You can find the most up-to-date technical documentation on the VMware website at:
https://docs.vmware.com/
If you have comments about this documentation, submit your feedback to
docfeedback@vmware.com
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About VMware ESXi Installation and Setup

VMware ESXi Installation and Setup describes how to install and configure VMware ESXi™.

Intended Audience

*VMware ESXi Installation and Setup* is intended for experienced administrators who want to install and configure ESXi.

This information is written for experienced Windows or Linux system administrators who are familiar with virtual machine technology and data center operations. The information about using the Image Builder and VMware vSphere® Auto Deploy™ is written for administrators who have experience with Microsoft PowerShell and VMware vSphere® PowerCLI™.

vSphere Web Client and vSphere Client

Task instructions in this guide are based on the vSphere Web Client. You can also perform most of the tasks in this guide by using the new vSphere Client. The new vSphere Client user interface terminology, topology, and workflow are closely aligned with the same aspects and elements of the vSphere Web Client user interface. You can apply the vSphere Web Client instructions to the new vSphere Client unless otherwise instructed.

*Note*  In vSphere 6.7, most of the vSphere Web Client functionality is implemented in the vSphere Client. For an up-to-date list of the unsupported functionality, see Functionality Updates for the vSphere Client.

VMware Technical Publications Glossary

VMware Technical Publications provides a glossary of terms that might be unfamiliar to you. For definitions of terms as they are used in VMware technical documentation, go to http://www.vmware.com/support/pubs.
Introduction to vSphere
Installation and Setup

vSphere 6.7 provides various options for installation and setup. To ensure a successful vSphere deployment, understand the installation and setup options, and the sequence of tasks.

The two core components of vSphere are ESXi and vCenter Server. ESXi is the virtualization platform on which you can create and run virtual machines and virtual appliances. vCenter Server is a service that acts as a central administrator for ESXi hosts connected in a network. vCenter Server lets you pool and manage the resources of multiple hosts.

You can install vCenter Server on a Windows virtual machine or physical server, or deploy the vCenter Server Appliance. The vCenter Server Appliance is a preconfigured Linux-based virtual machine optimized for running vCenter Server and the vCenter Server components. You can deploy the vCenter Server Appliance on ESXi hosts 6.0 or later, or on vCenter Server instances 6.0 or later.

Starting with vSphere 6.0, all prerequisite services for running vCenter Server and the vCenter Server components are bundled in the VMware Platform Services Controller™. You can deploy vCenter Server with an embedded or external Platform Services Controller, but you must always install or deploy the Platform Services Controller before installing or deploying vCenter Server.

For detailed information about the vCenter Server installation process, see vCenter Server Installation and Setup.
Overview of the vSphere Installation and Setup Process

vSphere is a sophisticated product with multiple components to install and set up. To ensure a successful vSphere deployment, understand the sequence of tasks required.

Installing vSphere includes the following tasks:
1. Read the vSphere release notes.
2. Install ESXi.
   a. Verify that your system meets the minimum hardware requirements. See ESXi Requirements.
   b. Determine the ESXi installation option to use. See Options for Installing ESXi.
c Determine where you want to locate and boot the ESXi installer. See Media Options for Booting the ESXi Installer. If you are using PXE to boot the installer, verify that your network PXE infrastructure is properly set up. See PXE Booting the ESXi Installer.

d Create a worksheet with the information you will need when you install ESXi. See Required Information for ESXi Installation.

e Install ESXi.
  ■ Installing ESXi Interactively
  ■ Installing or Upgrading Hosts by Using a Script

Note You can also provision ESXi hosts by using vSphere Auto Deploy, but vSphere Auto Deploy is installed together with vCenter Server. To provision ESXi hosts by using Auto Deploy, you must deploy the vCenter Server Appliance or install vCenter Server.

3 Configure the ESXi boot and network settings, the direct console, and other settings. See Setting Up ESXi and After You Install and Set Up ESXi.

4 Consider setting up a syslog server for remote logging, to ensure sufficient disk storage for log files. Setting up logging on a remote host is especially important for hosts with limited local storage. See Required Free Space for System Logging and Configure Syslog on ESXi Hosts.

5 Determine the vCenter Server and Platform Services Controller deployment model that is suitable for your environment.

6 Deploy or install vCenter Server and Platform Services Controller.

   For detailed information, see the vCenter Server Installation and Setup guide.
About ESXi Evaluation and Licensed Modes

You can use evaluation mode to explore the entire set of features for ESXi hosts. The evaluation mode provides the set of features equal to a vSphere Enterprise Plus license. Before the evaluation mode expires, you must assign to your hosts a license that supports all the features in use.

For example, in evaluation mode, you can use vSphere vMotion technology, the vSphere HA feature, the vSphere DRS feature, and other features. If you want to continue using these features, you must assign a license that supports them.

The installable version of ESXi hosts is always installed in evaluation mode. ESXi Embedded is preinstalled on an internal storage device by your hardware vendor. It might be in evaluation mode or prelicensed.

The evaluation period is 60 days and begins when you turn on the ESXi host. At any time during the 60-day evaluation period, you can convert from licensed mode to evaluation mode. The time available in the evaluation period is decreased by the time already used.

For example, suppose that you use an ESXi host in evaluation mode for 20 days and then assign a vSphere Standard Edition license key to the host. If you set the host back in evaluation mode, you can explore the entire set of features for the host for the remaining evaluation period of 40 days.

For information about managing licensing for ESXi hosts, see the vCenter Server and Host Management documentation.
Installing and Setting Up ESXi

You can install and set up ESXi on your physical hardware so that it acts as a platform for virtual machines.

This chapter includes the following topics:
- ESXi Requirements
- Preparing for Installing ESXi
- Installing ESXi
- Setting Up ESXi
- After You Install and Set Up ESXi

ESXi Requirements

To install or upgrade ESXi, your system must meet specific hardware and software requirements.

ESXi Hardware Requirements

Make sure the host meets the minimum hardware configurations supported by ESXi6.7.

Hardware and System Resources

To install or upgrade ESXi, your hardware and system resources must meet the following requirements:
- Supported server platform. For a list of supported platforms, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility.
- ESXi 6.7 requires a host machine with at least two CPU cores.
- ESXi 6.7 supports 64-bit x86 processors released after September 2006. This includes a broad range of multi-core processors. For a complete list of supported processors, see the VMware compatibility guide at http://www.vmware.com/resources/compatibility.
- ESXi 6.7 requires the NX/XD bit to be enabled for the CPU in the BIOS.
- ESXi 6.7 requires a minimum of 4 GB of physical RAM. It is recommended to provide at least 8 GB of RAM to run virtual machines in typical production environments.
- To support 64-bit virtual machines, support for hardware virtualization (Intel VT-x or AMD RVI) must be enabled on x64 CPUs.
One or more Gigabit or faster Ethernet controllers. For a list of supported network adapter models, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility.

SCSI disk or a local, non-network, RAID LUN with unpartitioned space for the virtual machines.

For Serial ATA (SATA), a disk connected through supported SAS controllers or supported on-board SATA controllers. SATA disks are considered remote, not local. These disks are not used as a scratch partition by default because they are seen as remote.

**Note** You cannot connect a SATA CD-ROM device to a virtual machine on an ESXi 6.7 host. To use the SATA CD-ROM device, you must use IDE emulation mode.

### Storage Systems

For a list of supported storage systems, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility. For Software Fibre Channel over Ethernet (FCoE), see Installing and Booting ESXi with Software FCoE.

### ESXi Booting Requirements

vSphere 6.7 supports booting ESXi hosts from the Unified Extensible Firmware Interface (UEFI). With UEFI, you can boot systems from hard drives, CD-ROM drives, or USB media.

Starting with vSphere 6.7, VMware Auto Deploy supports network booting and provisioning of ESXi hosts with UEFI.

ESXi can boot from a disk larger than 2 TB if the system firmware and the firmware on any add-in card that you are using support it. See the vendor documentation.

**Note** Changing the boot type from legacy BIOS to UEFI after you install ESXi 6.7 might cause the host to fail to boot. In this case, the host displays an error message similar to Not a VMware boot bank. Changing the host boot type between legacy BIOS and UEFI is not supported after you install ESXi 6.7.

### Storage Requirements for ESXi 6.7 Installation or Upgrade

Installing ESXi 6.7 or upgrading to ESXi 6.7 requires a boot device that is a minimum of 1 GB. When booting from a local disk, SAN or iSCSI LUN, a 5.2-GB disk is required to allow for the creation of the VMFS volume and a 4-GB scratch partition on the boot device. If a smaller disk or LUN is used, the installer attempts to allocate a scratch region on a separate local disk. If a local disk cannot be found the scratch partition, /scratch, is on the ESXi host ramdisk, linked to /tmp/scratch. You can reconfigure /scratch to use a separate disk or LUN. For best performance and memory optimization, do not leave /scratch on the ESXi host ramdisk.

To reconfigure /scratch, see Set the Scratch Partition from the vSphere Web Client.

Due to the I/O sensitivity of USB and SD devices, the installer does not create a scratch partition on these devices. When installing or upgrading on USB or SD devices, the installer attempts to allocate a scratch region on an available local disk or datastore. If no local disk or datastore is found, /scratch is placed on the ramdisk. After the installation or upgrade, you should reconfigure /scratch to use a persistent...
datastore. Although a 1GB USB or SD device suffices for a minimal installation, you should use a 4GB or larger device. The extra space is used for an expanded coredump partition on the USB/SD device. Use a high-quality USB flash drive of 16 GB or larger so that the extra flash cells can prolong the life of the boot media, but high-quality drives of 4 GB or larger are sufficient to hold the extended coredump partition. See Knowledge Base article http://kb.vmware.com/kb/2004784.

In Auto Deploy installations, the installer attempts to allocate a scratch region on an available local disk or datastore. If no local disk or datastore is found, /scratch is placed on ramdisk. You should reconfigure /scratch to use a persistent datastore following the installation.

For environments that boot from a SAN or use Auto Deploy, you need not allocate a separate LUN for each ESXi host. You can co-locate the scratch regions for many ESXi hosts onto a single LUN. The number of hosts assigned to any single LUN should be weighed against the LUN size and the I/O behavior of the virtual machines.

**ESXi 6.7 Installation on M.2 and other Non-USB Low-end Flash Media**

Unlike USB flash devices, the ESXi installer creates a VMFS datastore on M.2 and other non-USB low-end flash media. If you deploy a virtual machine or migrate a virtual machine to this boot device datastore, the boot device can be worn out quickly depending on the endurance of the flash device and the characteristics of the workload. Even read-only workloads can cause problems on low-end flash devices.

**Important** If you install ESXi on M.2 or other non-USB low-end flash media, delete the VMFS datastore on the device immediately after installation. See vSphere Storage for more information on removing VMFS datastores.

**Supported Remote Management Server Models and Firmware Versions**

You can use remote management applications to install or upgrade ESXi, or to manage hosts remotely.

**Table 5-1. Supported Remote Management Server Models and Minimum Firmware Versions**

<table>
<thead>
<tr>
<th>Remote Management Server Model</th>
<th>Firmware Version</th>
<th>Java</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell DRAC 7</td>
<td>1.30.30 (Build 43)</td>
<td>1.7.0_60-b19</td>
</tr>
<tr>
<td>Dell DRAC 6</td>
<td>1.54 (Build 15), 1.70 (Build 21)</td>
<td>1.6.0_24</td>
</tr>
<tr>
<td>Dell DRAC 5</td>
<td>1.0, 1.45, 1.51</td>
<td>1.6.0_20, 1.6.0_203</td>
</tr>
<tr>
<td>Dell DRAC 4</td>
<td>1.75</td>
<td>1.6.0_23</td>
</tr>
<tr>
<td>HP ILO</td>
<td>1.81, 1.92</td>
<td>1.6.0_22, 1.6.0_23</td>
</tr>
<tr>
<td>HP ILO 2</td>
<td>1.8, 1.81</td>
<td>1.6.0_20, 1.6.0_23</td>
</tr>
<tr>
<td>HP ILO 3</td>
<td>1.28</td>
<td>1.7.0_60-b19</td>
</tr>
<tr>
<td>HP ILO 4</td>
<td>1.13</td>
<td>1.7.0_60-b19</td>
</tr>
<tr>
<td>IBM RSA 2</td>
<td>1.03, 1.2</td>
<td>1.6.0_22</td>
</tr>
</tbody>
</table>
## Recommendations for Enhanced ESXi Performance

To enhance performance, install or upgrade ESXi on a robust system with more RAM than the minimum required and with multiple physical disks.

For ESXi system requirements, see [ESXi Hardware Requirements](#).

### Table 5-2. Recommendations for Enhanced Performance

<table>
<thead>
<tr>
<th>System Element</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAM</td>
<td>ESXi hosts require more RAM than typical servers. Provide at least 8GB of RAM to take full advantage of ESXi features and run virtual machines in typical production environments. An ESXi host must have sufficient RAM to run concurrent virtual machines. The following examples are provided to help you calculate the RAM required by the virtual machines running on the ESXi host. Operating four virtual machines with Red Hat Enterprise Linux or Windows XP requires at least 3GB of RAM for baseline performance. This figure includes approximately 1024MB for the virtual machines, 256MB minimum for each operating system as recommended by vendors. Running these four virtual machines with 512MB RAM requires that the ESXi host have approximately 4GB RAM, which includes 2048MB for the virtual machines. These calculations do not take into account possible memory savings from using variable overhead memory for each virtual machine. See <a href="#">vSphere Resource Management</a>.</td>
</tr>
<tr>
<td>Dedicated Fast Ethernet adapters for virtual machines</td>
<td>Place the management network and virtual machine networks on different physical network cards. Dedicated Gigabit Ethernet cards for virtual machines, such as Intel PRO 1000 adapters, improve throughput to virtual machines with high network traffic.</td>
</tr>
<tr>
<td>Disk location</td>
<td>Place all data that your virtual machines use on physical disks allocated specifically to virtual machines. Performance is better when you do not place your virtual machines on the disk containing the ESXi boot image. Use physical disks that are large enough to hold disk images that all the virtual machines use.</td>
</tr>
<tr>
<td>VMFS5 partitioning</td>
<td>The ESXi installer creates the initial VMFS volumes on the first blank local disk found. To add disks or modify the original configuration, use the vSphere Web Client. This practice ensures that the starting sectors of partitions are 64K-aligned, which improves storage performance. <strong>Note</strong> For SAS-only environments, the installer might not format the disks. For some SAS disks, it is not possible to identify whether the disks are local or remote. After the installation, you can use the vSphere Web Client to set up VMFS.</td>
</tr>
</tbody>
</table>
Table 5-2. Recommendations for Enhanced Performance (Continued)

<table>
<thead>
<tr>
<th>System Element</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>Faster processors improve ESXi performance. For certain workloads, larger caches improve ESXi performance.</td>
</tr>
<tr>
<td>Hardware compatibility</td>
<td>Use devices in your server that are supported by ESXi 6.7 drivers. See the Hardware Compatibility Guide at <a href="http://www.vmware.com/resources/compatibility">http://www.vmware.com/resources/compatibility</a>.</td>
</tr>
</tbody>
</table>

Incoming and Outgoing Firewall Ports for ESXi Hosts

The vSphere Web Client and the VMware Host Client allow you to open and close firewall ports for each service or to allow traffic from selected IP addresses.

The following table lists the firewalls for services that are installed by default. If you install other VIBs on your host, additional services and firewall ports might become available. The information is primarily for services that are visible in the vSphere Web Client but the table includes some other ports as well.

Table 5-3. Incoming Firewall Connections

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5988</td>
<td>TCP</td>
<td>CIM Server</td>
<td>Server for CIM (Common Information Model).</td>
</tr>
<tr>
<td>5989</td>
<td>TCP</td>
<td>CIM Secure Server</td>
<td>Secure server for CIM.</td>
</tr>
<tr>
<td>427</td>
<td>TCP, UDP</td>
<td>CIM SLP</td>
<td>The CIM client uses the Service Location Protocol, version 2 (SLPv2) to find CIM servers.</td>
</tr>
<tr>
<td>546</td>
<td>DHCPv6</td>
<td></td>
<td>DHCP client for IPv6.</td>
</tr>
<tr>
<td>8301, 8302</td>
<td>UDP</td>
<td>DVSSync</td>
<td>DVSSync ports are used for synchronizing states of distributed virtual ports between hosts that have VMware FT record/replay enabled. Only hosts that run primary or backup virtual machines must have these ports open. On hosts that are not using VMware FT these ports do not have to be open.</td>
</tr>
<tr>
<td>902</td>
<td>TCP</td>
<td>NFC</td>
<td>Network File Copy (NFC) provides a file-type-aware FTP service for vSphere components. ESXi uses NFC for operations such as copying and moving data between datastores by default.</td>
</tr>
<tr>
<td>12345, 23451</td>
<td>UDP</td>
<td>vSANClustering Service</td>
<td>VMware vSAN Cluster Monitoring and Membership Directory Service. Uses UDP-based IP multicast to establish cluster members and distribute vSAN metadata to all cluster members. If disabled, vSAN does not work.</td>
</tr>
<tr>
<td>68</td>
<td>UDP</td>
<td>DHCP Client</td>
<td>DHCP client for IPv4.</td>
</tr>
<tr>
<td>53</td>
<td>UDP</td>
<td>DNS Client</td>
<td>DNS client.</td>
</tr>
<tr>
<td>8200, 8100, 8300</td>
<td>TCP, UDP</td>
<td>Fault Tolerance</td>
<td>Traffic between hosts for vSphere Fault Tolerance (FT).</td>
</tr>
<tr>
<td>6999</td>
<td>UDP</td>
<td>NSX Distributed Logical Router Service</td>
<td>NSX Virtual Distributed Router service. The firewall port associated with this service is opened when NSX VIBs are installed and the VDR module is created. If no VDR instances are associated with the host, the port does not have to be open. This service was called NSX Distributed Logical Router in earlier versions of the product.</td>
</tr>
</tbody>
</table>
### Table 5-3. Incoming Firewall Connections (Continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2233</td>
<td>TCP</td>
<td>vSAN Transport</td>
<td>vSAN reliable datagram transport. Uses TCP and is used for vSAN storage IO. If disabled, vSAN does not work.</td>
</tr>
<tr>
<td>161</td>
<td>UDP</td>
<td>SNMP Server</td>
<td>Allows the host to connect to an SNMP server.</td>
</tr>
<tr>
<td>22</td>
<td>TCP</td>
<td>SSH Server</td>
<td>Required for SSH access.</td>
</tr>
<tr>
<td>8000</td>
<td>TCP</td>
<td>vMotion</td>
<td>Required for virtual machine migration with vMotion. ESXi hosts listen on port 8000 for TCP connections from remote ESXi hosts for vMotion traffic.</td>
</tr>
<tr>
<td>902, 443</td>
<td>TCP</td>
<td>vSphere Web Client</td>
<td>Client connections</td>
</tr>
<tr>
<td>8080</td>
<td>TCP</td>
<td>vsanvp</td>
<td>vSAN VASA Vendor Provider. Used by the Storage Management Service (SMS) that is part of vCenter to access information about vSAN storage profiles, capabilities, and compliance. If disabled, vSAN Storage Profile Based Management (SPBM) does not work.</td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>vSphere Web Access</td>
<td>Welcome page, with download links for different interfaces.</td>
</tr>
<tr>
<td>5900-5964</td>
<td>TCP</td>
<td>RFB protocol</td>
<td></td>
</tr>
<tr>
<td>80, 9000</td>
<td>TCP</td>
<td>vSphere Update Manager</td>
<td></td>
</tr>
</tbody>
</table>

