Windows TechNet Web site at [http://technet.microsoft.com](http://technet.microsoft.com).
- Become familiar with how to use Keychain Access on a Mac. For more information, go to the Apple Support Web site at [http://support.apple.com](http://support.apple.com).
- Install Windows IIS.

#### Procedure

1  Export the self-signed certificate from your Horizon FLEX server.
   a  On the Horizon FLEX server, start MMC (`mmc.exe`), add the Certificates snap-in for a computer account, and manage certificates for the local computer.
   b  Select File > Add/Remove Snap-in.
   c  Click the Certificates snap-in and click Add.
   d  On the Certificates snap-in display, select Computer account and click Next.

      This setting is required by the Horizon FLEX server.
   e  Select Local Computer and click Finish and then OK.
   f  In the left navigation pane, expand Certificates (Local Computer).
   g  Right-click on `Trusted Root Certification Authorities` and select All Tasks > Import.

      The Certificate Import Wizard opens.
   h  Click Next.
   i  Browse for the root certificate file and click Next.
   j  Select `Place all certificates in the following store: Trusted Root Certification Authorities` and click Next, then click Finish.
Navigate to **Trusted Root Certification Authorities > Certificates**.

Select and export the self-signed certificate.

Export the certificate in DER-encoded binary X.509 (.CER) format.

Copy the self-signed certificate to the Mac.

Import the self-signed certificate on the Mac.

   a. Double-click the self-signed certificate to open it in Keychain Access.

   The self-signed certificate appears in **login**.

   b. Copy the self-signed certificate to **System**.

   You must copy the certificate to **System** to ensure that it is trusted by all users and local system processes, including the virtual machine (vmware-vmx) processes in Fusion Pro.

   c. Open the self-signed certificate in **System**, expand **Trust**, select **Use System Default**, and save your changes.

   d. Reopen the self-signed certificate in **System**, expand **Trust**, select **Always Trust**, and save your changes.

   e. Delete the self-signed certificate from **login**.

The self-signed certificate is now trusted for all users.

**Importing Internal CA Certificates**

If you use a certificate from an internal CA instead of from a commercial CA such as Entrust or Go Daddy, and you do not configure the certificate into the source virtual machine being prepared, you should import the root CA certificate on each end-user host for Horizon FLEX virtual machines to function correctly.

**NOTE** Because the server certificate is signed by the root CA, you do not need to import the server certificate to end-user hosts.

If the list of certificates is empty in the policy file, Workstation Player and Fusion Pro will fall back to authenticating against the host's list of trusted certificates.

If you include the internal CA certificate of a source virtual machine on the Horizon FLEX Policy Server, and you configure or install the certificate for the Horizon FLEX Client (either in the source virtual machine's policy file or in the host's list of trusted certificates), you do not need to install the root CA certificate on end-user hosts when certificate updates are required, for example, when a certificate expires.

For information about configuring certificates into a source virtual machine, see “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.

For information about creating a trusted certificates list and importing it to the Horizon FLEX Policy Server, see “Creating a Trusted Certificates List in a Source Virtual Machine,” on page 25.

For information about updating certificates, see “Updating Trusted Certificates on the Horizon FLEX Server,” on page 23.

**Import an Internal Root CA Certificate on a Windows Host**

To import an internal root CA certificate on a Windows host, you export the certificate from your Horizon FLEX server and import it to the Windows computer.

**Prerequisites**

- Become familiar with how to install and use the MMC Certificates snap-in on a Windows system. For more information, go to the Windows TechNet Web site at [http://technet.microsoft.com](http://technet.microsoft.com).
- Obtain and install an internal CA certificate. You can use the Windows MMC Certificates snap-in to request a certificate.
- Install Windows IIS.

**Procedure**

1. Export the root CA certificate from your Horizon FLEX server.
   a. On the Horizon FLEX server, start MMC (`mmc.exe`), add the Certificates snap-in for a computer account, and manage certificates for the local computer.
   b. Select File > Add/Remove Snap-in.
   c. Click the Certificates snap-in and click Add.
   d. On the Certificates snap-in display, select Computer account and click Next.
      This setting is required by the Horizon FLEX server.
   e. Select Local Computer and click Finish and then OK.
   f. In the left navigation pane, expand Certificates (Local Computer).
   g. Right-click on Trusted Root Certification Authorities and select All Tasks > Import.
      The Certificate Import Wizard opens.
   h. Click Next.
   i. Browse for the root certificate file and click Next.
   j. Select Place all certificates in the following store: Trusted Root Certification Authorities and click Next, then click Finish.
   k. Navigate to Trusted Root Certification Authorities > Certificates.
   l. Select and export the root CA certificate.

2. Copy the root CA certificate to the Windows computer.
3. Import the root CA certificate to the Windows computer.
   a. On the Windows computer, start MMC (`mmc.exe`).
   b. Add the Certificates snap-in for the computer account and manage certificates for the local computer.
   c. Import the root CA certificate into Trusted Root Certification Authorities > Certificates.

The root CA certificate is now trusted for all users.

**Import an Internal Root CA Certificate on a Mac Host**

To import an internal root CA certificate on a Mac host, you export the certificate from your Horizon FLEX server and import it to the Mac.

**Prerequisites**

- Become familiar with how to install and use the MMC Certificates snap-in on a Windows system. For more information, go to the Windows TechNet Web site at [http://technet.microsoft.com](http://technet.microsoft.com).
- Become familiar with how to use Keychain Access on a Mac. For more information, go to the Apple Support Web site at [http://support.apple.com](http://support.apple.com).
- Install Windows IIS.
**Procedure**

1. Export the root CA certificate from your Horizon FLEX server.
   a. On the Horizon FLEX server, start MMC (`mmc.exe`), add the Certificates snap-in for a computer account, and manage certificates for the local computer.
   b. Select **File > Add/Remove Snap-in**.
   c. Click the **Certificates** snap-in and click **Add**.
   d. On the **Certificates snap-in display**, select **Computer account** and click **Next**.
      This setting is required by the Horizon FLEX server.
   e. Select **Local Computer** and click **Finish** and then **OK**.
   f. In the left navigation pane, expand **Certificates (Local Computer)**.
   g. Right-click on **Trusted Root Certification Authorities** and select **All Tasks > Import**.
      The Certificate Import Wizard opens.
   h. Click **Next**.
   i. Browse for the root certificate file and click **Next**.
   j. Select **Place all certificates in the following store: Trusted Root Certification Authorities** and click **Next**, then click **Finish**.
   k. Navigate to **Trusted Root Certification Authorities > Certificates**.
   l. Select and export the root CA certificate.
      Export the certificate in DER-encoded binary X.509 (.CER) format.

2. Copy the root CA certificate to the Mac.

3. Import the root CA certificate on the Mac.
   a. Double-click the root CA certificate to open it in Keychain Access.
      The root CA certificate appears in **login**.
   b. Copy the root CA certificate to **System**.
      You must copy the certificate to **System** to ensure that it is trusted by all users and local system processes, including the virtual machine (.vmx) processes in Fusion.
   c. Open the root CA certificate, expand **Trust**, select **Use System Defaults**, and save your changes.
   d. Reopen the root CA certificate, expand **Trust**, select **Always Trust**, and save your changes.
   e. Delete the root CA certificate from **login**.
Creating and Deploying Horizon FLEX Virtual Machines

You can create multiple Horizon FLEX virtual machines and entitle those virtual machines to a variety of end users, including Mac users. Users can be connected or disconnected from the enterprise network when they use their Horizon FLEX virtual machines. When you create a source virtual machine for a Horizon FLEX virtual machine, you must select certain options for the virtual machine to function correctly with Horizon FLEX.

You can use Fusion Pro or Workstation Pro (not included in the Horizon FLEX package) to create a source virtual machine.

This chapter includes the following topics:

- “Horizon FLEX Virtual Machine Deployment Overview,” on page 35
- “Create a Source Virtual Machine in Fusion Pro,” on page 38
- “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40
- “Install the Mirage Client In a Source Virtual Machine,” on page 42
- “Prepare a Source Virtual Machine to Join an Active Directory Domain,” on page 43
- “Compress a Source Virtual Machine Package,” on page 44
- “Register a Source Virtual Machine with the Horizon FLEX Policy Server,” on page 44
- “Creating Policies and Entitlements,” on page 45
- “Create a URI to Deploy a Horizon FLEX Virtual Machine,” on page 53

Horizon FLEX Virtual Machine Deployment Overview

To deploy a Horizon FLEX virtual machine, you perform tasks in a specific order.

1. Plan the virtual machine deployment.
   See “Considerations for Creating Horizon FLEX Virtual Machines,” on page 36.

2. Create and configure a source virtual machine.
   See “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.

3. (Optional) Prepare the source virtual machine to join an Active Directory domain.
   See “Prepare a Source Virtual Machine to Join an Active Directory Domain,” on page 43.

4. Compress the source virtual machine package and save it in your download directory.
   See “Compress a Source Virtual Machine Package,” on page 44.
5 Register the source virtual machine with the Horizon FLEX Policy Server.
   See “Register a Source Virtual Machine with the Horizon FLEX Policy Server,” on page 44.

6 Create a policy for the Horizon FLEX image and entitle the image to your Active Directory users and
groups.

7 (Optional) Create a URI to deploy the Horizon FLEX virtual machine.
   See “Create a URI to Deploy a Horizon FLEX Virtual Machine,” on page 53.

Considerations for Creating Horizon FLEX Virtual Machines

When you create Horizon FLEX virtual machines, you must consider the requirements of the client end
users.

Horizon FLEX virtual machines are restricted virtual machines, meaning that not all functions are available
to your client end users. By using policies and entitlements, you can control the features available to client
end users. See “Creating Policies and Entitlements,” on page 45. Note that client end users can create their
own non-Horizon FLEX virtual machines by using the Horizon FLEX client software.

Virtual Processor and Memory Requirements

When you create source virtual machines, the virtual machines must meet the following virtual processor
and memory requirements:

- The number of virtual processor cores cannot exceed the maximum number of logical CPUs supported
  by the guest operating system.
- The number of sockets cannot exceed the maximum number of sockets that the guest operating system
  supports. If you create the source virtual machine by using Fusion Pro, you cannot specify the number
  of sockets.
- The memory size cannot be lower than the minimum memory size that the guest operating system
  requires.
- When you use Fusion Pro or Workstation Pro software, the total number of virtual processors cannot
  exceed the maximum number of virtual processors that Fusion Pro or Workstation Pro supports for the
  specific guest operating system.

In the Workstation Pro user interface, the virtual processors and sockets of a virtual machine have the
following user interface settings:

- "Number of processors” indicates the number of (virtual) CPUs, which equals the number of
  (virtual) sockets.
- "Number of cores per processor” indicates the virtual processor cores per processor.
- "Total processor cores” indicates the number of sockets times the number of cores per socket.

In the Fusion Pro user interface, "Processors” indicates the number of sockets times the number of cores
per socket.

On the host operating system the number of logical CPUs or logical processors is the total number of
physical CPUs or sockets times the number of physical cores per CPU, times the number of hyper-
threading per physical cores.

By applying policies, you can set the policy to make sure that the virtual machine is not oversubscribed on
the client end user host. For more information, see “Optimizing Virtual Processors and Memory for
Horizon FLEX Virtual Machines,” on page 37.
Horizon FLEX Server and Client Compatibility

If you use different versions of the Horizon FLEX server and the Horizon FLEX client, the server and client might become unsynchronized. The following considerations apply to Horizon FLEX server and client compatibility:

- A client with an earlier Horizon FLEX client version cannot download a virtual machine from the current Horizon FLEX server version. The client is also unable to power on an existing virtual machine in online mode. The client user receives an error message that the client version needs to be upgraded.
  
  For example, a client using a Horizon FLEX 1.6 client version cannot download a virtual machine from a Horizon FLEX 1.7 server.

- The current Horizon FLEX client version can work with an earlier Horizon FLEX server version, but the new features of the current server version are not available.
  
  For example, a client using Horizon FLEX 1.7 can work with a Horizon FLEX 1.6 server. However, any new features in Horizon FLEX 1.7 are not available to an administrator that uses the Horizon FLEX 1.6 server.

- To prevent compatibility issues, when you upgrade the Horizon FLEX server version, upgrade the client version as well.

Horizon FLEX Virtual Machine Hardware Compatibility

Hardware version incompatibility can prevent client users from opening Horizon FLEX virtual machines. A client running an earlier Horizon FLEX version that does not support later hardware versions cannot open a virtual machine running a higher hardware version.

For example, if a hardware version 12 virtual machine is created by using a Horizon FLEX 1.7 client, a Horizon FLEX 1.5 client cannot open the virtual machine. Because the Horizon FLEX 1.5 client only supports up to hardware version 11, the client cannot open or power on a hardware version 12 virtual machine.

Optimizing Virtual Processors and Memory for Horizon FLEX Virtual Machines

When you create Horizon FLEX virtual machines, you can set the policy to automatically optimize the virtual machine’s virtual processors and memory to fit the client host operating system.

When creating Horizon FLEX virtual machines, you might not know the CPU and memory constraints of the client end user’s host operating system. If the number of CPUs and memory size of the Horizon FLEX virtual machine are too large for the user’s host operating system, the virtual machine cannot open. In this case, the client end user’s host operating system is oversubscribed.

By default, the number of virtual processors and memory size of a Horizon FLEX virtual machine are optimized to fit the end client’s host operating system. You can enable or disable the Horizon FLEX virtual machine optimization by using the Optimize CPU and memory policy setting. See “Configure a General Policy for a Horizon FLEX Image,” on page 46.

Virtual machine optimization is enabled by default if a current Horizon FLEX client connects to an older Horizon FLEX server version that does not support optimization.

Note: If you provide a Horizon FLEX 1.7 virtual machine to a user running an earlier version of a supported client, the CPU and memory optimization is not supported and the client’s host operating system can be oversubscribed. To prevent oversubscription, client end users must upgrade to the supported Horizon FLEX client version.

The number of virtual processor cores allocated to a virtual machine is limited to no more than 50 percent of cores on the host. The memory size for a virtual machine is limited by the reserved memory size for all running virtual machines on the host. The limit is approximately 75 percent of the host memory, depending on the platform.
**Example: Virtual Processor Optimization**

The following examples show how virtual processors for Horizon FLEX virtual machines are optimized by using the *Optimize CPU and memory* policy setting.

<table>
<thead>
<tr>
<th>Example</th>
<th>Horizon FLEX Virtual Machine</th>
<th>Client Host</th>
<th>Optimization Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td>12 sockets with 1 core per socket = 12 cores</td>
<td>8 cores</td>
<td>Virtual machine has 4 cores (4 sockets * 1 core per socket = 4 cores).</td>
</tr>
<tr>
<td>Example 2</td>
<td>4 sockets with 2 cores per socket = 8 cores</td>
<td>12 cores</td>
<td>Virtual machine has 4 cores (4 sockets * 1 core per socket = 4 cores). Note: The number of cores is always reduced to the maximum number that can be divided by the number of sockets.</td>
</tr>
<tr>
<td>Example 3</td>
<td>1 socket with 2 cores per socket = 2 cores</td>
<td>8 cores</td>
<td>Virtual machine has 2 cores.</td>
</tr>
</tbody>
</table>

**Example: Memory Optimization**

The following examples show how memory for Horizon FLEX virtual machines is optimized by using the *Optimize CPU and memory* policy setting.