### Table 5-4. Outgoing Firewall Connections

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>427</td>
<td>TCP, UDP</td>
<td>CIM SLP</td>
<td>The CIM client uses the Service Location Protocol, version 2 (SLPv2) to find CIM servers.</td>
</tr>
<tr>
<td>547</td>
<td>TCP, UDP</td>
<td>DHCPv6</td>
<td>DHCP client for IPv6.</td>
</tr>
<tr>
<td>8301, 8302</td>
<td>UDP</td>
<td>DVSSync</td>
<td>DVSSync ports are used for synchronizing states of distributed virtual ports between hosts that have VMware FT record/replay enabled. Only hosts that run primary or backup virtual machines must have these ports open. On hosts that are not using VMware FT these ports do not have to be open.</td>
</tr>
<tr>
<td>44046, 31031</td>
<td>TCP</td>
<td>HBR</td>
<td>Used for ongoing replication traffic by vSphere Replication and VMware Site Recovery Manager.</td>
</tr>
<tr>
<td>902</td>
<td>TCP</td>
<td>NFC</td>
<td>Network File Copy (NFC) provides a file-type-aware FTP service for vSphere components. ESXi uses NFC for operations such as copying and moving data between datastores by default.</td>
</tr>
<tr>
<td>9</td>
<td>UDP</td>
<td>WOL</td>
<td>Used by Wake on LAN.</td>
</tr>
<tr>
<td>12345 23451</td>
<td>UDP</td>
<td>vSAN Clustering Service</td>
<td>Cluster Monitoring, Membership, and Directory Service used by vSAN.</td>
</tr>
<tr>
<td>68</td>
<td>UDP</td>
<td>DHCP Client</td>
<td>DHCP client.</td>
</tr>
<tr>
<td>53</td>
<td>TCP, UDP</td>
<td>DNS Client</td>
<td>DNS client.</td>
</tr>
<tr>
<td>80, 8200, 8100, 8300</td>
<td>TCP, UDP</td>
<td>Fault Tolerance</td>
<td>Supports VMware Fault Tolerance.</td>
</tr>
<tr>
<td>3260</td>
<td>TCP</td>
<td>Software iSCSI Client</td>
<td>Supports software iSCSI.</td>
</tr>
</tbody>
</table>
Table 5-4. Outgoing Firewall Connections (Continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6999</td>
<td>UDP</td>
<td>NSX Distributed Logical Router Service</td>
<td>The firewall port associated with this service is opened when NSX VIBs are installed and the VDR module is created. If no VDR instances are associated with the host, the port does not have to be open.</td>
</tr>
<tr>
<td>5671</td>
<td>TCP</td>
<td>rabbitmqproxy</td>
<td>A proxy running on the ESXi host. This proxy allows applications that are running inside virtual machines to communicate with the AMQP brokers that are running in the vCenter network domain. The virtual machine does not have to be on the network, that is, no NIC is required. Ensure that outgoing connection IP addresses include at least the brokers in use or future. You can add brokers later to scale up.</td>
</tr>
<tr>
<td>2233</td>
<td>TCP</td>
<td>vSAN Transport</td>
<td>Used for RDT traffic (Unicast peer to peer communication) between vSAN nodes.</td>
</tr>
<tr>
<td>8000</td>
<td>TCP</td>
<td>vMotion</td>
<td>Required for virtual machine migration with vMotion.</td>
</tr>
<tr>
<td>902</td>
<td>UDP</td>
<td>VMware vCenter Agent</td>
<td>vCenter Server agent.</td>
</tr>
<tr>
<td>8080</td>
<td>TCP</td>
<td>vsanvp</td>
<td>Used for vSAN Vendor Provider traffic.</td>
</tr>
<tr>
<td>9080</td>
<td>TCP</td>
<td>I/O Filter Service</td>
<td>Used by the I/O Filters storage feature</td>
</tr>
</tbody>
</table>

Table 5-5. Firewall Ports for Services That Are Not Visible in the UI by Default

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Service</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5900 -5964</td>
<td>TCP</td>
<td>RFB protocol</td>
<td>The RFB protocol is a simple protocol for remote access to graphical user interfaces.</td>
</tr>
<tr>
<td>8889</td>
<td>TCP</td>
<td>OpenWSMAN Daemon</td>
<td>Web Services Management (WS-Management is a DMTF open standard for the management of servers, devices, applications, and Web services.</td>
</tr>
</tbody>
</table>

Required Free Space for System Logging

If you used Auto Deploy to install your ESXi 6.7 host, or if you set up a log directory separate from the default location in a scratch directory on the VMFS volume, you might need to change your current log size and rotation settings to ensure that enough space is available for system logging.

All vSphere components use this infrastructure. The default values for log capacity in this infrastructure vary, depending on the amount of storage available and on how you have configured system logging. Hosts that are deployed with Auto Deploy store logs on a RAM disk, which means that the amount of space available for logs is small.

If your host is deployed with Auto Deploy, reconfigure your log storage in one of the following ways:

- Redirect logs over the network to a remote collector.
- Redirect logs to a NAS or NFS store.
If you redirect logs to non-default storage, such as a NAS or NFS store, you might also want to reconfigure log sizing and rotations for hosts that are installed to disk.

You do not need to reconfigure log storage for ESXi hosts that use the default configuration, which stores logs in a scratch directory on the VMFS volume. For these hosts, ESXi 6.7 configures logs to best suit your installation, and provides enough space to accommodate log messages.

<table>
<thead>
<tr>
<th>Log</th>
<th>Maximum Log File Size</th>
<th>Number of Rotations to Preserve</th>
<th>Minimum Disk Space Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Agent (hostd)</td>
<td>10 MB</td>
<td>10</td>
<td>100 MB</td>
</tr>
<tr>
<td>VirtualCenter Agent (vpxa)</td>
<td>5 MB</td>
<td>10</td>
<td>50 MB</td>
</tr>
<tr>
<td>vSphere HA agent (Fault Domain Manager, fdm)</td>
<td>5 MB</td>
<td>10</td>
<td>50 MB</td>
</tr>
</tbody>
</table>

For information about setting up a remote log server, see Configure Syslog on ESXi Hosts.

**VMware Host Client System Requirements**

Make sure that your browser supports the VMware Host Client.

The following guest operating systems and Web browser versions are supported for the VMware Host Client.

<table>
<thead>
<tr>
<th>Supported Browsers</th>
<th>Mac OS</th>
<th>Windows</th>
<th>Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Chrome</td>
<td>50+</td>
<td>50+</td>
<td>50+</td>
</tr>
<tr>
<td>Mozilla Firefox</td>
<td>45+</td>
<td>45+</td>
<td>45+</td>
</tr>
<tr>
<td>Microsoft Internet Explorer</td>
<td>N/A</td>
<td>11+</td>
<td>N/A</td>
</tr>
<tr>
<td>Microsoft Edge</td>
<td>N/A</td>
<td>38+</td>
<td>N/A</td>
</tr>
<tr>
<td>Safari</td>
<td>9.0+</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**ESXi Passwords and Account Lockout**

For ESXi hosts, you have to use a password with predefined requirements. You can change the required length and character class requirement or allow pass phrases using the Security.PasswordQualityControl advanced option.

ESXi uses the Linux PAM module pam_passwdqc for password management and control. See the man page for pam_passwdqc for detailed information.

*Note*  The default requirements for ESXi passwords can change from one release to the next. You can check and change the default password restrictions using the Security.PasswordQualityControl advanced option.
ESXi Passwords

ESXi enforces password requirements for access from the Direct Console User Interface, the ESXi Shell, SSH, or the VMware Host Client.

- By default, you have to include a mix of characters from four character classes: lowercase letters, uppercase letters, numbers, and special characters such as underscore or dash when you create a password.
- By default, password length is more than 7 and less than 40.
- Passwords cannot contain a dictionary word or part of a dictionary word.

**Note** An uppercase character that begins a password does not count toward the number of character classes used. A number that ends a password does not count toward the number of character classes used.

Example ESXi Passwords

The following password candidates illustrate potential passwords if the option is set as follows.

```
retry=3 min=disabled,disabled,disabled,7,7
```

With this setting, passwords with one or two character classes and pass phrases are not allowed, because the first three items are disabled. Passwords from three- and four-character classes require seven characters. See the `pam_passwdqc` man page for details.

With these settings, the following passwords are allowed.

- xQaTEhb!: Contains eight characters from three character classes.
- xQaT3#A: Contains seven characters from four character classes.

The following password candidates do not meet requirements.

- Xqat3hi: Begins with an uppercase character, reducing the effective number of character classes to two. The minimum number of required character classes is three.
- xQaTEh2: Ends with a number, reducing the effective number of character classes to two. The minimum number of required character classes is three.

ESXi Pass Phrase

Instead of a password, you can also use a pass phrase; however, pass phrases are disabled by default. You can change this default or other settings, by using the `Security.PasswordQualityControl` advanced option from the vSphere Web Client.

For example, you can change the option to the following.

```
retry=3 min=disabled,disabled,16,7,7
```

This example allows pass phrases of at least 16 characters and at least 3 words, separated by spaces.
For legacy hosts, changing the `/etc/pamd/passwd` file is still supported, but changing the file is deprecated for future releases. Use the `Security.PasswordQualityControl` advanced option instead.

## Changing Default Password Restrictions

You can change the default restriction on passwords or pass phrases by using the `Security.PasswordQualityControl` advanced option for your ESXi host. See the *vCenter Server and Host Management* documentation for information on setting ESXi advanced options.

You can change the default, for example, to require a minimum of 15 characters and a minimum number of four words, as follows:

```
retry=3 min=disabled,disabled,15,7,7 passphrase=4
```

See the man page for `pam_passwdqc` for details.

**Note** Not all possible combinations of the options for `pam_passwdqc` have been tested. Perform additional testing after you change the default password settings.

## ESXi Account Lockout Behavior

Starting with vSphere 6.0, account locking is supported for access through SSH and through the vSphere Web Services SDK. The Direct Console Interface (DCUI) and the ESXi Shell do not support account lockout. By default, a maximum of ten failed attempts is allowed before the account is locked. The account is unlocked after two minutes by default.

## Configuring Login Behavior

You can configure the login behavior for your ESXi host with the following advanced options:

- `Security.AccountUnlockTime`. Number of seconds that a user is locked out.

See the *vCenter Server and Host Management* documentation for information on setting ESXi advanced options.

## Preparing for Installing ESXi

Before you install ESXi, determine the installation option that is suitable for your environment and prepare for the installation process.

### Download the ESXi Installer

Download the installer for ESXi.

**Prerequisites**

Create a My VMware account at [https://my.vmware.com/web/vmware/](https://my.vmware.com/web/vmware/).
Procedure

   ESXi is listed under Datacenter & Cloud Infrastructure.

2. Confirm that the md5sum is correct.

Options for Installing ESXi

ESXi can be installed in several ways. To ensure the best vSphere deployment, understand the options thoroughly before beginning the installation.

ESXi installations are designed to accommodate a range of deployment sizes.

Depending on the installation method you choose, different options are available for accessing the installation media and booting the installer.

Interactive ESXi Installation

Interactive installations are recommended for small deployments of fewer than five hosts.

You boot the installer from a CD or DVD, from a bootable USB device, or by PXE booting the installer from a location on the network. You follow the prompts in the installation wizard to install ESXi to disk. See Installing ESXi Interactively.

Scripted ESXi Installation

Running a script is an efficient way to deploy multiple ESXi hosts with an unattended installation.

The installation script contains the host configuration settings. You can use the script to configure multiple hosts with the same settings. See Installing or Upgrading Hosts by Using a Script.

The installation script must be stored in a location that the host can access by HTTP, HTTPS, FTP, NFS, CDROM, or USB. You can PXE boot the ESXi installer or boot it from a CD/DVD or USB drive.
vSphere Auto Deploy ESXi Installation

vSphere 5.x and later provide several ways to install ESXi with vSphere Auto Deploy.

vSphere Auto Deploy can provision hundreds of physical hosts with ESXi software. You can specify the image to deploy and the hosts to provision with the image. Optionally, you can specify host profiles to apply to the hosts, a vCenter Server location (datacenter, folder, or cluster), and script bundle for each host.

vCenter Server makes ESXi updates and patches available for download in the form of an image profile. The host configuration is provided in the form of a host profile. You can create host profiles by using the vSphere Web Client. You can create custom image profiles by using vSphere ESXi Image Builder. See Customizing Installations with vSphere ESXi Image Builder and vSphere Host Profiles.

When you provision hosts by using vSphere Auto Deploy, vCenter Server loads the ESXi image directly into the host memory. vSphere Auto Deploy does not store the ESXi state on the host disk. The vSphere Auto Deploy server continues to provision this host every time the host boots.

You can also use vSphere Auto Deploy to install an ESXi host, and set up a host profile that causes the host to store the ESXi image and configuration on the local disk, a remote disk, or a USB drive. Subsequently, the ESXi host boots from this local image and vSphere Auto Deploy no longer provisions the host. This process is similar to performing a scripted installation. With a scripted installation, the script provisions a host and the host then boots from disk. For this case, vSphere Auto Deploy provisions a host and the host then boots from disk. For more information, see Using vSphere Auto Deploy for Stateless Caching and Stateful Installs.

Media Options for Booting the ESXi Installer

The ESXi installer must be accessible to the system on which you are installing ESXi.

The following boot media are supported for the ESXi installer:

- Boot from a CD/DVD. See Download and Burn the ESXi Installer ISO Image to a CD or DVD.
- Boot from a USB flash drive. See Format a USB Flash Drive to Boot the ESXi Installation or Upgrade.
- PXE boot from the network. PXE Booting the ESXi Installer
- Boot from a remote location using a remote management application. See Using Remote Management Applications

**Download and Burn the ESXi Installer ISO Image to a CD or DVD**

If you do not have an ESXi installation CD/DVD, you can create one.

You can also create an installer ISO image that includes a custom installation script. See Create an Installer ISO Image with a Custom Installation or Upgrade Script.

**Procedure**

   ESXi is listed under Datacenter & Cloud Infrastructure.

2. Confirm that the md5sum is correct.

3. Burn the ISO image to a CD or DVD.

**Format a USB Flash Drive to Boot the ESXi Installation or Upgrade**

You can format a USB flash drive to boot the ESXi installation or upgrade.

The instructions in this procedure assume that the USB flash drive is detected as /dev/sdb.

**Note** The `ks.cfg` file that contains the installation script cannot be located on the same USB flash drive that you are using to boot the installation or upgrade.

**Prerequisites**

- Linux machine with superuser access to it
- USB flash drive that can be detected by the Linux machine
- The ESXi ISO image, VMware-VMvisor-Installer-version_number-build_number.x86_64.iso, which includes the isolinux.cfg file
- Syslinux package
Procedure

1. If your USB flash drive is not detected as /dev/sdb, or you are not sure how your USB flash drive is detected, determine how it is detected.
   a. At the command line, run the command for displaying the current log messages.
      
      ```
      tail -f /var/log/messages
      ```
   b. Plug in your USB flash drive.
      
      You see several messages that identify the USB flash drive in a format similar to the following message.
      
      ```
      ```
      
      In this example, sdb identifies the USB device. If your device is identified differently, use that identification, in place of sdb.

2. Create a partition table on the USB flash device.
   
   ```
   /sbin/fdisk /dev/sdb
   ```
   
   a. Enter d to delete partitions until they are all deleted.
   b. Enter n to create a primary partition 1 that extends over the entire disk.
   c. Enter t to set the type to an appropriate setting for the FAT32 file system, such as c.
   d. Enter a to set the active flag on partition 1.
   e. Enter p to print the partition table.
      
      The result should be similar to the following message.
      
      ```
      Disk /dev/sdb: 2004 MB, 2004877312 bytes
      255 heads, 63 sectors/track, 243 cylinders
      Units = cylinders of 16065 * 512 = 8225280 bytes
      Device Boot Start End Blocks Id System
      /dev/sdb1 1 243 1951866 c W95 FAT32 (LBA)
      ```
   f. Enter w to write the partition table and exit the program.

3. Format the USB flash drive with the Fat32 file system.
   
   ```
   /sbin/mkfs.vfat -F 32 -n USB /dev/sdb1
   ```
4 Install the Syslinux bootloader on the USB flash drive.

The locations of the Syslinux executable file and the mbr.bin file might vary for the different Syslinux versions. For example, if you downloaded Syslinux 6.02, run the following commands.

```
/usr/bin/syslinux /dev/sdb1
cat /usr/lib/syslinux/mbr/mbr.bin > /dev/sdb
```

5 Create a destination directory and mount the USB flash drive to it.

```
mkdir /usbdisk
mount /dev/sdb1 /usbdisk
```

6 Create a destination directory and mount the ESXi installer ISO image to it.

```
mkdir /esxi_cdrom
mount -o loop VMware-VMvisor-Installer-6.x.x-XXXXXX.x86_64.iso /esxi_cdrom
```

7 Copy the contents of the ISO image to the USB flash drive.

```
cp -r /esxi_cdrom/* /usbdisk
```

8 Rename the isolinux.cfg file to syslinux.cfg.

```
mv /usbdisk/isolinux.cfg /usbdisk/syslinux.cfg
```

9 In the /usbdisk/syslinux.cfg file, edit the APPEND -c boot.cfg line to APPEND -c boot.cfg -p 1.

10 Unmount the USB flash drive.

```
umount /usbdisk
```

11 Unmount the installer ISO image.

```
umount /esxi_cdrom
```

The USB flash drive can boot the ESXi installer.

Create a USB Flash Drive to Store the ESXi Installation Script or Upgrade Script

You can use a USB flash drive to store the ESXi installation script or upgrade script that is used during scripted installation or upgrade of ESXi.

When multiple USB flash drives are present on the installation machine, the installation software searches for the installation or upgrade script on all attached USB flash drives.
The instructions in this procedure assume that the USB flash drive is detected as `/dev/sdb`.

**Note**  Do not store the ks file containing the installation or upgrade script on the same USB flash drive that you are using to boot the installation or upgrade.

**Prerequisites**
- Linux machine
- ESXi installation or upgrade script, the `ks.cfg` kickstart file
- USB flash drive

**Procedure**
1. Attach the USB flash drive to a Linux machine that has access to the installation or upgrade script.
2. Create a partition table.
   ```bash
   /sbin/fdisk /dev/sdb
   a Type d to delete partitions until they are all deleted.
   b Type n to create primary partition 1 that extends over the entire disk.
   c Type t to set the type to an appropriate setting for the FAT32 file system, such as c.
   d Type p to print the partition table.
   The result should be similar to the following text:
   ```
   ```
   Disk /dev/sdb: 2004 MB, 2004877312 bytes
   255 heads, 63 sectors/track, 243 cylinders
   Units = cylinders of 16065 * 512 = 8225280 bytes
   Device Boot Start  End  Blocks Id  System
   /dev/sdb1   1 243 1951866  c  W95 FAT32 (LBA)
   ```
   e Type w to write the partition table and quit.
3. Format the USB flash drive with the Fat32 file system.
   ```bash
   /sbin/mkfs.vfat -F 32 -n USB /dev/sdb1
   ```
4. Mount the USB flash drive.
   ```bash
   mount /dev/sdb1 /usbdisk
   ```
5. Copy the ESXi installation script to the USB flash drive.
   ```bash
   cp ks.cfg /usbdisk
   ```
6. Unmount the USB flash drive.
   ```bash
   The USB flash drive contains the installation or upgrade script for ESXi.
   ```
What to do next

When you boot the ESXi installer, point to the location of the USB flash drive for the installation or upgrade script. See Enter Boot Options to Start an Installation or Upgrade Script and PXELINUX Configuration Files.

Create an Installer ISO Image with a Custom Installation or Upgrade Script

You can customize the standard ESXi installer ISO image with your own installation or upgrade script. This customization enables you to perform a scripted, unattended installation or upgrade when you boot the resulting installer ISO image.

See also About Installation and Upgrade Scripts and About the boot.cfg File.

Prerequisites

- Linux machine
- The ESXi ISO image `VMware-VMvisor-Installer-6.x.x-XXXXXX.x86_64.iso`, where `6.x.x` is the version of ESXi you are installing, and `XXXXXX` is the build number of the installer ISO image
- Your custom installation or upgrade script, the `ks_cust.cfg` kickstart file

Procedure

1. Download the ESXi ISO image from the VMware Web site.
2. Mount the ISO image in a folder:

   ```bash
   mount -o loop VMware-VMvisor-Installer-6.x.x-XXXXXX.x86_64.iso /esxi_cdrom_mount
   XXXXXXX is the ESXi build number for the version that you are installing or upgrading to.
   ```
3. Copy the contents of `cdrom` to another folder:

   ```bash
   cp -r /esxi_cdrom_mount /esxi_cdrom
   ```
4. Copy the kickstart file to `/esxi_cdrom`.

   ```bash
   cp ks_cust.cfg /esxi_cdrom
   ```
5. (Optional) Modify the `boot.cfg` file to specify the location of the installation or upgrade script by using the `kernelopt` option.

   ```bash
   You must use uppercase characters to provide the path of the script, for example,
   ```

   ```bash
   kernelopt=runweasel ks=cdrom:/KS_CUST.CFG
   ```

   The installation or upgrade becomes completely automatic, without the need to specify the kickstart file during the installation or upgrade.
Recreate the ISO image using the `mkisofs` or the `genisoimage` command.

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
</table>

You can use this ISO image for regular boot or UEFI secure boot.

The ISO image includes your custom installation or upgrade script.

**What to do next**

Install ESXi from the ISO image.

**PXE Booting the ESXi Installer**

You can use the preboot execution environment (PXE) to boot a host. Starting with vSphere 6.0, you can PXE boot the ESXi installer from a network interface on hosts with legacy BIOS or using UEFI.

ESXi is distributed in an ISO format that is designed to install to flash memory or to a local hard drive. You can extract the files and boot by using PXE.

PXE uses Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) to boot an operating system over a network.

PXE booting requires some network infrastructure and a machine with a PXE-capable network adapter. Most machines that can run ESXi have network adapters that can PXE boot.

**Note** PXE booting with legacy BIOS firmware is possible only over IPv4. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.

**Sample DHCP Configurations**

To PXE boot the ESXi installer, the DHCP server must send the address of the TFTP server and the filename of the initial boot loader to the ESXi host.

When the target machine first boots, it broadcasts a packet across the network requesting information to boot itself. The DHCP server responds. The DHCP server must be able to determine whether the target machine is allowed to boot and the location of the initial boot loader binary, typically a file on a TFTP server.

**Caution** Do not set up a second DHCP server if your network already has one. If multiple DHCP servers respond to DHCP requests, machines can obtain incorrect or conflicting IP addresses, or can fail to receive the proper boot information. Talk to a network administrator before setting up a DHCP server. For support on configuring DHCP, contact your DHCP server vendor.
Many DHCP servers can PXE boot hosts. If you are using a version of DHCP for Microsoft Windows, see the DHCP server documentation to determine how to pass the next-server and filename arguments to the target machine.

**Example of Booting Using TFTP with IPv4**

This example shows how to configure an ISC DHCP server to boot ESXi using a TFTP server at IPv4 address xxx.xxx.xxx.xxx.

```
#
# ISC DHCP server configuration file snippet. This is not a complete
# configuration file; see the ISC server documentation for details on
# how to configure the DHCP server.
#
allow booting;
allow bootp;
option client-system-arch code 93 = unsigned integer 16;
class "pxeclients" {
    match if substring(option vendor-class-identifier, 0, 9) = "PXEClient";
    next-server xxx.xxx.xxx.xxx;
    if option client-system-arch = 00:07 or option client-system-arch = 00:09 {
        filename = "mboot.efi";
    } else {
        filename = "pxelinux.0";
    }
}
```

When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the pxelinux.0 or mboot.efi binary file on the TFTP server.

**Example of Booting Using TFTP with IPv6**

This example shows how to configure an ISC DHCPv6 server to boot ESXi using a TFTP server at IPv6 address xxxx:xxxx:xxxx:xxxx::xxxx.

```
#
# ISC DHCPv6 server configuration file snippet. This is not a complete
# configuration file; see the ISC server documentation for details on
# how to configure the DHCP server.
#
allow booting;
allow bootp;
option dhcp6.bootfile-url code 59 = string;
option dhcp6.bootfile-url "tftp://[xxxx:xxxx:xxxx:xxxx:xxxx::xxxx]/mboot.efi";
```

When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the mboot.efi binary file on the TFTP server.
Example of Booting Using HTTP with IPv4

This example shows how to configure an ISC DHCP server to boot ESXi using a Web server at IPv4 address xxx.xxx.xxx.xxx. The example uses gPXELINUX for legacy BIOS hosts and iPXE for UEFI hosts.

```plaintext
# ISC DHCPv6 server configuration file snippet. This is not a complete configuration file; see the ISC server documentation for details on how to configure the DHCP server.
# allow booting;
# allow bootp;
option dhcp6.bootfile-url code 59 = string;
if exists user-class and option user-class = "iPXE" {
    option dhcp6.bootfile-url "tftp://[xxxx:xxxx:xxxx:xxxx::xxxx]/mboot.efi";
}
```

When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the gpxelinux.0 or snponly.efi binary file on the TFTP server. In the UEFI case, iPXE then asks the DHCP server for the next file to load, and this time the server returns mboot.efi as the filename.

Example of Booting Using HTTP with IPv6

This example shows how to configure an ISC DHCPv6 server to boot ESXi using a TFTP server at IPv6 address xxxx:xxxx:xxxx:xxxx::xxxx.

```plaintext
# ISC DHCPv6 server configuration file snippet. This is not a complete configuration file; see the ISC server documentation for details on how to configure the DHCP server.
# allow booting;
# allow bootp;
option dhcp6.bootfile-url code 59 = string;
if exists user-class and option user-class = "iPXE" {
    option dhcp6.bootfile-url "tftp://[xxxx:xxxx:xxxx:xxxx::xxxx]/mboot.efi";
}
```
When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the snponly.efi (iPXE) binary file on the TFTP server. iPXE then asks the DHCP server for the next file to load, and this time the server returns mboot.efi as the filename.

**PXELINUX Configuration Files**

You need a PXELINUX configuration file to boot the ESXi installer on a legacy BIOS system. The configuration file defines the menu displayed to the target ESXi host as it boots up and contacts the TFTP server for all SYSLINUX configurations, including PXELINUX and gPXELINUX.

This section gives general information about PXELINUX configuration files. For examples, see Sample DHCP Configurations.

For syntax details, see the SYSLINUX web site at [http://www.syslinux.org/](http://www.syslinux.org/).

**Required Files**

In the PXE configuration file, you must include paths to the following files:

- `mboot.c32` is the boot loader.
- `boot.cfg` is the boot loader configuration file.

See [About the boot.cfg File](#)

**File Name for the PXE Configuration File**

For the file name of the PXE configuration file, select one of the following options:

- `01-mac_address_of_target_ESXi_host`. For example, `01-23-45-67-89-0a-bc`
- The target ESXi host IP address in hexadecimal notation.
- `default`

The initial boot file, `pxelinux.0` or `gpxelinux.0`, tries to load a PXE configuration file in the following order:

1. It tries with the MAC address of the target ESXi host, prefixed with its ARP type code, which is 01 for Ethernet.
2. If that attempt fails, it tries with the hexadecimal notation of target ESXi system IP address.
3. Ultimately, it tries to load a file named `default`.

**File Location for the PXE Configuration File**

Save the file in `/tftpboot/pxelinux.cfg/` on the TFTP server.

For example, you might save the file on the TFTP server at `/tftpboot/pxelinux.cfg/01-00-21-5a-ce-40-f6`. The MAC address of the network adapter on the target ESXi host is `00-21-5a-ce-40-f6`. 

VMware ESXi Installation and Setup
PXE Boot Background Information
Understanding the PXE boot process can help you during troubleshooting.

TFTP Server
Trivial File Transfer Protocol (TFTP) is similar to the FTP service, and is typically used only for network booting systems or loading firmware on network devices such as routers. TFTP is available on Linux and Windows.

- Most Linux distributions include a copy of the tftp-hpa server. If you require a supported solution, purchase a supported TFTP server from your vendor of choice. You can also acquire a TFTP server from one of the packaged appliances on the VMware Marketplace.
- If your TFTP server will run on a Microsoft Windows host, use tftpd32 version 2.11 or later. See http://tftpd32.jounin.net/.

SYSLINUX, PXELINUX, and gPXELINUX
If you are using PXE in a legacy BIOS environment, you need to understand the different boot environments.

- SYSLINUX is an open source boot environment for machines that run legacy BIOS firmware. The ESXi boot loader for BIOS systems, mbootc.32, runs as a SYSLINUX plugin. You can configure SYSLINUX to boot from several types of media, including disk, ISO image, and network. You can find the SYSLINUX package at http://www.kernel.org/pub/linux/utils/boot/syslinux/.
- PXELINUX is a SYSXLINUX configuration for booting from a TFTP server according to the PXE standard. If you use PXELINUX to boot the ESXi installer, the pxelinux.0 binary file, mboot.c32, the configuration file, the kernel, and other files are all transferred by TFTP.
- gPXELINUX is a hybrid configuration that includes both PXELINUX and gPXE and supports booting from a Web server. gPXELINUX is part of the SYSLINUX package. If you use gPXELINUX to boot the ESXi installer, only the gpxelinux.0 binary file, mboot.c32, and the configuration file are transferred via TFTP. The remaining files are transferred via HTTP. HTTP is typically faster and more reliable than TFTP, especially for transferring large amounts of data on a heavily loaded network.

Note VMware currently builds the mboot.c32 plugin to work with SYSLINUX version 3.86 and tests PXE booting only with that version. Other versions are likely to be incompatible. This is not a statement of limited support. For support of third-party agents that you use to set up your PXE booting infrastructure, contact the vendor.

UEFI PXE and iPXE
Most UEFI firmware natively includes PXE support that allows booting from a TFTP server. The firmware can directly load the ESXi boot loader for UEFI systems, mboot.efi. Additional software such as PXELINUX is not required.
iPXE can also be useful for UEFI systems that do not include PXE in firmware and for older UEFI systems with bugs in their PXE support. For such cases you can try installing iPXE on a USB flash drive and booting from there.

**Note**  Apple Macintosh products do not include PXE boot support. They include support for network booting via an Apple-specific protocol instead.

### Alternative Approaches to PXE Booting

Alternative approaches to PXE booting different software on different hosts are also possible, for example:

- Configuring the DHCP server to provide different initial boot loader filenames to different hosts depending on MAC address or other criteria. See your DHCP server's documentation.
- Approaches using iPXE as the initial bootloader with an iPXE configuration file that selects the next bootloader based on the MAC address or other criteria.

### Installing and Booting ESXi with Software FCoE

You can install and boot ESXi from an FCoE LUN using VMware software FCoE adapters and network adapters with FCoE offload capabilities. Your host does not require a dedicated FCoE HBA.

See the vSphere Storage documentation for information about installing and booting ESXi with software FCoE.

### Using Remote Management Applications

Remote management applications allow you to install ESXi on servers that are in remote locations.

Remote management applications supported for installation include HP Integrated Lights-Out (iLO), Dell Remote Access Card (DRAC), IBM management module (MM), and Remote Supervisor Adapter II (RSA II). For a list of currently supported server models and remote management firmware versions, see Supported Remote Management Server Models and Firmware Versions. For support on remote management applications, contact the vendor.

You can use remote management applications to do both interactive and scripted installations of ESXi remotely.

If you use remote management applications to install ESXi, the virtual CD might encounter corruption problems with systems or networks operating at peak capacity. If a remote installation from an ISO image fails, complete the installation from the physical CD media.

### Customizing Installations with vSphere ESXi Image Builder

You can use VMware vSphere® ESXi™ Image Builder CLI to create ESXi installation images with a customized set of updates, patches, and drivers.

You can use vSphere ESXi Image Builder with the vSphere Web Client or with PowerCLI to create an ESXi installation image with a customized set of ESXi updates and patches. You can also include third-party network or storage drivers that are released between vSphere releases.
You can deploy an ESXi image created with vSphere ESXi Image Builder in either of the following ways:

- By burning it to an installation DVD.
- Through vCenter Server, using the Auto Deploy feature.

**Understanding vSphere ESXi Image Builder**

You can use the VMware vSphere® ESXi™ Image Builder CLI to manage software depots, image profiles, and software packages (VIBs). Image profiles and VIBs specify the software you want to use during installation or upgrade of an ESXi host.

**vSphere ESXi Image Builder Overview**

vSphere ESXi Image Builder lets you manage vSphere image profiles and VIBs.

VIBs are software packages, and image profiles contain a set of software packages. See Software Depots and Their Components.

**Figure 5-2. Image Builder Architecture**

You use vSphere ESXi Image Builder cmdlets for managing the software to deploy to your ESXi hosts in several different situations.
Table 5-7. Cases Where You Can Use vSphere ESXi Image Builder

<table>
<thead>
<tr>
<th>Use Case for vSphere ESXi Image Builder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create image profiles for use by vSphere Auto Deploy</td>
<td>Use vSphere ESXi Image Builder to create an image profile that defines the VIBs that vSphere Auto Deploy uses to provision hosts.</td>
</tr>
<tr>
<td>Add custom third-party drivers to existing image profile and export to ISO or bundle</td>
<td>When you add third-party driver or extension custom VIBs to your ESXi hosts, use vSphere ESXi Image Builder to clone the base image provided by VMware, add the custom VIBs, and export to ISO or to offline bundle ZIP file.</td>
</tr>
<tr>
<td>Perform upgrades</td>
<td>If you upgrade from a 4.0 or 4.1 system that includes custom extensions or drivers, you can use vSphere ESXi Image Builder to create an image profile that includes the vSphere 5 base VIB. You can create vSphere 5 VIBs for the custom extensions and add those VIBs to the base VIB. Export the custom image profile to an ISO you can install or to a ZIP that you can use with vSphere Update Manager.</td>
</tr>
<tr>
<td>Create custom images with reduced footprint</td>
<td>If you require a minimal footprint image, you can clone the ESXi base image profile and remove VIBs using vSphere ESXi Image Builder.</td>
</tr>
</tbody>
</table>

The vSphere ESXi Image Builder cmdlets take image profiles and VIBs as input and produce various outputs.

Table 5-8. Input and Output to the vSphere ESXi Image Builder Cmdlets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Image profiles and VIBs that are located in a software depot are used as input to PowerCLI cmdlets running on a Windows client.</td>
</tr>
<tr>
<td>Output</td>
<td>PowerCLI cmdlets create custom image profiles that can be exported to an ISO image or an offline depot ZIP file. ISO images are used for installation. The ZIP depot can be used by Update Manager or by esxcli software commands to update or install images. Image profiles are also used in vSphere Auto Deploy rules to customize the software to provision ESXi hosts with.</td>
</tr>
</tbody>
</table>

Watch the video "Using Image Builder CLI" for information about vSphere ESXi Image Builder:


Software Depots and Their Components

Understanding how depots, profiles, and VIBs are structured and where you can use them is a prerequisite for in-memory installation of a custom ESXi ISO, for provisioning ESXi hosts using vSphere Auto Deploy, and for certain custom upgrade operations.
The following technical terms are used throughout the vSphere documentation set in discussions of installation and upgrade tasks.

**VIB**
A VIB is an ESXi software package. VMware and its partners package solutions, drivers, CIM providers, and applications that extend the ESXi platform as VIBs. VIBs are available in software depots. You can use VIBs to create and customize ISO images or to upgrade ESXi hosts by installing VIBs asynchronously onto the hosts.

See SoftwarePackage Object Properties.

**Image Profile**
An image profile defines an ESXi image and consists of VIBs. An image profile always includes a base VIB, and might include more VIBs. You examine and define an image profile by using vSphere ESXi Image Builder.

See ImageProfile Object Properties.

**Software Depot**
A software depot is a collection of VIBs and image profiles. The software depot is a hierarchy of files and folders and can be available through an HTTP URL (online depot) or a ZIP file (offline depot). VMware and VMware partners make depots available. Companies with large VMware installations might create internal depots to provision ESXi hosts with vSphere Auto Deploy, or to export an ISO for ESXi installation.

**vSphere ESXi Image Builder Cmdlets Overview**
vSphere ESXi Image Builder cmdlets allow you to manage image profiles and VIBs.
vSphere ESXi Image Builder includes the following cmdlets.

**Note**  When you run vSphere ESXi Image Builder cmdlets, provide all parameters on the command line when you invoke the cmdlet. Supplying parameters in interactive mode is not recommended.

Run Get-Help cmdlet_name at the PowerCLI prompt for detailed reference information.

**Table 5-9. vSphere ESXi Image Builder Cmdlets**

<table>
<thead>
<tr>
<th>Cmdlet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add-EsxSoftwareDepot</td>
<td>Adds the software depot or ZIP file at the specified location to your current environment. Downloads metadata from the depot and analyzes VIBs for dependencies.</td>
</tr>
<tr>
<td>Remove-EsxSoftwareDepot</td>
<td>Disconnects from the specified software depot.</td>
</tr>
<tr>
<td>Get-EsxSoftwareDepot</td>
<td>Returns a list of software depots that are in the current environment. If you want to examine and manage image profiles and VIBs, you must first add the corresponding software depot to your environment.</td>
</tr>
<tr>
<td>Get-EsxSoftwarePackage</td>
<td>Returns a list of software package objects (VIBs). Use this cmdlet's options to filter the results.</td>
</tr>
<tr>
<td>Get-EsxImageProfile</td>
<td>Returns an array of ImageProfile objects from all currently added depots.</td>
</tr>
<tr>
<td>New-EsxImageProfile</td>
<td>Creates a new image profile. In most cases, creating a new profile by cloning an existing profile is recommended. See Clone an Image Profile.</td>
</tr>
</tbody>
</table>
Table 5-9. vSphere ESXi Image Builder Cmdlets (Continued)

<table>
<thead>
<tr>
<th>Cmdlet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-EsxImageProfile</td>
<td>Modifies a local ImageProfile object and performs validation tests on the modified profile. The cmdlet returns the modified object but does not persist it.</td>
</tr>
<tr>
<td>Export-EsxImageProfile</td>
<td>Exports an image profile as either an ESXi ISO image for ESXi installation, or as a ZIP file.</td>
</tr>
<tr>
<td>Compare-EsxImageProfile</td>
<td>Returns an ImageProfileDiff structure that shows whether the two profiles have the same VIB list and acceptance level. See Acceptance Levels.</td>
</tr>
<tr>
<td>Remove-EsxImageProfile</td>
<td>Removes the image profile from the software depot.</td>
</tr>
<tr>
<td>Add-EsxSoftwarePackage</td>
<td>Adds one or more new packages (VIBs) to an existing image profile.</td>
</tr>
<tr>
<td>Remove-EsxSoftwarePackage</td>
<td>Removes one or more packages (VIBs) from an image profile.</td>
</tr>
</tbody>
</table>

Image Profiles

Image profiles define the set of VIBs that an ESXi installation or update process uses. Image profiles apply to hosts provisioned with vSphere Auto Deploy and to other ESXi 5.x hosts. You define and manipulate image profiles with vSphere ESXi Image Builder.

Image Profile Requirements

You can create a custom image profile from scratch or clone an existing profile and add or remove VIBs. A profile must meet the following requirements to be valid.

- Each image profile must have a unique name and vendor combination.
- Each image profile has an acceptance level. When you add a VIB to an image profile with an vSphere ESXi Image Builder cmdlet, Image Builder checks that the VIB matches the acceptance level defined for the profile.
- You cannot remove VIBs that are required by other VIBs.
- You cannot include two versions of the same VIB in an image profile. When you add a new version of a VIB, the new version replaces the existing version of the VIB.

Image Profile Validation

An image profile and its VIBs must meet several criteria to be valid.

- Image profiles must contain at least one base VIB and one bootable kernel module.
- If any VIB in the image profile depends on another VIB, that other VIB must also be included in the image profile. VIB creators store that information in the SoftwarePackage object's Depends property.
- VIBs must not conflict with each other. VIB creators store conflict information in the SoftwarePackage object's Conflicts property.
- Two VIBs with the same name, but two different versions, cannot coexist. When you add a new version of a VIB, the new version replaces the existing version of the VIB.
- No acceptance level validation issues exist.
When you make a change to an image profile, vSphere ESXi Image Builder checks that the change does not invalidate the profile.

**Dependency Validation**
When you add or remove a VIB, vSphere ESXi Image Builder checks that package dependencies are met. Each SoftwarePackage object includes a Depends property that specifies a list of other VIBs that VIB depends on. See Structure of ImageProfile, SoftwarePackage, and ImageProfileDiff Objects.

**Acceptance Level Validation**
vSphere ESXi Image Builder performs acceptance level validation each time an image profile is created or changed. vSphere ESXi Image Builder checks the acceptance level of VIBs in the image profile against the minimum allowed acceptance level of the profile. The acceptance level of the VIB is also validated each time the signature of a VIB is validated.

**VIB Validation During Export**
When you export an image profile to an ISO, vSphere ESXi Image Builder validates each VIB by performing the following actions.
- Checks that no conflicts exist by checking the Conflicts property of each SoftwarePackage object.
- Performs VIB signature validation. Signature validation prevents unauthorized modification of VIB packages. The signature is a cryptographic checksum that guarantees that a VIB was produced by its author. Signature validation also happens during installation of VIBs on an ESXi host and when the vSphere Auto Deploy server uses VIBs.
- Checks that VIBs follow file path usage rules. VMware tests VMwareCertified and VMwareAccepted VIBs to guarantee those VIBs always follow file path usage rules.