<table>
<thead>
<tr>
<th>Example</th>
<th>Horizon FLEX Virtual Machine</th>
<th>Client Host</th>
<th>Optimization Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td>10 GB of memory allocated</td>
<td>12 GB of reserved memory</td>
<td>Horizon FLEX virtual machine is allowed the full 10-GB memory allocation.</td>
</tr>
<tr>
<td>Example 2</td>
<td>10 GB of memory allocated</td>
<td>2 GB of reserved memory</td>
<td>Horizon FLEX virtual machine is automatically scaled down to 2 GB of memory.</td>
</tr>
</tbody>
</table>

**Create a Source Virtual Machine in Fusion Pro**

You can use Fusion Pro to create a source virtual machine for a Horizon FLEX virtual machine. When you create a source virtual machine, you must set encryption and restriction information so that the virtual machine functions correctly with Horizon FLEX.

You can also use Workstation Pro to create a source virtual machine. Workstation Pro is not included in the Horizon FLEX package.

If you enable USB device use, drag and drop, and copy and paste features when you create the virtual machine, you can set policies in the Horizon FLEX Admin Console to enable or disable these features for end users. However, if you disable these features when you create the virtual machine, you cannot override the virtual machine settings to enable the features by setting policies.
Horizon FLEX only supports virtual machine names using English characters. Do not use non-ASCII characters in .vmx or .tar filenames. Fusion Pro cannot create Horizon FLEX virtual machines in Japanese or Simplified Chinese.

**Note** When preparing a Horizon FLEX virtual machine, make sure that the .vmx policy file is in the same folder as all virtual machine disk (.vmdk) files. If the .vmx file and the virtual machine disk files are in different directories on the client user’s machine, then the user will receive an error message when attempting to start the Horizon FLEX virtual machine.

**Prerequisites**

- Become familiar with how to create a virtual machine in Fusion Pro. See the Fusion documentation at [https://www.vmware.com/support/pubs/fusion_pubs.html](https://www.vmware.com/support/pubs/fusion_pubs.html).
- Become familiar with the supported guest operating systems for Horizon FLEX virtual machines. See “Supported Host and Guest Operating Systems,” on page 12.
- Install Fusion Pro with a Horizon FLEX license key.
- If you add certificates to the virtual machine, the trusted certificate must be installed on the Horizon FLEX server or on your local host. See “Configure the System Certificate Store for the Horizon FLEX Server,” on page 22.

**Procedure**

1. Open Fusion Pro and create a virtual machine.
   
   Select a guest operating system that is supported for Horizon FLEX virtual machines. When the virtual machine is created, Fusion Pro tries to install VMware Tools. Configure the virtual machine for distribution to your end users.

2. From the Virtual Machine Library, select the new virtual machine and select **Settings > Encryption & Restrictions**.

3. Select **Enable Encryption** and set a password for opening the virtual machine.
   
   The password must be six characters or longer. You must give this encryption password to your end users to enable them to open the virtual machine.
   
   You must retain the encryption password. You cannot access the virtual machine without this password.

4. Check **Enable Restrictions** and set a password for editing the restrictions on the virtual machine.
   
   This password should be different from the virtual machine encryption password.
   
   You must retain the restrictions password. You cannot edit the restrictions on the virtual machine without this password.

5. Click **Configure**.
   
   The restrictions configuration window opens.

6. Set the **Restriction Type** to **Managed**.
   
   You must set the restriction type to **Managed** to distribute and use the virtual machine with Horizon FLEX.

7. Enter the URL of the Horizon FLEX server on which you intend to host the virtual machine in the **Restrictions Management Server** text box.

8. Click **Check Server** to verify the Horizon FLEX server URL.
9 (Optional) To add trusted certificates to the virtual machine, choose one of the following:

- To add the trusted root certificate directly from the Horizon FLEX server, click **Get Server Certificate**.
  
  A dialog box with the full certificate chain retrieved from the Horizon FLEX server appears. Click **OK**.

- To add the certificates from the local host, click the + button and navigate to the location of each certificate file.

  If you add certificates to the virtual machine, the Horizon FLEX Client uses the certificates in the virtual machine and does not use the certificates on the host.

10 Click **Save**.

11 Click the **Lock** icon to prevent further changes to the restrictions of the virtual machine.

   You can edit restrictions for the virtual machine by using the restrictions password.

**What to do next**

If you intend to join the Horizon FLEX virtual machine to an Active Directory domain, prepare the virtual machine to join the domain. See “Prepare a Source Virtual Machine to Join an Active Directory Domain,” on page 43.

To install the Mirage client in the source virtual machine, see “Install the Mirage Client In a Source Virtual Machine,” on page 42.

**Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX )**

You can use Workstation Pro to create a source virtual machine for a Horizon FLEX virtual machine. Workstation Pro is not included in the Horizon FLEX package. A Horizon FLEX license key for Workstation Pro is not required.

Horizon FLEX only supports virtual machine names using English characters. Do not use non-ASCII characters in .vmx or .tar filenames.

**Note** When preparing a Horizon FLEX virtual machine, make sure that the .vmx policy file is in the same folder as all virtual machine disk (.vmdk) files. If the .vmx file and the virtual machine disk files are in different directories on the client user’s machine, then the user will receive an error message when attempting to start the Horizon FLEX virtual machine.

**Prerequisites**

- Review how to create a virtual machine in Workstation Pro. See the Workstation Pro documentation at https://www.vmware.com/support/pubs/ws_pubs.html

- Review the supported guest operating systems for Horizon FLEX virtual machines. See “Supported Host and Guest Operating Systems,” on page 12.

- Install Workstation Pro.

- If adding certificates to the virtual machine, the trusted certificate must be installed on the Horizon FLEX server or on your local host. See “Configure the System Certificate Store for the Horizon FLEX Server,” on page 22.

**Procedure**

1 Open Workstation Pro and create a virtual machine. When the virtual machine is created, Workstation Pro tries to install VMware Tools.
2 Install the guest OS.
   Select a guest operating system that is supported for Horizon FLEX virtual machines. Configure the
   virtual machine for distribution to your end users.

3 Encrypt and restrict the virtual machine. Select the virtual machine and select **VM > Settings**.

4 On the **Options** tab, select **Access Control**.

5 Click **Encrypt**, type an encryption password, and click **Encrypt**.
   The encryption password is required to gain access to the virtual machine. It does not prevent the user from
   changing the virtual machine configuration. Turn on restrictions and enter a password to prevent
   the user from changing the virtual machine configuration.

   **IMPORTANT** Record the encryption password you use. If you forget the password, Workstation does not
   provide a way to retrieve it.

   Workstation Pro begins encrypting the virtual machine. After the encryption process is complete, you
   can set a restrictions password.

6 Select the **Enable Restrictions** check box and set a password for editing the restrictions on the virtual
   machine.
   Set a different password from the virtual machine encryption password.
   You must retain the restrictions password. You cannot edit the restrictions on the virtual machine
   without this password.

7 Set the **Restriction Type** to **Managed**.
   You must set the restriction type to **Managed** to distribute and use the virtual machine with
   Horizon FLEX.

8 Enter the URL of the Horizon FLEX server on which you intend to host the virtual machine in the
   **Restrictions Management Server** text box.

9 Click **Check Server** to verify the Horizon FLEX server URL.

10 (Optional) To add trusted certificates to the virtual machine, click the **Manage Certificates** icon and
    choose one of the following:

    - To add the trusted root certificate directly from the Horizon FLEX server, select **Add > From server**.
      Select the certificate and click **OK**.
      A dialog box with the full certificate chain retrieved from the Horizon FLEX server appears. Click
      **OK**.