**Acceptance Levels**
Each VIB is released with an acceptance level that cannot be changed. The host acceptance level determines which VIBs can be installed to a host. You can change the host acceptance levels with esxcli commands.

VMware supports the following acceptance levels.

**VMwareCertified**
The VMwareCertified acceptance level has the most stringent requirements. VIBs with this level go through thorough testing fully equivalent to VMware in-house Quality Assurance testing for the same technology. Today, only I/O Vendor Program (IOVP) program drivers are published at this level. VMware takes support calls for VIBs with this acceptance level.

**VMwareAccepted**
VIBs with this acceptance level go through verification testing, but the tests do not fully test every function of the software. The partner runs the tests and VMware verifies the result. Today, CIM providers and PSA plug-ins are among the VIBs published at this level. VMware directs support calls for VIBs with this acceptance level to the partner’s support organization.
PartnerSupported

VIbs with the PartnerSupported acceptance level are published by a partner that VMware trusts. The partner performs all testing. VMware does not verify the results. This level is used for a new or nonmainstream technology that partners want to enable for VMware systems. Today, driver VIB technologies such as Infiniband, ATAOE, and SSD are at this level with nonstandard hardware drivers. VMware directs support calls for VIBs with this acceptance level to the partner’s support organization.

CommunitySupported

The CommunitySupported acceptance level is for VIBs created by individuals or companies outside of VMware partner programs. VIBs at this level have not gone through any VMware-approved testing program and are not supported by VMware Technical Support or by a VMware partner.

Structure of ImageProfile, SoftwarePackage, and ImageProfileDiff Objects

Knowing the structure of ImageProfile, SoftwarePackage, and ImageProfileDiff objects helps you manage deployment and upgrade processes.

ImageProfile Object Properties

The ImageProfile object, which is accessible with the Get-ESxImageProfile PowerCLI cmdlet, has the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AcceptanceLevel</td>
<td>AcceptanceLevel</td>
<td>Determines which VIBs you can add to the profile. Levels are VMwareCertified, VMwareAccepted, PartnerSupported, and CommunitySupported. See Acceptance Levels.</td>
</tr>
<tr>
<td>Author</td>
<td>System.String</td>
<td>The person who created the profile. 60 characters or fewer.</td>
</tr>
<tr>
<td>CreationTime</td>
<td>System.DateTime</td>
<td>The timestamp of creation time.</td>
</tr>
<tr>
<td>Description</td>
<td>System.String</td>
<td>The full text description of profile. No length limit.</td>
</tr>
<tr>
<td>GUID</td>
<td>System.String</td>
<td>Globally unique ID of the image profile.</td>
</tr>
<tr>
<td>ModifiedTime</td>
<td>System.DateTime</td>
<td>The timestamp of last modification time.</td>
</tr>
<tr>
<td>Name</td>
<td>System.String</td>
<td>The name of the image profile. 80 characters or fewer.</td>
</tr>
<tr>
<td>ReadOnly</td>
<td>System.Boolean</td>
<td>When set to true, the profile cannot be edited. Use Set-ESxImageProfile - ReadOnly to make your custom image profiles read-only.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rules</td>
<td>ImageProfileRule[]</td>
<td>Any OEM hardware requirements and restrictions that the image profile might have. vSphere Auto Deploy verifies the value of this property when deploying an image profile and deploys the profile if matching hardware is available.</td>
</tr>
<tr>
<td>Vendor</td>
<td>System.String</td>
<td>The organization that publishes the profile. 40 characters or fewer.</td>
</tr>
<tr>
<td>VIBList</td>
<td>SoftwarePackage[]</td>
<td>The list of VIB IDs the image contains.</td>
</tr>
</tbody>
</table>

**SoftwarePackage Object Properties**

When preparing an image profile, you can examine software packages to decide which packages are suitable for inclusion. The SoftwarePackage object has the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AcceptanceLevel</td>
<td>AcceptanceLevel</td>
<td>The acceptance level of this VIB.</td>
</tr>
<tr>
<td>Conflicts</td>
<td>SoftwareConstraint[]</td>
<td>A list of VIBs that cannot be installed at the same time as this VIB. Each constraint uses the following format: package-name[&lt;</td>
</tr>
<tr>
<td>Depends</td>
<td>SoftwareConstraint[]</td>
<td>A list of VIBs that must be installed at the same time as this VIB. Same constraint format as Conflicts property.</td>
</tr>
<tr>
<td>Description</td>
<td>System.String</td>
<td>The long description of the VIB.</td>
</tr>
<tr>
<td>Guid</td>
<td>System.String</td>
<td>The unique ID for the VIB.</td>
</tr>
<tr>
<td>LiveInstallOk</td>
<td>System.Boolean</td>
<td>True if live installs of this VIB are supported.</td>
</tr>
<tr>
<td>LiveRemoveOk</td>
<td>System.Boolean</td>
<td>True if live removals of this VIB are supported.</td>
</tr>
<tr>
<td>MaintenanceMode</td>
<td>System.Boolean</td>
<td>True if hosts must be in maintenance mode for installation of this VIB.</td>
</tr>
<tr>
<td>Name</td>
<td>System.String</td>
<td>The name of the VIB. Usually uniquely describes the package on a running ESXi system.</td>
</tr>
<tr>
<td>Provides</td>
<td>SoftwareProvides</td>
<td>The list of virtual packages or interfaces this VIB provides. See SoftwareProvide Object Properties.</td>
</tr>
<tr>
<td>ReferenceURLs</td>
<td>SupportReference[]</td>
<td>The list of SupportReference objects with in-depth support information. The SupportReference object has two properties, Title and URL, both of type System.String.</td>
</tr>
</tbody>
</table>
### Name | Type | Description
--- | --- | ---
Replaces | SoftwareConstraint[] | The list of SoftwareConstraint objects that identify VIBs that replace this VIB or make it obsolete. VIBs automatically replace VIBs with the same name but lower versions.
Releases | System.DateTime | Date and time of VIB publication or release.
SourceUrls | System.String[] | The list of source URLs from which this VIB can be downloaded.
StatelessReady | System.Boolean | True if the package supports host profiles or other technologies that make it suitable for use in conjunction with vSphere Auto Deploy.
Summary | System.String | A one-line summary of the VIB.
Tags | System.String[] | An array of string tags for this package defined by the vendor or publisher. Tags can be used to identify characteristics of a package.
Vendor | System.String | The VIB vendor or publisher.
Version | System.String | The VIB version.
VersionObject | Software.Version | The VersionObject property is of type SoftwareVersion. The SoftwareVersion class implements a static Compare method to compare two versions of strings. See [SoftwareVersion Object Properties](#).

### ImageProfileDiff Object Properties

When you run the `Compare-EsxImageProfile` cmdlet, you pass in two parameters, first the reference profile, and then the comparison profile. The cmdlet returns an ImageProfileDiff object, which has the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| CompAcceptanceLevel | System.String | The acceptance level for the second profile that you passed to `Compare-EsxImageProfile`.
| DowngradeFromRef | System.String[] | The list of VIBs in the second profile that are downgrades from VIBs in the first profile.
| Equal | System.Boolean | True if the two image profiles have identical packages and acceptance levels.
<p>| OnlyInComp | System.String | The list of VIBs found only in the second profile that you passed to <code>Compare-EsxImageProfile</code>. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OnlyInRef</td>
<td>System.String[]</td>
<td>The list of VIBs found only in the first profile that you passed to Compare-EsxImageProfile.</td>
</tr>
<tr>
<td>PackagesEqual</td>
<td>System.Boolean</td>
<td>True if the image profiles have identical sets of VIB packages.</td>
</tr>
<tr>
<td>RefAcceptanceLevel</td>
<td>System.String</td>
<td>The acceptance level for the first profile that you passed to Compare-EsxImageProfile.</td>
</tr>
<tr>
<td>UpgradeFromRef</td>
<td>System.String[]</td>
<td>The list of VIBs in the second profile that are upgrades from VIBs in the first profile.</td>
</tr>
</tbody>
</table>

**SoftwareVersion Object Properties**

The SoftwareVersion object lets you compare two version strings. The object includes a Compare static method that accepts two strings as input and returns 1 if the first version string is a higher number than the second version string. Compare returns 0 if two versions strings are equal. Compare returns -1 if the second version string is a higher number than the first string. The object has the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>System.String</td>
<td>The part of the version before the hyphen. This part indicates the primary version.</td>
</tr>
<tr>
<td>Release</td>
<td>System.String</td>
<td>The part of the version after the hyphen. This part indicates the release version.</td>
</tr>
</tbody>
</table>

**SoftwareConstraint Object Properties**

The SoftwareConstraint object implements a MatchesProvide method. The method accepts a SoftwareProvides or SoftwarePackage object as input and returns True if the constraint matches the SoftwareProvide or the SoftwarePackage, or returns False otherwise.

The SoftwareConstraint object includes the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>System.String</td>
<td>The name of the constraint. This name should match a corresponding SoftwareProvide Name property.</td>
</tr>
<tr>
<td>Relation</td>
<td>System.String</td>
<td>An enum, or one of the following comparison indicators: &lt;&lt;, &lt;=, &gt;=, &gt;&gt;. This property can be $null if the constraint does not have a Relation and Version property.</td>
</tr>
</tbody>
</table>
### SoftwareProvide Object Properties

The `SoftwareProvide` object includes the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>System.String</td>
<td>The name of the provide.</td>
</tr>
<tr>
<td>Version</td>
<td>System.String</td>
<td>The version of the provide. Can be $null if the provide does not specify a version.</td>
</tr>
<tr>
<td>Release</td>
<td>System.String</td>
<td>The version of the provide as represented by a <code>SoftwareVersion</code> object. See <code>SoftwareVersion Object Properties</code>.</td>
</tr>
</tbody>
</table>

### vSphere ESXi Image Builder Installation and Usage

vSphere ESXi Image Builder consists of the vSphere ESXi Image Builder server and the vSphere ESXi Image Builder PowerShell cmdlets. The vSphere ESXi Image Builder server starts when your run the first vSphere ESXi Image Builder cmdlet.

#### Install vSphere ESXi Image Builder and Prerequisite Software

Before you can run vSphere ESXi Image Builder cmdlets, you must install PowerCLI and all prerequisite software. The vSphere ESXi Image Builder snap-in is included with the PowerCLI installation.

#### Prerequisites

If you want to manage vSphere ESXi Image Builder with PowerCLI cmdlets, verify that Microsoft .NET Framework 4.5 or 4.5.x and Windows PowerShell 3.0 or 4.0 are installed on a Microsoft Windows system.

You can install PowerCLI on the Windows system on which vCenter Server is installed or on a different Windows system. See the [vSphere PowerCLI User's Guide](#).

#### Procedure

1. Download the latest version of PowerCLI from the VMware Web site.
2. Navigate to the folder that contains the PowerCLI file you downloaded and double-click the executable file.
   - If the installation wizard detects an earlier version of PowerCLI on your system, it will attempt to upgrade your existing installation
3. Follow the prompts in the wizard to complete the installation.
What to do next

Review Using vSphere ESXi Image Builder Cmdlets. If you are new to PowerCLI, read the PowerCLI documentation.

Use vSphere ESXi Image Builder cmdlets and other PowerCLI cmdlets and PowerShell cmdlets to manage image profiles and VIBs. Use `Get-Help cmdlet_name` at any time for command-line help.

Configure the vSphere ESXi Image Builder Service Startup Type

Before you can use vSphere ESXi Image Builder with the vSphere Web Client, you must verify that the service is enabled and running.

Procedure

1. Log in to your vCenter Server system by using the vSphere Web Client.
2. On the vSphere Web Client Home page, click Administration.
4. Select ImageBuilder Service, click the Actions menu, and select Edit Startup Type.
   - On Windows, the vSphere ESXi Image Builder service is disabled. In the Edit Startup Type window, select Manual or Automatic to enable Auto Deploy.
   - On the vCenter Server Appliance, the vSphere ESXi Image Builder service by default is set to Manual. If you want the service to start automatically upon OS startup, select Automatic.

   If you select the manual startup type, you must start the service manually upon OS startup every time you want to use the service.

5. (Optional) Click the Start the service icon.
6. (Optional) If you want to use vSphere ESXi Image Builder with the vSphere Web Client, log out of the vSphere Web Client and log in again.

   The Auto Deploy icon is visible on the Home page of the vSphere Web Client.

What to do next

- Add a Software Depot.
- Import a Software Depot.
- Clone an Image Profile.
- Create an Image Profile.

Using vSphere ESXi Image Builder Cmdlets

vSphere ESXi Image Builder cmdlets are implemented as Microsoft PowerShell cmdlets and included in PowerCLI. Users of vSphere ESXi Image Builder cmdlets can take advantage of all PowerCLI features.

Experienced PowerShell users can use vSphere ESXi Image Builder cmdlets just like other PowerShell cmdlets. If you are new to PowerShell and PowerCLI, follow these tips.
You can type cmdlets, parameters, and parameter values in the PowerCLI shell.

- Get help for any cmdlet by running `Get-Help cmdlet_name`.
- Remember that PowerShell is not case sensitive.
- Use tab completion for cmdlet names and parameter names.
- Format any variable and cmdlet output by using `Format-List` or `Format-Table` or their short forms `fl` or `ft`. See `Get-Help Format-List`.
- Use wildcards for searching and filtering VIBs and image profiles. All wildcard expressions are supported.

**Passing Parameters by Name**

You can pass in parameters by name in most cases and surround parameter values that contain spaces or special characters with double quotes.

```
Add-EsxSoftwarePackage -ImageProfile profile42 -SoftwarePackage "partner package 35"
```

**Passing Parameters as Objects**

You can pass parameters as objects if you want to do scripting and automation. You can use the technique with cmdlets that return multiple objects or with cmdlets that return a single object.

1. Bind the output of a cmdlet that returns multiple objects to a variable.

   ```
   $profs = Get-EsxImageProfile
   ```

2. When you run the cmdlet that needs the object as input, access the object by position, with the list starting with 0.

   ```
   ```

The example adds the specified software package to the fifth image profile in the list returned by `Get-EsxImageProfile`.

Most of the examples in the *vCenter Server Installation and Setup* documentation pass in parameters by name. *vSphere ESXi Image Builder Workflows* includes examples that pass parameters as objects.

**Using vSphere ESXi Image Builder with the vSphere Web Client**

You can manage software packages (VIBs), image profiles, and software depots by using the vSphere ESXi Image Builder service in the vSphere Web Client.

- **Add a Software Depot**
  
  Before you can work with software depots and customize image profiles, you must add one or more software depots to the vSphere ESXi Image Builder inventory. You can add a software depot by using the vSphere Web Client.
- **Import a Software Depot**
  If an offline depot is located on your local file system, you can import the ZIP file to the vSphere ESXi Image Builder inventory by using the vSphere Web Client.

- **Clone an Image Profile**
  You can use the vSphere Web Client to clone image profiles. You can clone an image profile when you want to make small changes to the VIB list in a profile, or if you want to use hosts from different vendors and want to use the same basic profile, but want to add vendor-specific VIBs.

- **Create an Image Profile**
  You can create a new image profile by using the vSphere Web Client instead of cloning an existing one. You might consider creating a new image profile if it differs significantly from the image profiles in your inventory.

- **Edit an Image Profile**
  You can edit image profiles by using the vSphere Web Client. You can change the name, details and VIB list of an image profile.

- **Compare Image Profiles**
  You can compare two image profiles by using the vSphere Web Client, for example, to see if they have the same VIB list, version, or acceptance level.

- **Move an Image Profile to a Different Software Depot**
  You can move image profiles between custom depots by using the vSphere Web Client. You can move an image profile to a custom depot to edit the image profile.

- **Export an Image Profile to ISO or Offline Bundle ZIP**
  You can export an image profile to an ISO image or a ZIP file by using the vSphere Web Client. You can use the ISO image as an ESXi installer or to upgrade hosts with vSphere Upgrade Manager. The ZIP file contains metadata and the VIBs of the image profile. You can use it for ESXi upgrades or as an offline depot.

### Add a Software Depot

Before you can work with software depots and customize image profiles, you must add one or more software depots to the vSphere ESXi Image Builder inventory. You can add a software depot by using the vSphere Web Client.

**Prerequisites**

Verify that the vSphere ESXi Image Builder service is enabled and running. See [Configure the vSphere ESXi Image Builder Service Startup Type](#).

**Procedure**

1. On the vSphere Web Client Home page, click **Auto Deploy**.
   
   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2. On the **Software Depots** tab, click the **Add Software Depot** icon.
3 Select the type of depot that you want to create.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Depot</td>
<td>a Enter the name of the depot in the inventory.</td>
</tr>
<tr>
<td></td>
<td>b Enter the URL of the online depot.</td>
</tr>
<tr>
<td>Custom Depot</td>
<td>Enter the name of the depot in the inventory.</td>
</tr>
</tbody>
</table>

4 Click OK.

**What to do next**

- You can associate an image profile with a new vSphere Auto Deploy rule to provision ESXi hosts. See Create a Deploy Rule or Clone a Deploy Rule.
- You can associate an image profile with an ESXi host. See Add a Host to the vSphere Auto Deploy Inventory.
- Edit the Image Profile Association of a Host.

**Import a Software Depot**

If an offline depot is located on your local file system, you can import the ZIP file to the vSphere ESXi Image Builder inventory by using the vSphere Web Client.

**Prerequisites**

Verify that the vSphere ESXi Image Builder service is enabled and running. See Configure the vSphere ESXi Image Builder Service Startup Type.

**Procedure**

1 On the vSphere Web Client Home page, click Auto Deploy.

   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2 On the Software Depots tab, click the Import Software Depot icon.

3 Enter the name of the software depot in the inventory.

4 Click Browse and select a ZIP file from the local system, that contains the software depot you want to import.

5 Click Upload.

**What to do next**

- You can associate an image profile with a new vSphere Auto Deploy rule to provision ESXi hosts. See Create a Deploy Rule or Clone a Deploy Rule.
- You can associate an image profile with an ESXi host. See Add a Host to the vSphere Auto Deploy Inventory.
- Edit the Image Profile Association of a Host.
Clone an Image Profile

You can use the vSphere Web Client to clone image profiles. You can clone an image profile when you want to make small changes to the VIB list in a profile, or if you want to use hosts from different vendors and want to use the same basic profile, but want to add vendor-specific VIBs.

The acceptance level of the VIBs you add to the base image must be at least as high as the level of the base image. If you add a VIB with a lower acceptance level to the image profile, you must lower the image profile acceptance level. For more information, see Working with Acceptance Levels.

Prerequisites

- Verify that the vSphere ESXi Image Builder service is enabled and running. See Configure the vSphere ESXi Image Builder Service Startup Type.
- Add or import a software depot to the vSphere ESXi Image Builder inventory. See Add a Software Depot and Import a Software Depot.

Procedure

1. On the vSphere Web Client Home page, click Auto Deploy.
   
   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2. On the Software Depots tab, select the software depot that contains the image profile that you want to work with.

3. From the list of image profiles in the depot, select the image profile that you want to clone and click Clone.

4. Enter an image profile name, vendor, and description.
   
   You must enter a unique image profile name.

5. From the Software depot drop-down list, select in which custom depot to add the new image profile and click Next.

6. (Optional) From the drop-down list, select an acceptance level for the image profile.

7. From the Available tab, select the VIBs that you want to add to the image profile and deselect the ones that you want to remove.

   You can view the VIBs that will be added to the image profile from the Selected tab. You can filter the VIBs by software depot from the Software depot drop-down list on the Available tab.

   **Note**   The image profile must contain a bootable ESXi image to be valid.

8. Click Next.

   vSphere ESXi Image Builder verifies that the change does not invalidate the profile. Some VIBs depend on other VIBs and become invalid if you include them in an image profile separately. When you add or remove a VIB, vSphere ESXi Image Builder checks whether the package dependencies are met.
9 On the Ready to complete page, review the summary information for the new image profile and click Finish.

What to do next

- You can associate an image profile with a new vSphere Auto Deploy rule to provision ESXi hosts. See Create a Deploy Rule or Clone a Deploy Rule.
- You can associate an image profile with an ESXi host. See Add a Host to the vSphere Auto Deploy Inventory.
- Edit the Image Profile Association of a Host.

Create an Image Profile

You can create a new image profile by using the vSphere Web Client instead of cloning an existing one. You might consider creating a new image profile if it differs significantly from the image profiles in your inventory.

The acceptance level of the VIBs you add to the base image must be at least as high as the level of the base image. If you add a VIB with a lower acceptance level to the image profile, you must lower the image profile acceptance level. For more information, see Working with Acceptance Levels.

Prerequisites

- Verify that the vSphere ESXi Image Builder service is enabled and running. See Configure the vSphere ESXi Image Builder Service Startup Type.
- Add or import a software depot to the vSphere ESXi Image Builder inventory. See Add a Software Depot and Import a Software Depot.

Procedure

1 On the vSphere Web Client Home page, click Auto Deploy. By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2 On the Software Depots tab, select the custom depot in which you want to create a new image profile.

3 On the Image Profiles tab, click New Image Profile.

4 Enter an image profile name, vendor, and description. You must enter a unique image profile name.

5 From the Software depot drop-down list, select in which custom depot to add the new image profile and click Next.

6 (Optional) From the drop-down list, select an acceptance level for the image profile.
7 From the **Available** tab, select the VIBs that you want to add to the image profile and deselect the ones that you want to remove.

You can view the VIBs that will be added to the image profile from the **Selected** tab. You can filter the VIBs by software depot from the **Software depot** drop-down list on the **Available** tab.

**Note** The image profile must contain a bootable ESXi image to be valid.

8 Click **Next**.

vSphere ESXi Image Builder verifies that the change does not invalidate the profile. Some VIBs are dependent on others and will not be valid if you include them in an image profile separately. When you add or remove a VIB, vSphere ESXi Image Builder checks that package dependencies are met.

9 On the Ready to complete page, review the summary information for the new image profile and click **Finish**.

**What to do next**

- You can associate an image profile with a new vSphere Auto Deploy rule to provision ESXi hosts. See **Create a Deploy Rule** or **Clone a Deploy Rule**.
- You can associate an image profile with an ESXi host. See **Add a Host to the vSphere Auto Deploy Inventory**.
- **Edit the Image Profile Association of a Host**.

**Edit an Image Profile**

You can edit image profiles by using the vSphere Web Client. You can change the name, details and VIB list of an image profile.

The acceptance level of the VIBs you add to the base image must be at least as high as the level of the base image. If you add a VIB with a lower acceptance level to the image profile, you must lower the image profile acceptance level. For more information, see **Working with Acceptance Levels**.

**Prerequisites**

- Verify that the vSphere ESXi Image Builder service is enabled and running. See **Configure the vSphere ESXi Image Builder Service Startup Type**.
- Add or import a software depot to the vSphere ESXi Image Builder inventory. See **Add a Software Depot** and **Import a Software Depot**.
- Verify that there is at least one custom depot in the vSphere ESXi Image Builder inventory.

**Procedure**

1 On the vSphere Web Client Home page, click **Auto Deploy**.

   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2 On the **Software Depots** tab, select the software depot that contains the image profile that you want to work with.
On the **Image Profiles** tab, select the image profile that you want to edit and click **Edit**.

(Optional) Change the name, vendor and description information of the image profile.

Click **Next**.

From the **Available** tab, select the VIBs that you want to add to the image profile and deselect the ones that you want to remove.

You can view the VIBs that will be added to the image profile from the **Selected** tab. You can filter the VIBs by software depot from the **Software depot** drop-down list on the **Available** tab.

**Note**  The image profile must contain a bootable ESXi image to be valid.

Click **Next**.

vSphere ESXi Image Builder verifies that the change does not invalidate the profile. Some VIBs depend on other VIBs and become invalid if you include them in an image profile separately. When you add or remove a VIB, vSphere ESXi Image Builder checks whether the package dependencies are met.

On the Ready to complete page, review the summary information for the edited image profile and click **Finish**.

**What to do next**

- You can associate an image profile with a new vSphere Auto Deploy rule to provision ESXi hosts. See [Create a Deploy Rule](#) or [Clone a Deploy Rule](#).
- You can associate an image profile with an ESXi host. See [Add a Host to the vSphere Auto Deploy Inventory](#).
- [Edit the Image Profile Association of a Host](#).

**Compare Image Profiles**

You can compare two image profiles by using the vSphere Web Client, for example, to see if they have the same VIB list, version, or acceptance level.

**Prerequisites**

- Verify that the vSphere ESXi Image Builder service is enabled and running. See [Configure the vSphere ESXi Image Builder Service Startup Type](#).
- Add or import a software depot to the vSphere ESXi Image Builder inventory. See [Add a Software Depot](#) and [Import a Software Depot](#).

**Procedure**

1. On the vSphere Web Client Home page, click **Auto Deploy**.

   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2. On the **Software Depots** tab, select the software depot that contains the image profile that you want to work with.
3 On the **Image Profiles** tab, select the image profile that you want to compare and click **Compare To**.

4 In the Compare Image Profile dialog box, from the **Software Depot** drop-down menu, select the software depot that contains the second image profile that you want to compare.

5 From the **Image Profile** drop-down menu, select the second image profile that you want to compare.

6 Under Software Packages, on the **All** tab, view the comparison of the two image profiles.

   The left side of the list displays the names, versions, acceptance levels, and vendors of the VIBs that the first chosen image profile contains. The right part of the list provides information about the second image profile. The VIBs marked with *no change* are the same in both profiles. VIBs that are present in only one of the image profiles are marked *missing* in the image profile that they are not present in.

**Move an Image Profile to a Different Software Depot**

You can move image profiles between custom depots by using the vSphere Web Client. You can move an image profile to a custom depot to edit the image profile.

**Prerequisites**

- Verify that the vSphere ESXi Image Builder service is enabled and running. See Configure the vSphere ESXi Image Builder Service Startup Type.
- Add or import a software depot to the vSphere ESXi Image Builder inventory. See Add a Software Depot and Import a Software Depot.
- Verify that there is at least one custom depot in the vSphere ESXi Image Builder inventory.

**Procedure**

1 On the vSphere Web Client Home page, click **Auto Deploy**.

   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2 On the **Software Depots** tab, select the software depot that contains the image profile that you want to work with.

3 On the **Image Profiles** tab, select an image profile and click **Move to**.

4 From the drop-down list, select the custom depot in which you want to move the image profile.

5 Click **OK**.

**Export an Image Profile to ISO or Offline Bundle ZIP**

You can export an image profile to an ISO image or a ZIP file by using the vSphere Web Client. You can use the ISO image as an ESXi installer or to upgrade hosts with vSphere Upgrade Manager. The ZIP file contains metadata and the VIBs of the image profile. You can use it for ESXi upgrades or as an offline depot.

**Prerequisites**

- Verify that the vSphere ESXi Image Builder service is enabled and running. See Configure the vSphere ESXi Image Builder Service Startup Type.
Add or import a software depot to the vSphere ESXi Image Builder inventory. See Add a Software Depot and Import a Software Depot.

Procedure

1. On the vSphere Web Client Home page, click **Auto Deploy**.
   By default, only the Administrator role has privileges to use the vSphere ESXi Image Builder service.

2. On the **Software Depots** tab, select the software depot that contains the image profile that you want to work with.

3. On the **Image Profiles** tab, select the image profile that you want to export and click **Export Image Profile**.

4. Select the type of the exported file.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>Exports the image profile to a bootable ISO image. If you want to create an ISO image that you can burn to a CD or DVD and use to boot up a stateless ESXi instance, select the <strong>Do not include an installer on the ISO</strong> check box.</td>
</tr>
<tr>
<td>ZIP</td>
<td>Exports the image profile to a ZIP file.</td>
</tr>
</tbody>
</table>

5. (Optional) If you want to bypass the acceptance level verification of the image profile, select **Skip acceptance level checking**.

6. Click the **Generate image** button.

7. When the image generates successfully, click **Download** to download the exported file.

8. Click **Close**.

Using vSphere ESXi Image Builder with PowerCLI Cmdlets

The vSphere ESXi Image Builder cmdlets allow you to manipulate software depots, image profiles, and VIBs.

Clone an Image Profile

Cloning a published profile is the easiest way to create a custom image profile. Cloning a profile is especially useful if you want to remove a few VIBs from a profile, or if you want to use hosts from different vendors and want to use the same basic profile, but want to add vendor-specific VIBs. VMware partners or large installations might consider creating a new profile.

Prerequisites

- Install the PowerCLI and all prerequisite software. See vSphere ESXi Image Builder Installation and Usage.
- Verify that you have access to the software depot that contains the image profile you want to clone.
Procedure

1. In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot -DepotUrl depot_url</code>.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a. Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b. Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

The cmdlet returns one or more SoftwareDepot objects.

2. (Optional) Run the `Get-EsxImageProfile` cmdlet to find the name of the profile that you want to clone.

   You can use filtering options with `Get-EsxImageProfile`.

3. Run the `New-EsxImageProfile` cmdlet to create the new profile and use the `-CloneProfile` parameter to specify the profile you want to clone.

   ```powershell
   New-EsxImageProfile -CloneProfile My_Profile -Name "Test Profile 42"
   ```

   This example clones the profile named `My_Profile` and assigns it the name Test Profile 42. You must specify a unique combination of name and vendor for the cloned profile.

What to do next

See [Examine Depot Contents](#) for some examples of filtering.

Customize the image profile by adding or removing VIBs. See [Add VIBs to an Image Profile](#).

Add VIBs to an Image Profile

You can add one or more VIBs to an image profile if that image profile is not set to read only. If the new VIB depends on other VIBs or conflicts with other VIBs in the profile, a message is displayed at the PowerShell prompt and the VIB is not added.

You can add VIBs from VMware or from VMware partners to an image profile. If you add VMware VIBs, vSphere ESXi Image Builder performs validation. If you add VIBs from two or more OEM partners simultaneously, no errors are reported but the resulting image profile might not work. Install VIBs from only one OEM vendor at a time.

If an error about acceptance level problems appears, change the acceptance level of the image profile and the acceptance level of the host. Consider carefully whether changing the host acceptance level is appropriate. VIB acceptance levels are set during VIB creation and cannot be changed.
You can add VIBs even if the resulting image profile is invalid.

**Note** VMware can support only environments and configurations that are proven to be stable and fully functional through rigorous and extensive testing. Use only those supported configurations. You can use custom VIBs if you lower your host acceptance level, and as a result, supportability. In that case, track the changes you made, so you can revert them if you want to remove custom VIBs and restore the host acceptance level to the default (Partner Supporter) later. See Working with Acceptance Levels.

**Prerequisites**

Install the PowerCLI and all prerequisite software. See Install vSphere ESXi Image Builder and Prerequisite Software

**Procedure**

1. In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot -DepotUrl depot_url</code></td>
</tr>
<tr>
<td>ZIP file</td>
<td>a. Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b. Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

   The cmdlet returns one or more `SoftwareDepot` objects.

2. Run the `Get-EsxImageProfile` cmdlet to list all image profiles in all currently visible depots.

   The cmdlet returns all available profiles. You can narrow your search by using the optional arguments to filter the output.

3. Clone the profile.

   ```PowerShell
   New-EsxImageProfile -CloneProfile My_Profile -Name "Test Profile 42" -Vendor "My Vendor"
   ```

   Image profiles published by VMware and its partners are read only. To make changes, you must clone the image profile. The vendor parameter is required.

4. Run the `Add-EsxSoftwarePackage` cmdlet to add a new package to one of the image profiles.

   ```PowerShell
   Add-EsxSoftwarePackage -ImageProfile My_Profile -SoftwarePackage partner-package
   ```

   The cmdlet runs the standard validation tests on the image profile. If validation succeeds, the cmdlet returns a modified, validated image profile. If the VIB that you want to add depends on a different VIB, the cmdlet displays that information and includes the VIB that would resolve the dependency. If the acceptance level of the VIB that you want to add is lower than the image profile acceptance level, an error occurs.
Export an Image Profile to ISO or Offline Bundle ZIP

You can export an image profile to an ISO image or a ZIP file of component files and folders. You cannot create both by running the cmdlet once. You can use the ISO image as an ESXi installer or upload the ISO into vSphere Update Manager for upgrades. You can use the ZIP file, which contains metadata and the VIBs specified in the image profile, for upgrades to ESXi 5.0 and later.

Prerequisites

Install the PowerCLI and all prerequisite software. See Install vSphere ESXi Image Builder and Prerequisite Software.

Procedure

1. In a PowerCLI session, run the Add-EsxSoftwareDepot cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run Add-EsxSoftwareDepot -DepotUrl depot_url.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a. Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b. Run Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</td>
</tr>
</tbody>
</table>

   The cmdlet returns one or more SoftwareDepot objects.

2. Run Export-EsxImageProfile to export the image profile.

<table>
<thead>
<tr>
<th>Export Format</th>
<th>Cmdlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO images</td>
<td>Export-EsxImageProfile with the -ExportToIso parameter</td>
</tr>
<tr>
<td>Offline depot ZIP files</td>
<td>Export-EsxImageProfile with the -ExportToBundle parameter</td>
</tr>
</tbody>
</table>

   For the ISO image, vSphere ESXi Image Builder validates VIB signatures, adds VIB binaries to the image, and downloads the image to the specified location. For the ZIP file, vSphere ESXi Image Builder validates VIB signatures and downloads the VIB binaries to the specified location.

Example: Exporting an Image Profile

Follow these steps to export an image profile to an ISO image.

1. Add the software depot.

   Add-EsxSoftwareDepot -DepotUrl url_or_file

2. View all available image profiles to find the name of the image profile to export.

   Get-EsxImageProfile

3. Export the image profile.

   Export-EsxImageProfile -ImageProfile "myprofile" -ExportToIso -FilePath iso_name
Follow these steps to export an image profile to a ZIP file of component files and folders.

1 Add the software depot.

   Add-EsxSoftwareDepot -DepotUrl url_or_file

2 View all available image profiles to find the name of the image profile to export.

   Get-EsxImageProfile

3 Export the image profile.

   Export-EsxImageProfile -ImageProfile "myprofile" -ExportToBundle -FilePath C:\my_bundle.zip

What to do next

Use the ISO image in an ESXi installation or upload the ISO image into vSphere Update Manager to perform upgrades.

Use the ZIP file to upgrade an ESXi installation.

- Import the ZIP file into vSphere Update Manager for use with patch baselines.
- Download the ZIP file to an ESXi host or a datastore and run esxcli software vib commands to import the VIBs in the ZIP file.

See the vSphere Upgrade documentation.

Preserve Image Profiles Across Sessions

When you create an image profile and exit the PowerCLI session, the image profile is no longer available when you start a new session. You can export the image profile to a ZIP file software depot, and add that depot in the next session.

Prerequisites

Install the PowerCLI and all prerequisite software. See Install vSphere ESXi Image Builder and Prerequisite Software.

Procedure

1 In a PowerCLI session, create an image profile, for example by cloning an existing image profile and adding a VIB.

2 Export the image profile to a ZIP file by calling Export-EsxImageProfile with the ExportToBundle parameter.

   Export-EsxImageProfile -ImageProfile "my_profile" -ExportToBundle -FilePath "C:\isos\temp-base-plus-vib25.zip"

3 Exit the PowerCLI session.
4 When you start a new PowerCLI session, add the depot that contains your image profile to access it.

```
Add-EsxSoftwareDepot "C:\isos\temp-base-plus-vib25.zip"
```

**Compare Image Profiles**

You can compare two image profiles by using the `Compare-EsxImageProfile` cmdlet, for example, to see if they have the same VIB list or acceptance level. Comparing image profiles or their properties is also possible by using the PowerShell comparison operators.

**Prerequisites**

Install the PowerCLI and all prerequisite software. See [Install vSphere ESXi Image Builder and Prerequisite Software](#).

**Procedure**

1 In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>b Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

The cmdlet returns one or more `SoftwareDepot` objects.

2 (Optional) Run the `Get-EsxImageProfile` cmdlet to view a list of all image profiles in all available depots.

In the list, you can locate the names of the image profiles you want to compare.

3 Before comparing the image profiles, assign them to variables.

For example, you can create variables `$imageProfile1` and `$imageProfile2` to hold the names of the compared images profiles.

```
$imageProfile1 = Get-EsxImageProfile -Name "ImageProfile1"
$imageProfile2 = Get-EsxImageProfile -Name "ImageProfile2"
```
4 Compare the two image profiles by using the Compare-EsxImageProfile cmdlet or the –eq comparison operator, which returns a Boolean value.

- Compare the two image profiles to get a full description of the differences by using the Compare-EsxImageProfile cmdlet.
  
  ```powershell
  Compare-EsxImageProfile -ReferenceProfile $imageProfile1 -ComparisonProfile $imageProfile2
  ```

- Compare the two image profiles by VIB list and acceptance level using the –eq comparison operator.
  
  ```powershell
  if ($imageProfile1 -eq $imageProfile2) {
    Write-host "Successfully verified that both image profiles are equal."
  } else {
    Write-host "Failed to verify that the image profiles are equal."
  }
  ```

- Compare the two image profiles by a specific property using the –eq comparison operator.
  
  ```powershell
  if ($imageProfile1.vendor -eq $imageProfile2.vendor) {
    Write-host "Successfully verified that both image profiles are equal."
  } else {
    Write-host "Failed to verify that the image profiles are equal."
  }
  ```

**Compare VIBs**

You can compare two VIBs or their properties by using the PowerShell comparison operators.

**Prerequisites**

Install the PowerCLI and all prerequisite software. See Install vSphere ESXi Image Builder and Prerequisite Software.

**Procedure**

1. In a PowerCLI session, run the Add-EsxSoftwareDepot cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run Add-EsxSoftwareDepot -DepotUrl depot_url.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b Run Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</td>
</tr>
</tbody>
</table>

   The cmdlet returns one or more SoftwareDepot objects.

2. (Optional) Run the Get-EsxSoftwarePackage cmdlet to view all available VIBs.

   In the list, you can locate the names of the VIBs you want to compare.
3 Before comparing the VIBs, assign them to variables.

For example, you can create variables $vib1 and $vib2 to hold the names of the compared VIBs.

```powershell
$vib1 = Get-EsxSoftwarePackage -Name "ReferenceVIB"
$vib2 = Get-EsxSoftwarePackage -Name "ComparisonVIB"
```

4 Use a comparison operator to compare the VIBs by contents and acceptance level or by a specific property.

- Compare the two VIBs by their contents and acceptance level.
  ```powershell
  if ($vib1 -eq $vib2) {
    Write-host "Successfully verified that both VIBs are equal."
  } else {
    Write-host "Failed to verify that the VIBs are equal."
  }
  ```

- Compare a specific property of the VIBs by using a comparison operator such as -eq, -lt, -le, -gt or -ge.
  ```powershell
  if ($vib1.VersionObject -lt $vib2.VersionObject) {
    Write-host "Successfully verified that both the VIBs are equal."
  } else {
    Write-host "Failed to verify that the VIBs are equal."
  }
  ```

Working with Acceptance Levels

Hosts, image profiles, and individual VIBs have acceptance levels. VIB acceptance levels show how the VIB was tested. Understanding what each acceptance level implies, how to change levels, and what a change implies is an important part of installation and update procedures.
Acceptance levels are set for hosts, image profiles, and individual VIBs. The default acceptance level for an ESXi image or image profile is PartnerSupported.

**Host acceptance levels**
The host acceptance level determines which VIBs you can install on a host. You can change a host's acceptance level with ESXCLI commands. By default, ESXi hosts have an acceptance level of PartnerSupported to allow for easy updates with PartnerSupported VIBs.

*Note* VMware supports hosts at the PartnerSupported acceptance level. For problems with individual VIBs with PartnerSupported acceptance level, contact your partner's support organization.

**Image profile acceptance levels**
The image profile acceptance level is set to the lowest VIB acceptance level in the image profile. If you want to add a VIB with a low acceptance level to an image profile, you can change the image profile acceptance level with the `Set-EsxImageProfile` cmdlet. See Set the Image Profile Acceptance Level.

The vSphere Update Manager does not display the actual acceptance level. Use vSphere ESXi Image Builder cmdlets to retrieve the acceptance level information for VIBs and image profiles.

**VIB acceptance levels**
A VIB's acceptance level is set when the VIB is created. Only the VIB creator can set the acceptance level.

If you attempt to provision a host with an image profile or VIB that has a lower acceptance level than the host, an error occurs. Change the acceptance level of the host to install the image profile or VIB. See Change the Host Acceptance Level. Changing the acceptance level of the host changes the support level for that host.

The acceptance level of a host, image profile, or VIB lets you determine who tested the VIB and who supports the VIB. VMware supports the following acceptance levels.