    - To add the certificate from the local host, click **Add > From file** and navigate to the location of each
      certificate file.
      If you add certificates to the virtual machine, the Horizon FLEX Client uses the certificates in the virtual
      machine and does not use the certificates on the host.

11 Click **OK**.

**What to do next**

If you intend to join the Horizon FLEX virtual machine to an Active Directory domain, prepare the virtual
machine to join the domain. See “Prepare a Source Virtual Machine to Join an Active Directory Domain,” on
page 43.

To install the Mirage client in the source virtual machine, see “Install the Mirage Client In a Source Virtual
Machine,” on page 42.
Install the Mirage Client In a Source Virtual Machine

If the source virtual machine has a Windows guest operating system, you can install the Mirage client in the virtual machine. Installing the Mirage client is optional.

If you install the Mirage client in a source virtual machine, you can select disaster recovery scenarios when you entitle the virtual machine. For example, you can select an option to make the Mirage server create a CVD for the Horizon FLEX virtual machines that the end user downloads. Mirage periodically synchronizes end-user data into the datacenter based on the selected Mirage policy. You can use this data to restore the CVD or access files on the virtual machine by using the Mirage File Portal in the main Mirage Management Console.

**NOTE** When configuring the Mirage server for disaster recovery, make sure the MongoDB ports are configured correctly. For more information, see the *VMware Mirage Installation Guide*.

**Prerequisites**

- Create the source virtual machine. See “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.
- Obtain the *VMware Mirage Installation Guide* for Mirage client installation instructions.

**Procedure**

1. In Fusion Pro or Workstation Pro, start the source virtual machine and log in to the guest operating system.
2. Install the latest version of VMware Tools.
   a. From the menu bar, select **Virtual Machine > Install VMware Tools**.
   b. Click **Next** to progress through the installation.
   c. Select **Complete**, unless you need to exclude certain features of VMware Tools, and click **Next**.
   d. Click **Install**.
   e. When the installation finishes, click **Yes** to restart the virtual machine.
3. Install the Mirage client in the source virtual machine.
   - See the *VMware Mirage Installation Guide* for more information.
4. In the Mirage Management Console, verify that the endpoint appears as Pending Assignment.
   - **NOTE** Do not delete this Pending record as long as you are distributing this source virtual machine.
5. In the Mirage Management Console, enable automatic CVD creation.
   a. Right-click **System Configuration** and select **Settings**.
   b. Click the **CVD Auto Creation** tab.
   c. Select **Enable automatic CVD creation**.
      You can change the user message as needed.
   d. Click **OK**.
6. Power off the source virtual machine in Mirage while it is in Pending Assigning state.
   - Do not provide the username and password, and do not register the source virtual machine at the Mirage client prompt. If you do register the source virtual machine with Mirage, the Horizon FLEX virtual machine will be duplicated when the end user accesses it.
Once the Mirage client is active, when you create a new Horizon FLEX entitlement for this source virtual machine, Mirage controls for that virtual machine are available. See “Entitle a Horizon FLEX Image,” on page 50.

## Prepare a Source Virtual Machine to Join an Active Directory Domain

If you intend to join a Horizon FLEX virtual machine to a specific Active Directory domain, you must prepare the source virtual machine to join the domain before you register it with the Horizon FLEX Policy Server.

### Prerequisites

- Create a source virtual machine. See “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.

**Note**: Do not install Windows 7 Home edition or a non-Windows guest operating system in the source virtual machine. You cannot join a Windows 7 Home edition operating system or a non-Windows guest operating system to a domain.

- Verify that you have the administrator password for the source virtual machine.

- In the Horizon FLEX Admin Console, set the policy for the virtual machine to join the Active Directory domain. The Horizon FLEX administrator account must have permission to create objects in the Active Directory.

- An RODC must be installed in the DMZ.

- Configure the Active Directory to support the domain join.

### Procedure

1. In Fusion Pro, start the source virtual machine and log in to the guest operating system.
2. (Optional) Turn off **Windows update**.
3. Install the latest version of VMware Tools.
   a. From the menu bar, select **Virtual Machine > Install VMware Tools**.
   b. Click **Next** to progress through the installation.
   c. Select **Complete**, unless you need to exclude certain features of VMware Tools, and click **Next**.
   d. Click **Install**.
   e. When the installation finishes, click **Yes** to restart the virtual machine.
4. Run `install-rvmsetup.cmd` as an administrator to install the VMware RVM Setup Service in the source virtual machine.
   - The VMware RVM Setup Service performs the domain join operation. `install-rvmsetup.cmd` is included with VMware Tools.
5. Open the Windows Services snap-in (**services.msc**) and verify that the VMware RVM Setup Service startup type is set to Automatic.
6. Shut down the source virtual machine.
   - The VMware RVM Setup Service starts the next time you boot up the source virtual machine.
Compress a Source Virtual Machine Package

You must compress the source virtual machine package in TAR (.tar) format so that end users can easily download the virtual machine. A virtual machine package (sometimes called a bundle) includes all of the virtual machine files that are required to run a virtual machine.

**Prerequisites**

- Create the source virtual machine. See “Create a Source Virtual Machine in Fusion Pro,” on page 38 or “Create a Source Virtual Machine in Workstation Pro (Not included in Horizon FLEX),” on page 40.
- Create and configure a download folder for your Horizon FLEX virtual machine packages. See “Create a Download Folder for Horizon FLEX Virtual Machine Packages,” on page 15 and “Configure the IIS SSL Server Certificate for the Horizon FLEX Server,” on page 23.

**Procedure**

1. If the source virtual machine is running, shut it down.
2. In Fusion Pro or Workstation Pro, navigate to the source virtual machine.
3. Select **File > Export to TAR** and export the source virtual machine package to a TAR file.
   - Remove any spaces from the TAR file name. Removing spaces from the file name can make it easier to connect to the download URL for the virtual machine.
4. Export the TAR file to your Horizon FLEX virtual machine packages download folder.

**What to do next**

Register the source virtual machine with the Horizon FLEX Policy Server. See “Register a Source Virtual Machine with the Horizon FLEX Policy Server,” on page 44.

Register a Source Virtual Machine with the Horizon FLEX Policy Server

You must register a source virtual machine with the Horizon FLEX Policy Server as a Horizon FLEX image before you can distribute the virtual machine to end users.

**Prerequisites**

- Compress the source virtual machine files in a TAR (.tar) archive file. See “Compress a Source Virtual Machine Package,” on page 44.
- Verify that your Horizon FLEX virtual machine packages download directory is set up properly. See “Create a Download Folder for Horizon FLEX Virtual Machine Packages,” on page 15 and “Configure the IIS SSL Server Certificate for the Horizon FLEX Server,” on page 23.
- Verify that restrictions are already set in the source virtual machine’s configuration (.vmx) file. If you select a virtual machine that does not have restrictions set, the Horizon FLEX Policy Server rejects the .vmx file as invalid. For information about setting restrictions in a virtual machine, see “Create a Source Virtual Machine in Fusion Pro,” on page 38.

**Procedure**

1. If the source virtual machine is on a Mac, perform these steps.
   - a Find the virtual machine package (.vmwarevm) file for the virtual machine, right-click the file name, and select **Show Package Content**.
   - b Copy the virtual machine configuration (.vmx) file to a location that is accessible to the Horizon FLEX server.
2 Start the Horizon FLEX Admin Console.
   a In a Web browser, enter https://WebManagerServer:7443/rvm, where WebManagerServer is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b Enter the user name and password of a domain account that has access to Mirage.
   c Click Login.

3 Click Images in the left navigation panel.

4 Click the New (+) button.

5 Click Select next to the Select Image File text box and browse to the virtual machine configuration (.vmx) file for the source virtual machine.