**VMwareCertified**
The VMwareCertified acceptance level has the most stringent requirements. VIBs with this level go through thorough testing fully equivalent to VMware in-house Quality Assurance testing for the same technology. Today, only I/O Vendor Program (IOVP) program drivers are published at this level. VMware takes support calls for VIBs with this acceptance level.

**VMwareAccepted**
VIBs with this acceptance level go through verification testing, but the tests do not fully test every function of the software. The partner runs the tests and VMware verifies the result. Today, CIM providers and PSA plug-ins are among the VIBs published at this level. VMware directs support calls for VIBs with this acceptance level to the partner's support organization.
VIBs with the PartnerSupported acceptance level are published by a partner that VMware trusts. The partner performs all testing. VMware does not verify the results. This level is used for a new or nonmainstream technology that partners want to enable for VMware systems. Today, driver VIB technologies such as Infiniband, ATAoE, and SSD are at this level with nonstandard hardware drivers. VMware directs support calls for VIBs with this acceptance level to the partner's support organization.

The CommunitySupported acceptance level is for VIBs created by individuals or companies outside of VMware partner programs. VIBs at this level have not gone through any VMware-approved testing program and are not supported by VMware Technical Support or by a VMware partner.

Change the Host Acceptance Level

You can lower the host acceptance level to match the acceptance level for a VIB or image profile you want to install.

The acceptance level of each VIB on a host must be at least as high as the acceptance level of the host. For example, you cannot install a VIB with PartnerSupported acceptance level on a host with VMwareAccepted acceptance level. You must first lower the acceptance level of the host. For more information on acceptance levels, see Acceptance Levels.

Changing the host acceptance level to CommunitySupported affects the supportability of your host and might affect the security of your host.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See Getting Started with vSphere Command-Line Interfaces. For troubleshooting, run esxcli commands in the ESXi Shell.

Procedure

1. Retrieve the acceptance level for the VIB or image profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>View information for all VIBs</td>
<td>esxcli --server=server_name software sources vib list --depot=depot_URL</td>
</tr>
<tr>
<td>View information for a specified VIB</td>
<td>esxcli --server=server_name software sources vib list --viburl=vib_URL</td>
</tr>
<tr>
<td>View information for all image profiles</td>
<td>esxcli --server=server_name software sources profile list --depot=depot_URL</td>
</tr>
<tr>
<td>View information for a specified image profile</td>
<td>esxcli --server=server_name software sources profile get --depot=depot_URL --profile=profile_name</td>
</tr>
</tbody>
</table>
2 View the host acceptance level.

```
esxcli --server=server_name software acceptance get
```

3 Change the acceptance level of the host.

```
esxcli --server=server_name software acceptance set --level=acceptance_level
```

The value for `acceptance_level` can be VMwareCertified, VMwareAccepted, PartnerSupported, or CommunitySupported. The values for `acceptance_level` are case-sensitive.

**Note** If the host has a higher acceptance level than the VIB or image profile you want to add, you can run commands in the `esxcli software vib` or `esxcli software profile` namespace with the `--force` option. When you use the `--force` option, a warning appears because you enforce a VIB or image profile with lower acceptance level than the acceptance level of the host and your setup is no longer consistent. The warning is repeated when you install VIBs, remove VIBs, or perform certain other operations on the host that has inconsistent acceptance levels.

---

**Set the Image Profile Acceptance Level**

If you want to add a VIB to an image profile, and the acceptance level of the VIB is lower than that of the image profile, you can clone the image profile with a lower acceptance level or change the image profile's acceptance level.

You can specify VMwareCertified, VMwareAccepted, PartnerSupported, or CommunitySupported as an acceptance level of an image profile. If you lower the acceptance level, the level of support for the image profile and hosts that you provision with it changes. For more information, see [Acceptance Levels](#).

**Prerequisites**

Install PowerCLI and all prerequisite software. See [Install vSphere ESXi Image Builder and Prerequisite Software](#).

**Procedure**

1 In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot -DepotUrl depot_url</code>.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

The cmdlet returns one or more `SoftwareDepot` objects.

2 Get the acceptance level for the image profile.

```
Get-EsxImageProfile -Name string
```
3 Set the acceptance level of the image profile.

```powershell
Set-EsxImageProfile -Name string -AcceptanceLevel level
```

**vSphere ESXi Image Builder Workflows**

vSphere ESXi Image Builder workflows are examples for cmdlet usage. Workflows do not represent actual tasks, but illustrate how you might explore different ways of using a cmdlet. Administrators trying out the workflows benefit from some experience with PowerCLI, Microsoft PowerShell, or both.

**Examine Depot Contents**

You can examine software depots and VIBs with vSphere ESXi Image Builder cmdlets. You can use wildcards to examine depot contents. All wildcard expressions are supported.

The workflow itself passes parameters by name. However, you can pass parameters as objects by accessing variables.

You can use filtering options and wildcard expressions to examine depot contents.

**Prerequisites**

Verify that PowerCLI and prerequisite software is installed. See Install vSphere ESXi Image Builder and Prerequisite Software.

**Procedure**

1 In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot -DepotUrl depot_url</code>.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

The cmdlet returns one or more `SoftwareDepot` objects.

2 Retrieve image profiles.

You can filter by vendor, name, and acceptance level.

- `Get-EsxImageProfiles`

  Returns an array of `ImageProfile` objects from all depots you added to the session.

- `Get-EsxImageProfile -Vendor "C*"`

  Returns all image profiles created by a vendor with a name that starts with the letter C.
3 Retrieve software packages by using the `Get-EsxSoftwarePackage` cmdlet.

You can filter, for example by vendor or version, and you can use the standard PowerShell wildcard characters.

- `Get-EsxSoftwarePackage -Vendor "V*"`
  
  Returns all software packages from a vendor with a name that starts with the letter V.

- `Get-EsxSoftwarePackage -Vendor "V*" -Name "*scsi*"`
  
  Returns all software packages with a name that contains the string `scsi` in it from a vendor with a name that starts with the letter V.

- `Get-EsxSoftwarePackage -Version "2.0*"`
  
  Returns all software packages with a version string that starts with 2.0.

4 Use `-Newest` to find the latest package.

- `Get-EsxSoftwarePackage -Vendor "V*" -Newest`
  
  Returns the newest package for the vendors with a name that starts with the letter V, and displays the information as a table.

- `Get-EsxSoftwarePackage -Vendor "V*" -Newest | format-list`
  
  Returns detailed information about each software package by using a pipeline to link the output of the request for software packages to the PowerShell `format-list` cmdlet.

5 View the list of VIBs in the image profile.

```powershell
(Get-EsxImageProfile -Name "Robin's Profile").VibList
```

`VibList` is a property of the `ImageProfile` object.

6 Retrieve software packages released before or after a certain date by using the `CreatedBefore` or `CreatedAfter` parameter.

- `Get-EsxSoftwarePackage -CreatedAfter 7/1/2010`
  
  Returns software packages released after the specified date.
Example: Depot Content Examination Using Variables

This workflow example examines depot contents by passing in parameters as objects accessed by position in a variable, instead of passing in parameters by name. You can run the following commands in sequence from the PowerCLI prompt. Replace names with names that are appropriate in your installation.

```
Get-EsxSoftwarePackage -Vendor "V*"
Get-EsxSoftwarePackage -Vendor "V*" -Name "r*"
Get-EsxSoftwarePackage -Version "2.0*"
$sql1 = Get-EsxImageProfile -name ESX-5.0.0-123456-full
$sql1.VibList
Get-EsxSoftwarePackage -CreatedAfter 7/1/2010
```

Create Image Profiles by Cloning Workflow

You can use vSphere ESXi Image Builder cmdlets to check which depots are available, to add a depot, to view image profile information, and to create a new image profile by cloning one of the available image profiles.

Published profiles are usually read-only and cannot be modified. Even if a published profile is not read-only, cloning instead of modifying the profile is a best practice, because modifying the original profile erases the original. You cannot revert to the original, unmodified profile except by reconnecting to a depot.

A profile cloning workflow might include checking the current state of the system, adding a software depot, and cloning the profile.

Prerequisites

Verify that PowerCLI and prerequisite software is installed. See [Install vSphere ESXi Image Builder and Prerequisite Software](#).

Procedure

1. In a PowerShell window, check whether any software depots are defined for the current session.

```
$DefaultSoftwareDepots
```

PowerShell returns the currently defined depots, or nothing if you just started PowerShell.

2. If the depot containing the profile that you want to clone does not appear in the results, add it to the current session.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run Add-EsxSoftwareDepot -DepotUrl depot_url.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a Download the ZIP file to a local file path.</td>
</tr>
<tr>
<td></td>
<td>b Run Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline_bundle.zip</td>
</tr>
</tbody>
</table>

PowerShell adds the specified depot to your current session and lists all current depots.

3. (Optional) Check the $DefaultSoftwareDepots variable, which now returns the newly added depot.
4 View all available image profiles.

```
Get-EsxImageProfile
```

5 To clone an image profile, enter its name, a new name for the new profile, and a name of the vendor.

```
$ip = New-EsxImageProfile -CloneProfile base-tbd-v1 -Name "Test Profile 42" -Vendor "Vendor20"
```

6 (Optional) View the newly created image profile, $ip.

PowerShell returns the information about the image profile in tabular format.

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Vendor</th>
<th>Last Modified</th>
<th>Acceptance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Profile 42</td>
<td>Vendor20</td>
<td>9/15/2010 5:45:43...</td>
<td>PartnerSupported</td>
</tr>
</tbody>
</table>
```

**Example: Creating Image Profile by Cloning Using Variables**

This workflow example repeats the steps of this workflow by passing in parameters as objects accessed by position in a variable, instead of passing in parameters by name. You can run the following cmdlets in sequence from the PowerCLI prompt.

```
$DefaultSoftwareDepots
Add-EsxSoftwareDepot -DepotUrl depot_url
$DefaultSoftwareDepots
$profs = Get-EsxImageProfile
$profs
$ip = New-EsxImageProfile -CloneProfile $profs[2] -Name "new_profile_name" -Vendor "my_vendor"
$ip
```

**Create New Image Profiles Workflow**

In most situations, you create an image profile by cloning an existing profile. Some VMware customers or partners might need to create a new image profile. Pay careful attention to dependencies and acceptance levels if you create an image profile from scratch.

The system expects that the acceptance level of the VIBs you add to the base image is at least as high as the level of the base image. If you have to add a VIB with a lower acceptance level to the image profile, you must lower the image profile acceptance level. For more information, see Set the Image Profile Acceptance Level.

As an alternative to specifying the parameters on the command line, you can use the PowerShell prompting mechanism to specify string parameters. Prompting does not work for other parameters such as objects.

**Prerequisites**

- PowerCLI and prerequisite software is installed. See Install vSphere ESXi Image Builder and Prerequisite Software.
- You have access to a depot that includes a base image and one or more VIBs. VMware and VMware partners have public depots, accessible by a URL. VMware or VMware partners can create a ZIP file that you can unzip to your local environment and access by using a file path.

**Procedure**

1. In a PowerCLI session, run the `Add-EsxSoftwareDepot` cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot -DepotUrl depot_url</code>.</td>
</tr>
<tr>
<td>ZIP file</td>
<td>a. Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b. Run <code>Add-EsxSoftwareDepot -DepotUrl C:\file_path\offline-bundle.zip</code></td>
</tr>
</tbody>
</table>

The cmdlet returns one or more `SoftwareDepot` objects.

2. Run the `Get-EsxImageProfile` cmdlet to list all image profiles in all currently visible depots. You can narrow your search by using the optional arguments to filter the output.

```
Get-EsxSoftwarePackage -CreatedAfter 7/1/2010
```

3. Create a new profile, assign it a name and vendor, and add a base package.

```
New-EsxImageProfile -NewProfile -Name "Test #2" -vendor "Vendor42" -SoftwarePackage esx-base[0],esx-xlibs[0]
```

The example uses the esx-base package. In most cases, you include the esx-base package when you create a new image profile. Names that contain spaces are surrounded by quotes.

4. Use a pipeline to pass the new image profile to `format-list` for detailed information about the new package.

```
(Get-EsxImageProfile -Name "Test #2").VibList | format-list
```

**Example: Creating Image Profiles from Scratch Using Variables**

This command sequence repeats the steps of the workflow, but passes parameters as objects, accessed by position in a variable, instead of passing parameters by name. You can run the following commands in sequence at the PowerCLI prompt.

```
Add-EsxSoftwareDepot depoturl
$pkgs = Get-EsxSoftwarePackage -CreatedAfter 7/1/2010
$ip2 = New-EsxImageProfile -NewProfile -Name "Test #2" -vendor "Vendor42" -SoftwarePackage $pkgs[0]
$ip2.VibList | format-list
```
Edit Image Profiles Workflow

You can create a custom image by cloning and editing an image profile by using PowerCLI. You can add or remove one or more VIBs in the existing profile. If adding or removing VIBs prevents the image profile from working correctly, an error occurs.

Prerequisites

- PowerCLI and prerequisite software is installed. See Install vSphere ESXi Image Builder and Prerequisite Software.
- You have access to a depot that includes a base image and one or more VIBs. VMware and VMware partners make public depots, accessible by a URL, available. VMware or VMware partners can create a ZIP file that you can download to your local environment and access by using a file path.

Procedure

1. In a PowerCLI session, run the Add-EsxSoftwareDepot cmdlet for each depot you want to work with.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZIP file</td>
<td>a Download the ZIP file to a local file system.</td>
</tr>
<tr>
<td></td>
<td>b Run Add-EsxSoftwareDepot –DepotUrl C:\file_path\offline-bundle.zip</td>
</tr>
</tbody>
</table>

The cmdlet returns one or more SoftwareDepot objects.

2. Use a pipeline to pass the image profile you intend to edit to format-list to see detailed information.

In this example, the image profile created in Create New Image Profiles Workflow contains only the base image. A newly created image profile is not included in the depot. Instead, you access the image profile by name or by binding it to a variable.

```
Get-EsxImageProfile "Test #2" | format-list
```

PowerShell returns the information.

<table>
<thead>
<tr>
<th>Name</th>
<th>Test #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor</td>
<td>Vendor42</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>VibList</td>
<td>{esx-base 5.0.0.-...}</td>
</tr>
</tbody>
</table>
3  (Optional) If you are adding a VIB with a lower acceptance level than that of the image profile, change
the acceptance level of the image profile.

```powershell
Set-ExsImageProfile -ImageProfile "Test #2" -AcceptanceLevel VMwareAccepted
```

PowerShell returns the information about the changed profile in tabular format.

<table>
<thead>
<tr>
<th>Name</th>
<th>Vendor</th>
<th>Last Modified</th>
<th>Acceptance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test #2</td>
<td>Vendor42</td>
<td>9/22/2010 12:05:...</td>
<td>VMwareAccepted</td>
</tr>
</tbody>
</table>

4  Add a software package (VIB) to the image profile. You can add the package by name.

```powershell
Add-ExsSoftwarePackage -ImageProfile "Test #2"
   -SoftwarePackage NewPack3
```

PowerShell returns the information about the image profile in tabular format.

<table>
<thead>
<tr>
<th>Name</th>
<th>Vendor</th>
<th>Last Modified</th>
<th>Acceptance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test #2</td>
<td>Vendor42</td>
<td>9/22/2010 12:05:...</td>
<td>VMwareAccepted</td>
</tr>
</tbody>
</table>

**Note**  If an error occurs when you add the software package, you might have a problem with
acceptance levels, see Working with Acceptance Levels

5  View the image profile again.

```powershell
Get-ExsImageProfile "Test #2" | format-list
```

The VIB list is updated to include the new software package and the information is displayed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vendor42</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>VibList</td>
<td>esx-base 5.0.0.-..., NewPack3</td>
</tr>
</tbody>
</table>

**Example: Editing Image Profiles by Using Variables**

This cmdlet sequence repeats the steps of the workflow but passes parameters as objects, accessed by
position in a variable, instead of passing parameters by name. You can run the following cmdlets in
sequence from the PowerCLI prompt.

```powershell
Add-ExsSoftwareDepot -DepotUrl depot_url
$ip2 = Get-ExsImageProfile -name "Test #2"
$ip2 | format-list
Set-ExsImageProfile -ImageProfile $ip2 -AcceptanceLevel VMwareAccepted
Add-ExsImageSoftwarePackage -ImageProfile $ip2 -SoftwarePackage NewPack3
$ip2 | format-list
```
Required Information for ESXi Installation

In an interactive installation, the system prompts you for the required system information. In a scripted installation, you must supply this information in the installation script.

For future use, note the values you use during the installation. These notes are useful if you must reinstall ESXi and reenter the values that you originally chose.

Table 5-10. Required Information for ESXi Installation

<table>
<thead>
<tr>
<th>Information</th>
<th>Required or Optional</th>
<th>Default</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyboard layout</td>
<td>Required</td>
<td>U.S. English</td>
<td></td>
</tr>
<tr>
<td>VLAN ID</td>
<td>Optional</td>
<td>None</td>
<td>Range: 0 through 4094</td>
</tr>
<tr>
<td>IP address</td>
<td>Optional</td>
<td>DHCP</td>
<td>You can allow DHCP to configure the network during installation. After installation, you can change the network settings.</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>Optional</td>
<td>Calculated based on the IP address</td>
<td></td>
</tr>
<tr>
<td>Gateway</td>
<td>Optional</td>
<td>Based on the configured IP address and subnet mask</td>
<td></td>
</tr>
<tr>
<td>Primary DNS</td>
<td>Optional</td>
<td>Based on the configured IP address and subnet mask</td>
<td></td>
</tr>
<tr>
<td>Secondary DNS</td>
<td>Optional</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Host name</td>
<td>Required for static IP settings</td>
<td>None</td>
<td>The vSphere Web Client can use either the host name or the IP address to access the ESXi host.</td>
</tr>
<tr>
<td>Install location</td>
<td>Required</td>
<td>None</td>
<td>Must be at least 5 GB if you install the components on a single disk.</td>
</tr>
<tr>
<td>Migrate existing ESXi settings. Preserve existing VMFS datastore.</td>
<td>Required if you are installing ESXi on a drive with an existing ESXi installation.</td>
<td>None</td>
<td>If you have an existing ESXi 5.x installation, the ESXi installer offers a choice between preserving or overwriting the VMFS datastore during installation</td>
</tr>
<tr>
<td>Root password</td>
<td>Required</td>
<td>None</td>
<td>The root password must contain between 8 and 40 characters. For information about passwords see the vSphere Security documentation.</td>
</tr>
</tbody>
</table>

Installing ESXi

You can install ESXi interactively, with a scripted installation, or with vSphere Auto Deploy.

Installing ESXi Interactively

Use the interactive installation option for small deployments of fewer than five hosts.
In a typical interactive installation, you boot the ESXi installer and respond to the installer prompts to install ESXi to the local host disk. The installer reformats and partitions the target disk and installs the ESXi boot image. If you have not installed ESXi on the target disk before, all data on the drive is overwritten, including hardware vendor partitions, operating system partitions, and associated data.

**Note**  To ensure that you do not lose any data, migrate the data to another machine before you install ESXi.

If you are installing ESXi on a disk that contains a previous installation of ESXi or ESX, or a VMFS datastore, the installer provides you with options for upgrading. See the *vSphere Upgrade* documentation.

**Install ESXi Interactively**

You use the ESXi CD/DVD or a USB flash drive to install the ESXi software onto a SAS, SATA, SCSI hard drive, or USB drive.

**Prerequisites**

- You must have the ESXi installer ISO in one of the following locations:
  - On CD or DVD. If you do not have the installation CD/DVD, you can create one. See Download and Burn the ESXi Installer ISO Image to a CD or DVD
  - On a USB flash drive. See Format a USB Flash Drive to Boot the ESXi Installation or Upgrade.

  **Note**  You can also PXE boot the ESXi installer to run an interactive installation or a scripted installation. See PXE Booting the ESXi Installer.

- Verify that the server hardware clock is set to UTC. This setting is in the system BIOS.
- Verify that a keyboard and monitor are attached to the machine on which the ESXi software is installed. Alternatively, use a remote management application. See Using Remote Management Applications.
- Consider disconnecting your network storage. This action decreases the time it takes the installer to search for available disk drives. When you disconnect network storage, any files on the disconnected disks are unavailable at installation.
  
  Do not disconnect a LUN that contains an existing ESX or ESXi installation. Do not disconnect a VMFS datastore that contains the Service Console of an existing ESX installation. These actions can affect the outcome of the installation.

- Gather the information required by the ESXi installation wizard. See Required Information for ESXi Installation.
- Verify that ESXi Embedded is not present on the host machine. ESXi Installable and ESXi Embedded cannot exist on the same host.

**Procedure**

1. Insert the ESXi installer CD/DVD into the CD/DVD-ROM drive, or attach the Installer USB flash drive and restart the machine.
2 Set the BIOS to boot from the CD-ROM device or the USB flash drive. See your hardware vendor documentation for information on changing boot order.

3 On the Select a Disk page, select the drive on which to install ESXi, and press Enter. Press F1 for information about the selected disk.

**Note** Do not rely on the disk order in the list to select a disk. The disk order is determined by the BIOS and might be out of order. This might occur on systems where drives are continuously being added and removed.

If you select a disk that contains data, the Confirm Disk Selection page appears.

If you are installing on a disc with a previous ESXi or ESX installation or VMFS datastore, the installer provides several choices.

**Important** If you are upgrading or migrating an existing ESXi installation, see the *VMware ESXi Upgrade* documentation.

If you select a disk that is in vSAN disk group, the resulting installation depends on the type of disk and the group size:

- **If you select an SSD**, the SSD and all underlying HDDs in the same disk group are wiped.
- **If you select an HDD**, and the disk group size is greater than two, only the selected HDD is wiped.
- **If you select an HDD disk**, and the disk group size is two or less, the SSD and the selected HDD is wiped.

For more information about managing vSAN disk groups, see the *vSphere Storage* documentation.

4 Select the keyboard type for the host.

You can change the keyboard type after installation in the direct console.

5 Enter the root password for the host.

You can change the password after installation in the direct console.

6 Press Enter to start the installation.

7 When the installation is complete, remove the installation CD, DVD, or USB flash drive.

8 Press Enter to reboot the host.

If you are performing a new installation, or you chose to overwrite an existing VMFS datastore, during the reboot operation, VFAT scratch, and VMFS partitions are created on the host disk.

9 Set the first boot device to be the drive on which you installed ESXi in Step 3.

For information about changing boot order, see your hardware vendor documentation.

**Note** UEFI systems might require additional steps to set the boot device. See *Host Fails to Boot After You Install ESXi in UEFI Mode*
After the installation is complete, you can migrate existing VMFS data to the ESXi host.

You can boot a single machine from each ESXi image. Booting multiple devices from a single shared ESXi image is not supported.

**What to do next**

Set up basic administration and network configuration for ESXi. See [After You Install and Set Up ESXi](#).

**Install ESXi on a Software iSCSI Disk**

When you install ESXi to a software iSCSI disk, you must configure the target iSCSI qualified name (IQN).

During system boot, the system performs a Power-On Self Test (POST), and begins booting the adapters in the order specified in the system BIOS. When the boot order comes to the iSCSI Boot Firmware Table (iBFT) adapter, the adapter attempts to connect to the target, but does not boot from it. See Prerequisites.

If the connection to the iSCSI target is successful, the iSCSI boot firmware saves the iSCSI boot configuration in the iBFT. The next adapter to boot must be the ESXi installation media, either a mounted ISO image or a physical CD-ROM.

**Prerequisites**

- Verify that the target IQN is configured in the iBFT BIOS target parameter setting. This setting is in the option ROM of the network interface card (NIC) to be used for the iSCSI LUN. See the vendor documentation for your system.

- Disable the iBFT adapter option to boot to the iSCSI target. This action is necessary to make sure that the ESXi installer boots, rather than the iSCSI target. When you start your system, follow the prompt to log in to your iBFT adapter and disable the option to boot to the iSCSI target. See the vendor documentation for your system and iBFT adapter. After you finish the ESXi installation, you can reenable the option to boot from the LUN you install ESXi on.

**Procedure**

1. Start an interactive installation from the ESXi installation CD/DVD or mounted ISO image.

2. On the Select a Disk screen, select the iSCSI target you specified in the iBFT BIOS target parameter setting.

   If the target does not appear in this menu, make sure that the TCP/IP and initiator iSCSI IQN settings are correct. Check the network Access Control List (ACL) and confirm that the adapter has adequate permissions to access the target.

3. Follow the prompts to complete the installation.

4. Reboot the host.

5. In the host BIOS settings, enter the iBFT adapter BIOS configuration, and change the adapter parameter to boot from the iSCSI target.

   See the vendor documentation for your system.
What to do next

On your iBFT adapter, reenable the option to boot to the iSCSI target, so the system will boot from the LUN you installed ESXi on.

Installing or Upgrading Hosts by Using a Script

You can quickly deploy ESXi hosts by using scripted, unattended installations or upgrades. Scripted installations or upgrades provide an efficient way to deploy multiple hosts.

The installation or upgrade script contains the installation settings for ESXi. You can apply the script to all hosts that you want to have a similar configuration.

For a scripted installation or upgrade, you must use the supported commands to create a script. You can edit the script to change settings that are unique for each host.

The installation or upgrade script can reside in one of the following locations:

- FTP server
- HTTP/HTTPS server
- NFS server
- USB flash drive
- CD-ROM drive

Approaches for Scripted Installation

You can install ESXi on multiple machines using a single script for all of them or a separate script for each machine.

For example, because disk names vary from machine to machine, one of the settings that you might want to configure in a script is the selection for the disk to install ESXi on.

Table 5-11. Scripted Installation Choices

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always install on the first disk on multiple machines.</td>
<td>Create one script.</td>
</tr>
<tr>
<td>Install ESXi on a different disk for each machine.</td>
<td>Create multiple scripts.</td>
</tr>
</tbody>
</table>

For information about the commands required to specify the disk to install on, see Installation and Upgrade Script Commands.

Enter Boot Options to Start an Installation or Upgrade Script

You can start an installation or upgrade script by typing boot options at the ESXi installer boot command line.

At boot time you might need to specify options to access the kickstart file. You can enter boot options by pressing Shift+O in the boot loader. For a PXE boot installation, you can pass options through the kernelopts line of the boot.cfg file. See About the boot.cfg File and PXE Booting the ESXi Installer.
To specify the location of the installation script, set the `ks=filepath` option, where `filepath` is indicates the location of your Kickstart file. Otherwise, a scripted installation or upgrade cannot start. If `ks=filepath` is omitted, the text installer is run.

Supported boot options are listed in **Boot Options**.

**Procedure**

1. Start the host.
2. When the ESXi installer window appears, press Shift+O to edit boot options.

3. At the `runweasel` command prompt, type
   
   ```
   ks=location of installation script plus boot command-line options.
   ```

**Example: Boot Option**

You type the following boot options:

```plaintext
ks=http://00.00.00.00/kickstart/ks-osdc-pdp101.cfg nameserver=00.00.0.0 ip=00.00.00.000 netmask=255.255.255.0 gateway=00.00.00.000
```

**Boot Options**

When you perform a scripted installation, you might need to specify options at boot time to access the kickstart file.

**Supported Boot Options**

**Table 5-12. Boot Options for ESXi Installation**

<table>
<thead>
<tr>
<th>Boot Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>BOOTIF=hwtype-MAC address</code></td>
<td>Similar to the <code>netdevice</code> option, except in the PXELINUX format as described in the <code>IPAPPEND</code> option under SYSLINUX at the syslinux.zytor.com site.</td>
</tr>
<tr>
<td><code>gateway=ip address</code></td>
<td>Sets this network gateway as the default gateway to be used for downloading the installation script and installation media.</td>
</tr>
<tr>
<td><code>ip=ip address</code></td>
<td>Sets up a static IP address to be used for downloading the installation script and the installation media. Note: the PXELINUX format for this option is also supported. See the <code>IPAPPEND</code> option under SYSLINUX at the syslinux.zytor.com site.</td>
</tr>
<tr>
<td>Boot Option</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ks=cdrom:/path</td>
<td>Performs a scripted installation with the script at path, which resides on the CD in the CD-ROM drive. Each CDROM is mounted and checked until the file that matches the path is found.</td>
</tr>
<tr>
<td></td>
<td><strong>Important</strong> If you have created an installer ISO image with a custom installation or upgrade script, you must use uppercase characters to provide the path of the script, for example, ks=cdrom:/KS_CUST.CFG.</td>
</tr>
<tr>
<td>ks=file://path</td>
<td>Performs a scripted installation with the script at path.</td>
</tr>
<tr>
<td>ks=protocol://serverpath</td>
<td>Performs a scripted installation with a script located on the network at the given URL. protocol can be http, https, ftp, or nfs. An example using nfs protocol is ks=nfs://host/porturl-path. The format of an NFS URL is specified in RFC 2224.</td>
</tr>
<tr>
<td>ks=usb</td>
<td>Performs a scripted installation, accessing the script from an attached USB drive. Searches for a file named ks.cfg. The file must be located in the root directory of the drive. If multiple USB flash drives are attached, they are searched until the ks.cfg file is found. Only FAT16 and FAT32 file systems are supported.</td>
</tr>
<tr>
<td>ks=usb:/path</td>
<td>Performs a scripted installation with the script file at the specified path, which resides on USB.</td>
</tr>
<tr>
<td>ksdevice=device</td>
<td>Tries to use a network adapter device when looking for an installation script and installation media. Specify as a MAC address, for example, 00:50:56:C0:00:01. This location can also be a vmnicNN name. If not specified and files need to be retrieved over the network, the installer defaults to the first discovered network adapter that is plugged in.</td>
</tr>
<tr>
<td>nameserver=ip address</td>
<td>Specifies a domain name server to be used for downloading the installation script and installation media.</td>
</tr>
<tr>
<td>netdevice=device</td>
<td>Tries to use a network adapter device when looking for an installation script and installation media. Specify as a MAC address, for example, 00:50:56:C0:00:01. This location can also be a vmnicNN name. If not specified and files need to be retrieved over the network, the installer defaults to the first discovered network adapter that is plugged in.</td>
</tr>
<tr>
<td>netmask=subnet mask</td>
<td>Specifies subnet mask for the network interface that downloads the installation script and the installation media.</td>
</tr>
<tr>
<td>vlanid=vlanid</td>
<td>Configure the network card to be on the specified VLAN.</td>
</tr>
</tbody>
</table>

**About Installation and Upgrade Scripts**

The installation/upgrade script is a text file, for example ks.cfg, that contains supported commands.

The command section of the script contains the ESXi installation options. This section is required and must appear first in the script.
About the Default ks.cfg Installation Script

The ESXi installer includes a default installation script that performs a standard installation to the first detected disk.

The default ks.cfg installation script is located in the initial RAM disk at /etc/vmware/weasel/ks.cfg. You can specify the location of the default ks.cfg file with the ks=file://etc/vmware/weasel/ks.cfg boot option. See Enter Boot Options to Start an Installation or Upgrade Script.

When you install ESXi using the ks.cfg script, the default root password is myp@ssw0rd.

You cannot modify the default script on the installation media. After the installation, you can use the vSphere Web Client to log in to the vCenter Server that manages the ESXi host and modify the default settings.

The default script contains the following commands:

```
# Sample scripted installation file
#

# Accept the VMware End User License Agreement
vmaccepteula

# Set the root password for the DCUI and Tech Support Mode
rootpw myp@ssw0rd

# Install on the first local disk available on machine
install --firstdisk --overwritevmfs

# Set the network to DHCP on the first network adapter
network --bootproto=dhcp --device=vmnic0

# A sample post-install script
%post --interpreter=python --ignorefailure=true
import time
stampFile = open('/finished.stamp', mode='w')
stampFile.write(time.asctime())
```

Locations Supported for Installation or Upgrade Scripts

In scripted installations and upgrades, the ESXi installer can access the installation or upgrade script, also called the kickstart file, from several locations.

The following locations are supported for the installation or upgrade script:

- CD/DVD. See Create an Installer ISO Image with a Custom Installation or Upgrade Script.
- USB Flash drive. See Create a USB Flash Drive to Store the ESXi Installation Script or Upgrade Script.
- A network location accessible through the following protocols: NFS, HTTP, HTTPS, FTP
Path to the Installation or Upgrade Script
You can specify the path to an installation or upgrade script.

ks=http://XXX.XXX.XXX.XXX/kickstart/KS.CFG is the path to the ESXi installation script, where XXX.XXX.XXX.XXX is the IP address of the machine where the script resides. See About Installation and Upgrade Scripts.

To start an installation script from an interactive installation, you enter the ks= option manually. See Enter Boot Options to Start an Installation or Upgrade Script.

Installation and Upgrade Script Commands
To modify the default installation or upgrade script or to create your own script, use supported commands. Use supported commands in the installation script, which you specify with a boot command when you boot the installer.

To determine which disk to install or upgrade ESXi on, the installation script requires one of the following commands: install, upgrade, or installorupgrade. The install command creates the default partitions, including a VMFS datastore that occupies all available space after the other partitions are created.

accepteula or vmaccepteula (required)
Accepts the ESXi license agreement.

clearpart (optional)
Clears any existing partitions on the disk. Requires the install command to be specified. Carefully edit the clearpart command in your existing scripts.

--drives= Remove partitions on the specified drives.
--alldrives Ignores the --drives= requirement and allows clearing of partitions on every drive.
--ignoredrives= Removes partitions on all drives except those specified. Required unless the --drives= or --alldrives flag is specified.
--overwritevmfs Allows overwriting of VMFS partitions on the specified drives. By default, overwriting VMFS partitions is not allowed.
--firstdisk= disk-type1
   [disk-type2,...] Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

   1 Locally attached storage (local)
   2 Network storage (remote)
   3 USB disks (usb)
You can change the order of the disks by using a comma-separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including esx for the first disk with ESXi installed on it, model and vendor information, or the name of the VMkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is

```--firstdisk=ST3120814A,mptsas,local```

You can use localesx for local storage that contains ESXi image or remoteesx for remote storage that contains ESXi image.

dryrun (optional)

Parses and checks the installation script. Does not perform the installation.

install

Specifies that this is a fresh installation. Replaces the deprecated autopart command used for ESXi 4.1 scripted installations. Either the install, upgrade, or installorupgrade command is required to determine which disk to install or upgrade ESXi on.

```--disk= or --drive=```

Specifies the disk to partition. In the command `--disk=diskname`, the `diskname` can be in any of the forms shown in the following examples:

- Path: `--disk=/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0`
- MPX name: `--disk=mpx.vmhba1:C0:T0:L0`
- VML name: `--disk=vm1.000000034211234`
- vmkLUN UID: `--disk=vmkLUN_UID`

For accepted disk name formats, see Disk Device Names.

```--firstdisk=```

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1. Locally attached storage (local)
2. Network storage (remote)
3. USB disks (usb)

You can change the order of the disks by using a comma-separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including esx for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas
driver rather than a normal local disk, the argument is
--firstdisk=ST3120814A,mptsas,local. You can use localesx for
local storage that contains ESXi image or remotesesx for remote storage
that contains ESXi image.

--ignoressd
Excludes solid-state disks from eligibility for partitioning. This option can be
used with the install command and the --firstdisk option. This option
takes precedence over the --firstdisk option. This option is invalid with
the --drive or --disk options and with the upgrade and
installorupgrade commands. See the vSphere Storage documentation
for more information about preventing SSD formatting during auto-
partitioning.

--overwritevsan
You must use the --overwritevsan option when you install ESXi on a
disk, either SSD or HDD (magnetic), that is in a vSAN disk group. If you
use this option and no vSAN partition is on the selected disk, the
installation will fail. When you install ESXi on a disk that is in vSAN disk
group, the result depends on the disk that you select:

- If you select an SSD, the SSD and all underlying HDDs in the same
disk group will be wiped.
- If you select an HDD, and the disk group size is greater than two, only
  the selected HDD will be wiped.
- If you select an HDD disk, and the disk group size is two or less, the
  SSD and the selected HDD will be wiped.

For more information about managing vSAN disk groups, see the vSphere
Storage documentation.

--overwritevmfs
Required to overwrite an existing VMFS datastore on the disk before
installation.

--preservevmfs
Preserves an existing VMFS datastore on the disk during installation.

--novmfsondisk
Prevents a VMFS partition from being created on this disk. Must be used
with --overwritevmfs if a VMFS partition already exists on the disk.

installorupgrade
Either the install, upgrade, or installorupgrade command is required to determine which disk to
install or upgrade ESXi on.

--disk= or --drive=
Specifies the disk to partition. In the command --disk=\diskname, the
\diskname can be in any of the forms shown in the following examples:

- Path: --disk=/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0
- MPX name: --disk=mpx.vmhba1:C0:T0:L0
VML name: --disk=vml.000000034211234
vmkLUN UID: --disk=vmkLUN_UID

For accepted disk name formats, see Disk Device Names.

--firstdisk=
disk-type1, [disk-type2,...]

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (local)
2 Network storage (remote)
3 USB disks (usb)

You can change the order of the disks by using a comma-separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including esx for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is

--firstdisk=ST3120814A,mptsas,local. You can use localesx for local storage that contains ESXi image or remoteesx for remote storage that contains ESXi image.

--overwritevsan

You must use the --overwritevsan option when you install ESXi on a disk, either SSD or HDD (magnetic), that is in a vSAN disk group. If you use this option and no vSAN partition is on the selected disk, the installation will fail. When you install ESXi on a disk that is in a vSAN disk group, the result depends on the disk that you select:

- If you select an SSD, the SSD and all underlying HDDs in the same disk group will be wiped.
- If you select an HDD, and the disk group size is greater than two, only the selected HDD will be wiped.
- If you select an HDD disk, and the disk group size is two or less, the SSD and the selected HDD will be wiped.

For more information about managing vSAN disk groups, see the vSphere Storage documentation.

--overwritevmfs

Install ESXi if a VMFS partition exists on the disk, but no ESX or ESXi installation exists. Unless this option is present, the installer will fail if a VMFS partition exists on the disk, but no ESX or ESXi installation exists.
keyboard (optional)

Sets the keyboard type for the system.

`keyboardType` Specifies the keyboard map for the selected keyboard type. `keyboardType` must be one of the following types.

- Belgian
- Brazilian
- Croatian
- Czechoslovakian
- Danish
- Estonian
- Finnish
- French
- German
- Greek
- Icelandic
- Italian
- Japanese
- Latin American
- Norwegian
- Polish
- Portuguese
- Russian
- Slovenian
- Spanish
- Swedish
- Swiss French
- Swiss German
- Turkish
- Ukrainian
- United Kingdom
- US Default
serialnum or vmserialnum (optional)

Deprecated in ESXi 5.0.x. Supported in ESXi 5.1 and later. Configures licensing. If not included, ESXi installs in evaluation mode.

```
--esx=<license-key>
```

Specifies the vSphere license key to use. The format is 5 five-character groups (XXXXX-XXXXX-XXXXX-XXXXX-XXXXX).

network (optional)

Specifies a network address for the system.

```
--bootproto=[dhcp|static]
--device=
--ip=
--gateway=
--nameserver=
--netmask=
--hostname=
--vlanid= vlanid
--addvmportgroup=(0|1)
```

Specifies whether to obtain the network settings from DHCP or set them manually.

Specifies either the MAC address of the network card or the device name, in the form vmnicNN, as in vmnic0. This options refers to the uplink device for the virtual switch.

Sets an IP address for the machine to be installed, in the form xxx.xxx.xxx.xxx. Required with the `--bootproto=static` option and ignored otherwise.

Designates the default gateway as an IP address, in the form xxx.xxx.xxx.xxx. Used with the `--bootproto=static` option.

Designates the primary name server as an IP address. Used with the `--bootproto=static` option. Omit this option if you do not intend to use DNS.

The `--nameserver` option can accept two IP addresses. For example: `--nameserver="10.126.87.104[,10.126.87.120]"`

Specifies the subnet mask for the installed system, in the form 255.xxx.xxx.xxx. Used with the `--bootproto=static` option.

Specifies the host name for the installed system.

Specifies which VLAN the system is on. Used with either the `--bootproto=static` option. Set to an integer from 1 to 4096.

Specifies whether to add the VM Network port group, which is used by virtual machines. The default value is 1.

paranoid (optional)

Causes warning messages to interrupt the installation. If you omit this command, warning messages are logged.
part or partition (optional)

Creates an additional VMFS datastore on the system. Only one datastore per disk can be created. Cannot be used on the same disk as the install command. Only one partition can be specified per disk and it can only be a VMFS partition.

datastore name

Specifies where the partition is to be mounted.

--ondisk= or --ondrive=

Specifies the disk or drive where the partition is created.

--firstdisk=

disk-type1,

disk-type2,...]