6 Type a user-friendly name for the Horizon FLEX virtual machine file in the Image Name text box.
   For example: Windows 7 VM

7 (Optional) Type a description of the Horizon FLEX virtual machine in the Description text box.

8 (Optional) Click the Change button next to Icon and upload an icon for the Horizon FLEX virtual machine.
   Uploaded icons must be PNG (.png) files.

9 (Optional) In the Image URL text box type the fully qualified path of the TAR file that contains the source virtual machine package.
   End users will download the Horizon FLEX virtual machine from this URL. The URL format is http://server:port/download_directory/filename.tar, where server is the hostname or IP address of the server where you stored the TAR file, port is the port number on the server, download_folder is the name of the Horizon FLEX virtual machine download folder that contains the TAR file, and filename.tar is the name of the TAR file that contains the source virtual machine package. The URL can start with either http or https.
   For example: https://flexserver.demo.local:7443/flexdownloads/windows7vm.tar

10 (Optional) Type text in the Disclaimer (Optional) text box.
   If you do not specify any text, the Horizon FLEX Client does not display disclaimer text when a user downloads the Horizon FLEX virtual machine.

11 Click OK to register the source virtual machine as a Horizon FLEX image.

12 (Optional) Type the image URL in a Web browser to verify the URL.
   For example: https://flexserver.demo.local:7443/flexdownloads/windows7vm.tar
   You should be prompted to save the file. If you receive a permissions error, you might need to adjust the NTFS permissions for the download folder.

What to do next
Add policies to the Horizon FLEX image. See “Configure a General Policy for a Horizon FLEX Image,” on page 46.

Creating Policies and Entitlements
You use policies to set an expiration date and control the features in virtual machine instances created from a Horizon FLEX image. You use entitlements so that specific users and groups can create virtual machine instances from a particular Horizon FLEX image.

You associate a policy with each entitlement that you create. This policy defines the default restriction settings for the virtual machine instances that are created from the Horizon FLEX image in the entitlement.
You can include the same Horizon FLEX image in multiple entitlements, and you can associate each entitlement with a different policy. The same user can be a member of multiple entitlements.

When a virtual machine instance is created, the policies associated with entitlements determine the instance's initial restrictions. When you change a policy, the policy change applies to all virtual machine instances assigned to the entitlement. You cannot change the restrictions for a particular virtual machine instance by changing the policy. To change the restrictions for a particular virtual machine instance, you need to create an entitlement for that virtual machine and assign a new policy to that entitlement. You can also change policy for a virtual machine by creating a new policy and assigning it to the virtual machine instance. In this case, creating an entitlement is not required.

### Configure a General Policy for a Horizon FLEX Image

You configure general policies to set an expiration date and control the features in virtual machine instances created from a Horizon FLEX image.

**IMPORTANT** If the copy-and-paste, drag-and-drop, and folder sharing settings are enabled in the source virtual machine, you can configure a policy to enable or disable these features when users download an instance of the virtual machine. If these features are disabled in the source virtual machine, you cannot override the virtual machine settings by enabling the features in a policy.

You select the policy to assign to a Horizon FLEX image when you entitle the image to users. You can use the same policy in multiple entitlements.

#### Procedure

1. Start the Horizon FLEX Admin Console.
   a. In a Web browser, enter `https://<WebManagerServer>:7443/rvm`, where `<WebManagerServer>` is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b. Enter the user name and password of a domain account that has access to Mirage.
   c. Click **Login**.
2. Click **Policies** in the left navigation pane.
3. Click the **New (+)** button to create a policy, or select an existing policy and click **Change Policy** to modify it.
4. On the General tab, type a name for the policy in the **Policy Name** text box.
5. (Optional) Type a description for the policy in the **Description** text box.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expiration date</td>
<td>Use the calendar widget to set an expiration date for the virtual machine.</td>
</tr>
<tr>
<td>Copy and Paste operations</td>
<td>Specify whether to allow copy-and-paste operations in the virtual machine. This policy controls copy-and-paste operations between the virtual machine guest and host. It does not control copy-and-paste operations in the virtual machine.</td>
</tr>
<tr>
<td>Drag and Drop operations</td>
<td>Specify whether to allow drag-and-drop operations in the virtual machine. This policy controls drag-and-drop operations between the virtual machine guest and host. It does not control drag-and-drop operations in the virtual machine.</td>
</tr>
<tr>
<td>Folder Sharing settings</td>
<td>Specify whether to allow using shared folders in the virtual machine guest operating system if the administrator has configured shared folders in the virtual machine.</td>
</tr>
<tr>
<td>Change memory and CPU settings</td>
<td>Specify whether to allow users to change the memory and CPU settings of the virtual machine.</td>
</tr>
</tbody>
</table>
Option | Action
--- | ---
Optimize CPU and memory | Specify whether the Horizon FLEX virtual machine’s CPU and memory are automatically optimized to fit the client’s host operating system. This option is enabled by default. For more information, see “Optimizing Virtual Processors and Memory for Horizon FLEX Virtual Machines,” on page 37.

Require the user to change the power on passphrase when moving or copying the virtual machine | Specify whether to require users to change the encryption password if they move or copy the virtual machine.

Set the power on passphrase to match the user’s AD passphrase after first startup | Specify whether the password that users enter when powering on the virtual machine matches the Active Directory password.

Restrict the user from creating multiple copies of the virtual machine | Specify whether to allow users to download multiple instances of the virtual machine or copy already registered virtual machines.

7 (Optional) In End User Messages, configure virtual machine expiration settings. The default message is This virtual machine is expired.

a Type an additional custom message to display to the user when the virtual machine is expired.

b Select the Display this message check box, select the number of days before the virtual machine expires to display a custom message, and type the custom message text.

8 In Server Settings, configure Horizon FLEX server settings.

Option | Action
--- | ---
FLEX Server URL | Type the URL of the Horizon FLEX server that hosts the virtual machine package. For example: https://flexserver.demo.local:7443

| IMPORTANT Do not add /rvm to the end of the URL.

Server Contact Frequency | Select the frequency with which the virtual machine contacts the server for synchronization.

Offline Time Limit | Set the number of days that users can use the virtual machine before the virtual machine must connect to the Horizon FLEX server. When the offline time limit is exceeded, the virtual machine must connect to the Horizon FLEX server before it can power on.

9 Click OK to save the policy.

The new policy appears in the policy list.

What to do next

Entitle the Horizon FLEX virtual machine. See “Entitle a Horizon FLEX Image,” on page 50.

Configure a USB Device Policy for a Horizon FLEX Image

You configure policies to control whether USB devices can be used on virtual machines created from a Horizon FLEX image.

| IMPORTANT If the USB device controller is present in the source virtual machine, you can configure a policy to enable or disable this feature when users download an instance of the virtual machine. If this feature is disabled in the source virtual machine, you cannot override the virtual machine settings by enabling this feature in a policy. |
Procedure

1 Start the Horizon FLEX Admin Console.
   a In a Web browser, enter \texttt{https://WebManagerServer:7443/rvm}, where \texttt{WebManagerServer} is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b Enter the user name and password of a domain account that has access to Mirage.
   c Click Login.

2 Click Policies in the left navigation pane.

3 Click the New (+) button to create a policy, or select an existing policy and click Change Policy to modify it.

4 Click the Device Control tab to add a new device policy.

5 Select the Global Use of USB devices drop-down menu to set whether the policy will allow all USB devices or block all USB devices on the virtual machine.

   All the USB device classes are dimmed and cannot be changed. See “Configure a Custom USB Device Policy for a Horizon FLEX Image,” on page 48 to create a custom policy where specific USB device classes are allowed.

6 Click OK to save the policy.

   The new or updated policy appears in the policy list.

What to do next

Entitle the Horizon FLEX virtual machine. See “Entitle a Horizon FLEX Image,” on page 50.

Configure a Custom USB Device Policy for a Horizon FLEX Image

You can configure custom device policies to control whether specific types of USB devices can be used on virtual machines created from a Horizon FLEX image.

\textbf{IMPORTANT} If the USB device controller is present in the source virtual machine, you can configure a policy to enable or disable this feature when users download an instance of the virtual machine. If this feature is disabled in the source virtual machine, you cannot override the virtual machine settings by enabling this feature in a policy.

Procedure

1 Start the Horizon FLEX Admin Console.
   a In a Web browser, enter \texttt{https://WebManagerServer:7443/rvm}, where \texttt{WebManagerServer} is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b Enter the user name and password of a domain account that has access to Mirage.
   c Click Login.

2 Click Policies in the left navigation pane.

3 Click the New (+) button to create a policy, or select an existing policy and click Change Policy to modify it.

4 Click the Device Control tab to add a new device policy.

5 Set the Global Use of USB devices drop-down menu to Custom to allow or block specific classes of USB devices on the virtual machine.

   The text boxes for the class of USB devices appear, giving you the opportunity to allow or block specific classes.
6 Select the USB classes to allow or block on the virtual machine.

Table 5-3. USB Device Types

<table>
<thead>
<tr>
<th>USB Class</th>
<th>Base Class</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>01h</td>
<td>USB sound card</td>
</tr>
<tr>
<td>Communication and CDC Device</td>
<td>02h</td>
<td>USB network adapter, RS-232 serial devices</td>
</tr>
<tr>
<td>Physical</td>
<td>05h</td>
<td>Joystick</td>
</tr>
<tr>
<td>Image</td>
<td>06h</td>
<td>USB camera, USB scanner, webcam</td>
</tr>
<tr>
<td>Printer</td>
<td>07h</td>
<td>USB printer</td>
</tr>
<tr>
<td>Mass Storage</td>
<td>08h</td>
<td>USB disk</td>
</tr>
<tr>
<td>Smart Card</td>
<td>0Bh</td>
<td>USB smart card reader</td>
</tr>
<tr>
<td>Content Security</td>
<td>0Dh</td>
<td>Fingerprint reader</td>
</tr>
<tr>
<td>Video</td>
<td>0Eh</td>
<td>Webcam</td>
</tr>
<tr>
<td>Wireless Controller</td>
<td>E0h</td>
<td>Bluetooth adapter, Microsoft RNDIS</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>EFh</td>
<td>Select the Miscellaneous option to allow or block USB devices not covered in the previous classes. See Table 5-4 for USB classes that require the Miscellaneous setting.</td>
</tr>
</tbody>
</table>

Table 5-4. Miscellaneous USB Device Classes

<table>
<thead>
<tr>
<th>USB Class</th>
<th>Base Class</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Interface Device (HID)</td>
<td>03h</td>
<td>USB keyboard, USB joystick, USB mouse</td>
</tr>
<tr>
<td>Hub</td>
<td>09h</td>
<td>USB hub</td>
</tr>
<tr>
<td>Personal Healthcare</td>
<td>0Fh</td>
<td>Pulse monitor (watch)</td>
</tr>
<tr>
<td>Diagnostic Device</td>
<td>DCh</td>
<td>USB compliance testing device</td>
</tr>
<tr>
<td>Application-specific</td>
<td>FEh</td>
<td>IrDA Bridge, Test and Measurement Class (USBTMC), USB Device Firmware Upgrade (DFU)</td>
</tr>
</tbody>
</table>

7 Optionally, you can configure the device policy to allow specific USB devices.

a Under the Allow the virtual machine to use the following USB devices text box, click Add.

b Enter the name of the USB device in the Name text box.

c Enter the vendor ID as a hex value in the Vendor ID text box.

d Enter the product ID as a hex value in the Product ID text box.

e Click Add and click Update.

To obtain the USB device information on a Windows machine, click System Tools and then select Device Manager. To obtain USB device information on a Mac, click the Apple icon, select About the Mac, select System Report, then select USB and click the device item.

8 Click OK to save the policy.

The new or updated policy appears in the policy list.

What to do next

Entitle the Horizon FLEX virtual machine. See “Entitle a Horizon FLEX Image,” on page 50.
Update a Policy for a Deployed Horizon FLEX Image

After a Horizon FLEX image has been deployed to users, you can update policies that apply to existing virtual machine instances.

**IMPORTANT** If you edit an existing policy by using the Policies button in the left navigation pane, the edit applies only to new users. The edited policy does not apply to existing users with deployed virtual machine instances. For example, in a scenario where the original policy does not restrict the user from creating multiple copies of the virtual machine, if you edit the policy to add this restriction, it would not apply to existing virtual machines. If a user has a virtual machine covered by the original policy, that user could still make copies of that virtual machine. If that user downloads a second virtual machine covered by the edited policy, the user would be restricted from copying that second virtual machine.

**Procedure**

1. Start the Horizon FLEX Admin Console.
   a. In a Web browser, enter `https://WebManagerServer:7443/rvm`, where `WebManagerServer` is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b. Enter the user name and password of a domain account that has access to Mirage.
   c. Click Login.
2. Click Virtual Machines in the left navigation pane.
3. Select the virtual machine.
4. Click Change Policy.
5. Update the policy for the Horizon FLEX image and click OK when complete.

**What to do next**

See “Configure a General Policy for a Horizon FLEX Image,” on page 46 and “Configure a USB Device Policy for a Horizon FLEX Image,” on page 47 for more information.

Entitle a Horizon FLEX Image

You use entitlements to allow specific users and groups to download and use virtual machine instances from a particular Horizon FLEX image.

Users can download any Horizon FLEX virtual machine to which they are entitled. Users need to enter their Active Directory credentials before they can register and use a Horizon FLEX virtual machine for the first time. Users can log in to the Horizon FLEX server and download the virtual machine. Or they can copy the Horizon FLEX virtual machine from a USB and enter the Active Directory credentials when the virtual machine first boots.

**Prerequisites**

- Verify that the appropriate Active Directory users and groups are synchronized in the Horizon FLEX database. See “Configure Active Directory Settings,” on page 15.
- Register the source virtual machine with the Horizon FLEX Policy Server. See “Register a Source Virtual Machine with the Horizon FLEX Policy Server,” on page 44.
- Configure a policy for the Horizon FLEX image. See “Configure a General Policy for a Horizon FLEX Image,” on page 46.
Procedure

1. Start the Horizon FLEX Admin Console.
   a. In a Web browser, enter https://WebManagerServer:7443/rvm, where WebManagerServer is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b. Enter the user name and password of a domain account that has access to Mirage.
   c. Click Login.

2. Click Entitlements in the left pane.

3. Click the New (+) button to create an entitlement, select an existing entitlement and click Edit to modify it, or select an existing entitlement and click Duplicate to duplicate it.

4. Create the entitlement name and assign it to a Horizon FLEX image.
   a. Enter a name for the entitlement in the Entitlement Name text box.
   b. Select a Horizon FLEX image to add to the entitlement.
   c. In the Download URL text box, change the URL that the client uses to download the Horizon FLEX image.
   d. Click Next.

5. Select the Active Directory users and groups to include in the entitlement.
   a. Use the search field to find and select users and groups to add to the entitlement.
   b. Click Add to add a user or group to the Entitlement Members list.
   c. Click Next.

6. Select a policy for the entitlement and click Next.

7. (Optional) To use a virtual machine naming pattern, select Use machine name configuration and configure the naming pattern.
   a. Enter the machine name pattern to use in the Machine Name Pattern text box.
   b. Select a domain name from the Domain name drop-down menu.
   c. Enter an OU in the Organizational Unit text box.

For example: OU=hr1, OU=hr, OU=flex, DC=ws, DC=test, DC=com
8 (Optional) If you installed the Mirage client in the virtual machine, select whether to manage the virtual machine with Mirage.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use VMware Mirage for disaster recovery and Image management scenarios</td>
<td>Select this option to select a CVD policy, a base layer, an application layer, and other configurations. The Mirage server automatically creates a CVD for virtual machines that the end user downloads. Mirage periodically synchronizes end-user data into the data center based on the selected Mirage policy. In the main Mirage Management Console, you can use this data to restore the CVD or access files on the virtual machine by using the Mirage File Portal. The Mirage server also automatically deploys base and application layers to the virtual machine after it has been provisioned for image compliance and remote application delivery.</td>
</tr>
<tr>
<td>Use VMware Mirage for disaster recovery scenarios</td>
<td>Select this option to select a CVD policy. The Mirage server creates a CVD for virtual machines that the end user downloads. You can use this data to restore the CVD or access files on the virtual machine by using the Mirage File Portal in the main Mirage Management Console.</td>
</tr>
<tr>
<td>Do not use VMware Mirage to manage the virtual machines</td>
<td>Select this option to opt out of managing the virtual machine with Mirage.</td>
</tr>
</tbody>
</table>

If you delete a virtual machine in which the Mirage client is installed, the Mirage server archives the CVD of the deleted virtual machine.

9 Click **Next** and review the settings of the entitlement.

10 Click **Finish** to save the entitlement, or click **Back** to return to the previous page and edit the entitlement.

### Create a Virtual Machine Name Pattern

When entitling a Horizon FLEX image, you can create a virtual machine name pattern so that when virtual machines are created for the same user entitlement, Horizon FLEX creates unique virtual machine names.

The virtual machine name pattern must include the `{username}` or `{n}` parameters. The `{n}` parameter enables the creation of a running number pattern to add incremental numbers to virtual machine names. These patterns are valid:

- `VM-{username}`
- `VM-{n}`

These patterns are not valid:

- `VM-{username}-{username}`
- `VM-{username}-{n}`
- `VM-{n}-{n}`

The machine name is limited to 15 characters. If a machine name is longer than 15 characters, only the first 15 characters are used. For example, if the pattern is `VM-1234567890-{username}` and the user name is Jack, the machine name is trimmed to `VM-123456789-J`.

To ensure that each virtual machine receives a different name and can join the domain, it must include the `{username}` or `{n}` placeholders. The `{username}` placeholder is replaced by the individual user's name when the user downloads the virtual machine. For `{n}`, the Active Directory is searched for computers with names that match the pattern. If no names match the pattern, the running number value is 1. Otherwise, the value for the next running number is the successor number of the maximum number between all names that match the pattern.
For example, one virtual machine might be entitled to user1 and the machine name pattern might be set as VM-
username- n. When user1 downloads the virtual machine, Active Directory is searched to determine whether a machine name matches the name pattern, such as VM-user1-x, where x is the assigned number. If the maximum mapping number is 25, where the virtual machine name is VM-user1-25, this machine name is set as VM-user1-26. If no virtual machine matches the pattern, Horizon FLEX sets the machine as VM-user1-1.

You can entitle more than one virtual machine to the same user. For example, you can entitle three virtual machines to user1. When user1 downloads the virtual machines, the virtual machine name is changed to vm-x-user1. The assigned virtual machine number is not incremented for each user name but is based on when the virtual machine was registered.

For example, user1 might have three virtual machine names vm-10-user1, vm-26-user1 and vm-39-user1, depending on which other virtual machines were entitled to other users and when user1 downloaded each virtual machine. The incremented number is used only for tracking by the Horizon FLEX administrator. The client user does not see the incremented number.

Create a URI to Deploy a Horizon FLEX Virtual Machine

You can deploy a Horizon FLEX virtual machine by creating a uniform resource identifier (URI). Using a URI, you can create an email that contains a link that the end user can click to connect to a server and download a Horizon FLEX virtual machine.

Prerequisites

- Verify that the Horizon FLEX client is installed on the end user system.
- Give the end user a password for the server and the encryption password for the virtual machine.

Procedure

1. Construct a URI for the end user.
   A URI has the following structure:
   
   vmware-rvm://username@myserver.com:7443

   username is the user's login name and myserver.com is the host name of the server. You must include
   vmware-rvm:// and :7443 in the server address. Do not include http or https in the server address.

2. Type link text in an email and enter hyperlink information for the URI.
   You can use any email system to send the link. However, because the format of the URI is not
   recognized as a standard URL, you must manually enter the hyperlink information.

3. Create an email for the user and enter some link text.
   For example: Your Horizon FLEX virtual machine

4. Select the link text, right-click the selected text, and select Hyperlink.

5. Select Link to: Existing File or Web Page.

6. Enter the URI in the Address text box.
   For example: vmware-rvm://johndoe@yourserver.com:7443
   The link is now active.

7. Click OK.

8. Send the email to the user.

When the user clicks the link in the email, the user's Horizon FLEX Client starts and the server connection dialog box opens. The server and user name text boxes are prepopulated with the values that you specified in the URI. The user enters a password and connects to the server to download a virtual machine.
Managing Horizon FLEX Virtual Machines

You can manage deployed Horizon FLEX virtual machines by performing operations such as Edit, Lockout, Reactivate, Wipe, Archive, or Delete.

Manage Horizon FLEX Virtual Machines

Once Horizon FLEX virtual machines are deployed, you can manage them by performing different operations. You can view the inventory of deployed Horizon FLEX virtual machines in the Horizon FLEX Admin Console.

You can use the Search text box to filter the virtual machine list and the sortable column headings to find a specific virtual machine. Use the column heading drop-down menu to select the columns to view or hide.

When you select a virtual machine in the list, you can expand the Properties window at the bottom of the page to view general settings for the virtual machine and policies applied to the virtual machine.

Procedure

1. Start the Horizon FLEX Admin Console.
   a. In a Web browser, enter https://WebManagerServer:7443/rvm, where WebManagerServer is the DNS name or IP address of the host where the Mirage Web Manager is installed.
   b. Enter the user name and password of a domain account that has access to Mirage.
   c. Click Login.

2. Click Virtual Machines in the left navigation pane.

   The inventory of deployed Horizon FLEX virtual machines appears on the Virtual Machines page.

   If the policy field is blank, the virtual machine was created using Horizon FLEX 1.6 or earlier. The virtual machine may have a policy assigned to it and the policy continues to work. To create a new policy for the virtual machine, see “Creating Policies and Entitlements,” on page 45.

3. To manage a specific virtual machine, select the virtual machine in the list.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Policy</td>
<td>Select a virtual machine and click Change Policy to change the policies assigned to this virtual machine.</td>
</tr>
<tr>
<td>Lockout</td>
<td>Select a virtual machine and click Lockout to revoke user access to the specific virtual machine.</td>
</tr>
<tr>
<td>Reactivate</td>
<td>Select an archived or locked-out virtual machine and click Reactivate to reset the virtual machine.</td>
</tr>
<tr>
<td>Wipe</td>
<td>Select a virtual machine and click Wipe to delete it from the file system.</td>
</tr>
</tbody>
</table>
Option | Action
---|---
Archive | Select a virtual machine and click **Archive** to disable the virtual machine for use and keep an offline record of the virtual machine. Select the **Display archived instances** box at the bottom of the Virtual Machines page to view virtual machines that have been archived. You can click **Reactivate** to enable an archived virtual machine.  
Delete | Select an archived or wiped virtual machine and click **Delete**. You cannot delete a virtual machine that has any other status than Archived or Wiped.

4 To determine the actions that you can take for a virtual machine, view the virtual machine status in the **Status** column.

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>The virtual machine is in use, has contacted the server, and has not expired.</td>
</tr>
<tr>
<td>Inactive</td>
<td>The Horizon FLEX Client that the user used to open the virtual machine has failed to contact the server for longer than the offline working policy period.</td>
</tr>
<tr>
<td>Expired</td>
<td>The expiration date has been reached and the virtual machine has been turned off.</td>
</tr>
<tr>
<td>Pending Expired</td>
<td>The server is waiting for confirmation from the Horizon FLEX Client that the virtual machine is expired.</td>
</tr>
<tr>
<td>Locked Out</td>
<td>An administrator has locked out the user of the virtual machine.</td>
</tr>
<tr>
<td>Pending Lockout</td>
<td>A lockout has been initiated. The status remains Pending until the Horizon FLEX Client verifies that the virtual machine has been locked out.</td>
</tr>
<tr>
<td>Pending Reactivate</td>
<td>The server is waiting for confirmation from the Horizon FLEX Client that the virtual machine is reactivated.</td>
</tr>
<tr>
<td>Downloading</td>
<td>The user is downloading the virtual machine.</td>
</tr>
<tr>
<td>Download Cancelled</td>
<td>The user has canceled the download.</td>
</tr>
<tr>
<td>Download Paused</td>
<td>The user has paused the download.</td>
</tr>
<tr>
<td>Domain Join Fail</td>
<td>The virtual machine failed to join a domain. The most common reason why a virtual machine might fail to join a domain is that the object already exists in Active Directory. In this case, check the offline domain join log, which is maintained by the operating system, to determine how to solve the failure.</td>
</tr>
<tr>
<td>Deleted by User</td>
<td>The user has deleted the VM on the client.</td>
</tr>
<tr>
<td>Wiped</td>
<td>The virtual machine has been wiped by the administrator and removed from the user’s system.</td>
</tr>
<tr>
<td>Pending Wipe</td>
<td>The server is waiting for confirmation from the Horizon FLEX Client that the virtual machine has been removed from the user’s system.</td>
</tr>
<tr>
<td>Archived</td>
<td>The virtual machine has been archived.</td>
</tr>
</tbody>
</table>

**Note**: You must select the **Display archived instances** check box to view archived virtual machines.
You can perform maintenance operations on the Horizon FLEX system, including upgrading from previous Horizon FLEX versions.

This chapter includes the following topics:

- “Upgrade from Previous Horizon FLEX Versions,” on page 57
- “Horizon FLEX System Logs,” on page 58

### Upgrade from Previous Horizon FLEX Versions

You can upgrade the Horizon FLEX system from earlier Horizon FLEX versions.

**Prerequisites**

- All Mirage servers are shut down.
- All deployed Horizon FLEX virtual machines are shut down.

**Procedure**

1. Download the Horizon FLEX Server and Horizon FLEX Client installation files for the upgrade version.
2. Upgrade the Horizon FLEX Server component.
   
   a. To upgrade the Mirage Management Server, double-click on the `mirage.management.server.64x.buildnumber.msi` file in the server folder.

      By default, the configuration settings you selected during the initial installation are applied. You can change the configuration settings during the upgrade process.

   b. To upgrade the Mirage server, double-click on the `mirage.server.64x.buildnumber.msi` file.

      By default, the configuration settings you selected during the initial installation are applied. You can change the configuration settings during the upgrade process.

   c. To upgrade the Mirage Web Manager (Web Management Console), double-click on the `mirage.WebManagement.console.x64.buildnumber.msi` file in the `WebManagement` folder.

      Continue with no change.

   d. If you use Mirage to manage your Windows virtual machines, follow the instructions for upgrading from the previous Mirage version in the *VMware Mirage Administrator’s Guide*.  

VMware, Inc.
3 Upgrade all Horizon FLEX clients to the version that is compatible with the upgraded Horizon FLEX Server.

- Provide your end users with the installer file for the Fusion Pro or Workstation Player upgrade version, or instruct them to download the software from the VMware Web site.
- Upgrade the Horizon FLEX Clients by using a mass deployment.

**What to do next**

For complete Mirage upgrade instructions, see the VMware Mirage documentation at https://www.vmware.com/support/pubs/mirage_pubs.html.

**NOTE** Do not select the **Create new storage areas** when upgrading the Mirage Management Server. If you select this option and enter the path to the original storage area, your entire Mirage installation, including base layer, app layer, CVD data, and so on, are deleted and become irretrievable if a backup is unavailable.

See “Installing the Horizon FLEX Client for End Users,” on page 16 for information on using a mass deployment to provide the Horizon FLEX Client to end users.

**Horizon FLEX System Logs**

Horizon FLEX log files can be used for troubleshooting system issues.

Horizon FLEX system logs are available in the following locations:

- **Web App log file**
  
  C:\ProgramData\Wanova Mirage\rvm\logs\webapp.log

- **Horizon FLEX server logs**
  
  C:\Program Files\Wanova\Mirage Management Server\logs

  The most important log file is the mgmtservice.log file.

- **Horizon FLEX uses the Microsoft offline domain join feature. The offline domain join log file is at:**
  
  C:\Windows\debug\NetSetup.LOG
Index

A
Active Directory  15, 43, 50
architecture  8
archiving virtual machines  55

C
certificate store for Horizon FLEX server  22
certificates
  internal root CA  31, 32
  self-signed  21
certificates, self-signed  29, 30
certificates, setting up  21
components  7
configuring, Active Directory settings  15
copy and paste  46
creating Horizon FLEX VMs  35
custom device control settings  48

D
deleting virtual machines  55
deploying Horizon FLEX VMs  35
deployment overview  35
device control settings  47
domain join  43
download folder  15
drag and drop  46

E
editing virtual machines  55
domain join  43
drag and drop  46

F
folder sharing  46

G
glossary  5
guest operating systems  12

H
Horizon FLEX terminology  7
Horizon FLEX Admin Console  16
Horizon FLEX Client, installing for end users  16
Horizon FLEX server certificates  21
Horizon FLEX system logs  58
Horizon FLEX system server requirements  10
Horizon FLEX virtual machine planning considerations  36
Horizon FLEX VM deployment  35
host operating systems  12

I
IIS virtual directory  23
image URL  44
importing certificates on client host  28
installation overview  13
installing Fusion Pro, mass deployment package  17
installing Horizon FLEX Client software for end users  16
internal CA certificates  31, 32
introduction  7

K
Keychain Access  27, 32

L
locking out virtual machines  55

M
Mac certificates  27, 32
machine name configuration  50
entitlements and policies  45
EULA  44
memory and CPU settings  46
Mirage  8, 14
Mirage client  42

N
network requirements  11

O
organizational units  15
P
PEM format 26–28
policies 46
policies and entitlements 45
policy server 44
policy updates 50

R
reactivating virtual machines 55
REMOVE property values 19
restriction settings 38
RVM Setup Service 43

S
self-signed certificates 29, 30
setting up Horizon FLEX server certificate 21
source virtual machines 35, 38, 40, 44
status values 55
system requirements, Horizon FLEX 10

T
TAR file 44
trusted certificates list 25, 28

U
unattended installation, REMOVE property values 19
unattended Workstation Player installation 17
updating a policy 50
updating trusted certificates 23
upgrading Horizon FLEX version 57
URI format 53
USB custom device control settings 48
USB device control settings 47

V
virtual machine packages 44
virtual machine name pattern 52
VM packages 44
VMware RVM Setup Service 43
VMware Tools 43

W
Windows certificates 27, 29–31
wiping virtual machines 55
Workstation Player installation package 17
Workstation Player installation properties 18