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (local)
2 Network storage (remote)
3 USB disks (usb)

You can change the order of the disks by using a comma-separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including esx for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is --firstdisk=ST3120814A,mptsas,local. You can use localesx for local storage that contains ESXi image or remoteesx for remote storage that contains ESXi image.

reboot (optional)

Reboots the machine after the scripted installation is complete.

<--noeject>  The CD is not ejected after the installation.

rootpw (required)

Sets the root password for the system.

--iscrypted

Specifies that the password is encrypted.

password

Specifies the password value.
upgrade

Either the install, upgrade, or install or upgrade command is required to determine which disk to install or upgrade ESXi on.

`--disk=` or `--drive=`

Specifies the disk to partition. In the command `--disk=\text{diskname}`, the \text{diskname} can be in any of the forms shown in the following examples:

- Path: `--disk=/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0`
- MPX name: `--disk=mpx.vmhba1:C0:T0:L0`
- VML name: `--disk=vm1.000000034211234`
- vmkLUN UID: `--disk=vmkLUN_UID`

For accepted disk name formats, see Disk Device Names.

`--firstdisk=`

disk-type1, [disk-type2, ...]

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1. Locally attached storage (local)
2. Network storage (remote)
3. USB disks (usb)

You can change the order of the disks by using a comma-separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including esx for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`. You can use localesx for local storage that contains ESXi image or remoteesx for remote storage that contains ESXi image.

%include or include (optional)

Specifies another installation script to parse. This command is treated similarly to a multiline command, but takes only one argument.

`filename`

For example: `%include part.cfg`

%pre (optional)

Specifies a script to run before the kickstart configuration is evaluated. For example, you can use it to generate files for the kickstart file to include.

`--interpreter = [python|busybox]`

Specifies an interpreter to use. The default is busybox.
%post (optional)

Runs the specified script after package installation is complete. If you specify multiple %post sections, they run in the order that they appear in the installation script.

---interpreter Specifies an interpreter to use. The default is busybox.
=python|busybox

---timeout=secs Specifies a timeout for running the script. If the script is not finished when the timeout expires, the script is forcefully terminated.

---ignorefailure If true, the installation is considered a success even if the %post script terminated with an error.
=true|false

%firstboot

Creates an init script that runs only during the first boot. The script has no effect on subsequent boots. If multiple %firstboot sections are specified, they run in the order that they appear in the kickstart file.

Note You cannot check the semantics of %firstboot scripts until the system is booting for the first time. A %firstboot script might contain potentially catastrophic errors that are not exposed until after the installation is complete.

---interpreter Specifies an interpreter to use. The default is busybox.
=python|busybox

Note You cannot check the semantics of the %firstboot script until the system boots for the first time. If the script contains errors, they are not exposed until after the installation is complete.

Disk Device Names

The install, upgrade, and installorupgrade installation script commands require the use of disk device names.

Table 5-13. Disk Device Names

<table>
<thead>
<tr>
<th>Format</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VML</td>
<td>vml.00025261</td>
<td>The device name as reported by the VMkernel</td>
</tr>
<tr>
<td>MPX</td>
<td>mpx.vmhba0:C0:T0:L0</td>
<td>The device name</td>
</tr>
</tbody>
</table>

About the boot.cfg File

The boot loader configuration file boot.cfg specifies the kernel, the kernel options, and the boot modules that the mboot.c32 or mboot.efi boot loader uses in an ESXi installation.

The boot.cfg file is provided in the ESXi installer. You can modify the kernelopt line of the boot.cfg file to specify the location of an installation script or to pass other boot options.
The boot.cfg file has the following syntax:

```
# boot.cfg -- mboot configuration file
#
# Any line preceded with '#' is a comment.

title=STRING
prefix=DIRPATH
kernel=FILEPATH
kernelopt=STRING
modules=FILEPATH1 --- FILEPATH2... --- FILEPATHn

# Any other line must remain unchanged.
```

The commands in boot.cfg configure the boot loader.

**Table 5.14. Commands in boot.cfg.**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>title=STRING</td>
<td>Sets the boot loader title to STRING.</td>
</tr>
<tr>
<td>prefix=STRING</td>
<td>(Optional) Adds DIRPATH/ in front of every FILEPATH in the kernel= and modules= commands that do not already start with / or with http://.</td>
</tr>
<tr>
<td>kernel=FILEPATH</td>
<td>Sets the kernel path to FILEPATH.</td>
</tr>
<tr>
<td>kernelopt=STRING</td>
<td>Appends STRING to the kernel boot options.</td>
</tr>
<tr>
<td>modules=FILEPATH1 --- FILEPATH2... --- FILEPATHn</td>
<td>Lists the modules to be loaded, separated by three hyphens (---).</td>
</tr>
</tbody>
</table>

See Create an Installer ISO Image with a Custom Installation or Upgrade Script and PXE Booting the ESXi Installer.

**Install or Upgrade ESXi from a CD or DVD by Using a Script**

You can install or upgrade ESXi from a CD-ROM or DVD-ROM drive by using a script that specifies the installation or upgrade options.

You can start the installation or upgrade script by entering a boot option when you start the host. You can also create an installer ISO image that includes the installation script. With an installer ISO image, you can perform a scripted, unattended installation when you boot the resulting installer ISO image. See Create an Installer ISO Image with a Custom Installation or Upgrade Script.

**Prerequisites**

Before you run the scripted installation or upgrade, verify that the following prerequisites are met:

- The system on which you are installing or upgrading meets the hardware requirements. See ESXi Hardware Requirements.
- You have the ESXi installer ISO on an installation CD or DVD. See Download and Burn the ESXi Installer ISO Image to a CD or DVD.
The default installation or upgrade script (ks.cfg) or a custom installation or upgrade script is accessible to the system. See About Installation and Upgrade Scripts.

You have selected a boot command to run the scripted installation or upgrade. See Enter Boot Options to Start an Installation or Upgrade Script. For a complete list of boot commands, see Boot Options.

**Procedure**

1. Boot the ESXi installer from the local CD-ROM or DVD-ROM drive.
2. When the ESXi installer window appears, press Shift+O to edit boot options.
3. Type a boot option that calls the default installation or upgrade script or an installation or upgrade script file that you created.
   
   The boot option has the form `ks=`.
4. Press Enter.

The installation, upgrade, or migration runs, using the options that you specified.

**Install or Upgrade ESXi from a USB Flash Drive by Using a Script**

You can install or upgrade ESXi from a USB flash drive by using a script that specifies the installation or upgrade options.

Supported boot options are listed in Boot Options.

**Prerequisites**

Before running the scripted installation or upgrade, verify that the following prerequisites are met:

- The system that you are installing or upgrading to ESXi meets the hardware requirements for the installation or upgrade. See ESXi Hardware Requirements.
- You have the ESXi installer ISO on a bootable USB flash drive. See Format a USB Flash Drive to Boot the ESXi Installation or Upgrade.
- The default installation or upgrade script (ks.cfg) or a custom installation or upgrade script is accessible to the system. See About Installation and Upgrade Scripts.
You have selected a boot option to run the scripted installation, upgrade, or migration. See Enter Boot Options to Start an Installation or Upgrade Script.

**Procedure**

1. Boot the ESXi installer from the USB flash drive.
2. When the ESXi installer window appears, press Shift+O to edit boot options.

3. Type a boot option that calls the default installation or upgrade script or an installation or upgrade script file that you created.

   The boot option has the form `ks=`.

4. Press Enter.

The installation, upgrade, or migration runs, using the options that you specified.

**Performing a Scripted Installation or Upgrade of ESXi by Using PXE to Boot the Installer**

ESXi 6.7 provides many options for using PXE to boot the installer and using an installation or upgrade script.

- For information about setting up a PXE infrastructure, see PXE Booting the ESXi Installer.
- For information about creating and locating an installation script, see About Installation and Upgrade Scripts.
- For specific procedures to use PXE to boot the ESXi installer and use an installation script, see one of the following topics:
  - PXE Boot the ESXi Installer Using a Web Server
  - PXE Boot the ESXi Installer Using TFTP
- For information about using vSphere Auto Deploy to perform a scripted installation by using PXE to boot, see Installing ESXi Using vSphere Auto Deploy.

**PXE Booting the ESXi Installer**

You can use the preboot execution environment (PXE) to boot a host. Starting with vSphere 6.0, you can PXE boot the ESXi installer from a network interface on hosts with legacy BIOS or using UEFI.
ESXi is distributed in an ISO format that is designed to install to flash memory or to a local hard drive. You can extract the files and boot by using PXE.

PXE uses Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) to boot an operating system over a network.

PXE booting requires some network infrastructure and a machine with a PXE-capable network adapter. Most machines that can run ESXi have network adapters that can PXE boot.

**Note** PXE booting with legacy BIOS firmware is possible only over IPv4. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.

**Overview of the PXE Boot Installation Process**

Some of the details of the PXE boot process vary depending on whether the target host is using legacy BIOS or UEFI firmware, and whether the boot process uses TFTP only or TFTP plus HTTP.

When you boot the target host, it interacts with the different servers in the environment to get the network adapter, boot loader, kernel, IP address for the kernel, and finally the installation script. When all components are in place, installation starts, as shown in the following illustration.
The interaction between the ESXi host and other servers proceeds as follows:

1. The user boots the target ESXi host.
2. The target ESXi host makes a DHCP request.
3. The DHCP server responds with the IP information and the location of the TFTP server.
4. The ESXi host contacts the TFTP server and requests the file that the DHCP server specified.
5. The TFTP server sends the network boot loader, and the ESXi host executes it. The initial boot loader might load additional boot loader components from the TFTP server.
6. The boot loader searches for a configuration file on the TFTP server, downloads the kernel and other ESXi components from the HTTP server or the TFTP server and boots the kernel on the ESXi host.
7. The installer runs interactively or using a kickstart script, as specified in the configuration file.
PXE Boot the ESXi Installer Using TFTP

You can use a TFTP server to PXE boot the ESXi installer. The process differs slightly depending on whether you use UEFI or boot from a legacy BIOS. Because most environments include ESXi hosts that support UEFI boot and hosts that support only legacy BIOS, this topic discusses prerequisites and steps for both types of hosts.

- For legacy BIOS machines, the procedure supports booting multiple different versions of the ESXi installer by using the same `pxelinux.0` or `gpxelinux.0` initial boot loader for all target machines, but potentially different PXELINUX configuration files depending on the target machine's MAC address.
- For UEFI machines, the procedure supports booting multiple different versions of the ESXi installer by using the same `mboot.efi` initial boot loader for all target machines, but potentially different `boot.cfg` files depending on the target machine's MAC address.

Prerequisites

Verify that your environment meets the following prerequisites.

- ESXi installer ISO image, downloaded from the VMware Web site.
- Target host with a hardware configuration that is supported for your version of ESXi. See the VMware Compatibility Guide.
- Network adapter with PXE support on the target ESXi host.
- DHCP server configured for PXE booting. See Sample DHCP Configurations.
- TFTP server.
- Network security policies to allow TFTP traffic (UDP port 69).
- For legacy BIOS, you can use only IPv4 networking. For UEFI PXE boot, you can use IPv4 or IPv6 networking.
- (Optional) Installation script (kickstart file).
- Use a native VLAN in most cases. If you want to specify the VLAN ID to be used with PXE booting, check that your NIC supports VLAN ID specification.


Procedure

1. Configure the DHCP server for TFTP boot.
2  (Legacy BIOS only) Obtain and configure PXELINUX:
   a  Obtain SYSLINUX version 3.86, unpack it, and copy the pxelinux.0 file to the top-level /tftpboot directory on your TFTP server.
   b  Create a PXELINUX configuration file using the following code model.

```
ESXi-6.x.x-XXXXXX is the name of the TFTP subdirectory that contains the ESXi installer files.

DEFAULT install
NOHALT 1
LABEL install
   KERNEL ESXi-6.x.x-XXXXXX/mboot.c32
   APPEND -c ESXi-6.x.x-XXXXXX/boot.cfg
   IPAPPEND 2
```
   c  Save the PXELINUX file in the /tftpboot/pxelinux.cfg directory on your TFTP server with a filename that will determine whether all hosts boot this installer by default:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same installer</td>
<td>Name the file default if you want for all host to boot this ESXi installer by default.</td>
</tr>
<tr>
<td>Different installers</td>
<td>Name the file with the MAC address of the target host machine (01-mac_address_of_target_ESXi_host) if you want only a specific host to boot with this file, for example, 01-23-45-67-89-0a-bc.</td>
</tr>
</tbody>
</table>

3  (UEFI only) Copy the file /efi/boot/bootx64.efi from the ESXi installer ISO image to /tftpboot/mboot.efi on your TFTP server.

**Note**  Newer versions of mboot.efi can generally boot older versions of ESXi, but older versions of mboot.efi might be unable to boot newer versions of ESXi. If you plan to configure different hosts to boot different versions of the ESXi installer, use the mboot.efi from the newest version.

4  Create a subdirectory of your TFTP server's top-level /tftpboot directory and name it after the version of ESXi it will hold, for example, /tftpboot/ESXi-6.x.x-xxxxxx.

5  Copy the contents of the ESXi installer image to the directory you just created.

6  Modify the boot.cfg file
   a  Add the following line:

```
prefix=ESXi-6.x.x-xxxxxx
```

Here, ESXi-6.x.x-xxxxxx is the pathname of the installer files relative to the TFTP server's root directory.
   b  If the filenames in the kernel= and modules= lines begin with a forward slash (/) character, delete that character.
(Optional) For a scripted installation, in the boot.cfg file, add the kernelopt option to the line after the kernel command, to specify the location of the installation script.

Use the following code as a model, where XXX.XXX.XXX.XXX is the IP address of the server where the installation script resides, and esxi_ksFiles is the directory that contains the ks.cfg file.

```
kernelopt=ks=http://XXX.XXX.XXX.XXX/esxi_ksFiles/ks.cfg
```

(UEFI only) Specify whether you want for all UEFI hosts to boot the same installer.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same installer</td>
<td>Copy or link the boot.cfg file to /tftpboot/boot.cfg</td>
</tr>
<tr>
<td>Different installers</td>
<td>a Create a subdirectory of /tftpboot named after the MAC address of the target host machine (01-mac_address_of_target_ESXi_host), for example, 01-23-45-67-89-0a-bc.</td>
</tr>
<tr>
<td></td>
<td>b Place a copy of (or a link to) the host's boot.cfg file in that directory, for example, /tftpboot/01-23-45-67-89-0a-bc/boot.cfg.</td>
</tr>
</tbody>
</table>

PXE Boot the ESXi Installer Using a Web Server

You can use a Web server to PXE boot the ESXi installer. Because most environments include ESXi hosts that support UEFI boot and hosts that support only legacy BIOS, this topic discusses prerequisites and steps for both types of hosts.

- For legacy BIOS machines, the procedure supports booting multiple different versions of the ESXi installer by using the same pxelinux.0 or gpxelinux.0 initial boot loader for all target machines, but potentially different PXELINUX configuration files depending on the target machine's MAC address.

- For UEFI machines, the procedure supports booting multiple different versions of the ESXi installer by using the same nboot.efi initial boot loader for all target machines, but potentially different boot.cfg files depending on the target machine's MAC address.

Prerequisites

Verify that your environment has the following components:

- ESXi installer ISO image, downloaded from the VMware Web site.
- Target host with a hardware configuration that is supported for your version of ESXi. See the VMware Compatibility Guide.
- Network adapter with PXE support on the target ESXi host.
- DHCP server configured for PXE booting. See Sample DHCP Configurations.
- TFTP server.
- Network security policies to allow TFTP traffic (UDP port 69).
- For legacy BIOS, you can use only IPv4 networking. For UEFI PXE boot, you can use IPv4 or IPv6 networking.
(Optional) Installation script (kickstart file).

Use a native VLAN in most cases. If you want to specify the VLAN ID to be used with PXE booting, check that your NIC supports VLAN ID specification.

Verify that your environment also meets the following prerequisites required for PXE boot using a Web Server:

- Verify that the HTTP Web server is accessible by your target ESXi hosts.

Procedure

1. Configure the DHCP server for HTTP boot.

2. (UEFI only) Obtain and configure iPXE:
   a. Obtain the iPXE source code, as described at http://ipxe.org/download.
   b. Follow the instructions on that page, but use the following make command:
      ```
      make bin-x86_64-efi/snponly.efi
      ```
   c. Copy the resulting file `snponly.efi` to `/tftpboot` directory on your TFTP server.

3. (UEFI only) Copy the file `efi/boot/bootx64.efi` from the ESXi installer ISO image to `/tftpboot/mboot.efi` on your TFTP server.

   **Note** Newer versions of `mboot.efi` can generally boot older versions of ESXi, but older versions of `mboot.efi` might be unable to boot newer versions of ESXi. If you plan to configure different hosts to boot different versions of the ESXi installer, use the `mboot.efi` from the newest version.
4 (Legacy BIOS only) Obtain and configure PXELINUX:
   a Obtain SYSLINUX version 3.86, unpack it, and copy the gpxelinux.0 file to the top-
      level /tftpboot directory on your TFTP server.
   b Create a PXELINUX configuration file using the following code model.

      ESXi-6.x.x-XXXXXX is the name of the TFTP subdirectory that contains the ESXi installer files.

      DEFAULT install
      NOHALT 1
      LABEL install
         KERNEL ESXi-6.x.x-XXXXXX/mboot.c32
         APPEND -c ESXi-6.x.x-XXXXXX/boot.cfg
         IPAPPEND 2

   c Save the PXELINUX file in the /tftpboot/pxelinux.cfg directory on your TFTP server with a
      filename that will determine whether all hosts boot this installer by default:

      | Option          | Description                                                                 |
      |-----------------|------------------------------------------------------------------------------|
      | Same installer  | Name the file default if you want for all host to boot this ESXi installer by |
      | Different installers | Name the file with the MAC address of the target host machine (01- | default.                        |
                      | mac_address_of_target_ESXi_host) if you want only a specific host to boot   |
                      | with this file, for example, 01-23-45-67-89-0a-bc.                           |

5 Create a directory on your HTTP server named for the version of ESXi it will hold, for
   example, /var/www/html/ESXi-6.x.x-XXXXXX.

6 Copy the contents of the ESXi installer image to the directory you just created.

7 Modify the boot.cfg file
   a Add the following line:

      prefix=http://XXX.XXX.XXX.XXX/ESXi-6.x.x-XXXXXX

      where http://XXX.XXX.XXX.XXX/ESXi-6.x.x-XXXXXX is the location of the installer files on
      the HTTP server.
   b If the filenames in the kernel= and modules= lines begin with a forward slash (/) character,
      delete that character.

8 (Optional) For a scripted installation, in the boot.cfg file, add the kernelopt option to the line after
   the kernel command, to specify the location of the installation script.

   Use the following code as a model, where XXX.XXX.XXX.XXX is the IP address of the server where
   the installation script resides, and esxi_ksFiles is the directory that contains the ks.cfg file.

   kernelopt=ks=http://XXX.XXX.XXX.XXX/esxi_ksFiles/ks.cfg
9  (UEFI only) Specify whether you want for all UEFI hosts to boot the same installer.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same installer</td>
<td>Copy or link the boot.cfg file to /tftpboot/boot.cfg</td>
</tr>
</tbody>
</table>
| Different installers | a Create a subdirectory of /tftpboot named after the MAC address of the target host machine (01-mac_address_of_target_ESXi_host), for example, 01-23-45-67-89-0a-bc.  
                      | b Place a copy of (or a link to) the host's boot.cfg file in that directory, for example, /tftpboot/01-23-45-67-89-0a-bc/boot.cfg. |

**Installing ESXi Using vSphere Auto Deploy**

vSphere Auto Deploy lets you provision hundreds of physical hosts with ESXi software.

Using Auto Deploy, experienced system administrators can manage large deployments efficiently. Hosts are network-booted from a central Auto Deploy server. Optionally, hosts are configured with a host profile of a reference host. The host profile can be set up to prompt the user for input. After boot up and configuration complete, the hosts are managed by vCenter Server just like other ESXi hosts.

Auto Deploy can also be used for stateless caching or stateful installs.

**Important**  Auto Deploy requires a secure separation between the production network and the management or deployment networks as discussed in vSphere Auto Deploy Security Considerations. Using Auto Deploy without this separation is insecure.

**Stateless caching**  By default, Auto Deploy does not store ESXi configuration or state on the host disk. Instead, an image profile defines the image that the host is provisioned with, and other host attributes are managed through host profiles. A host that uses Auto Deploy for stateless caching still needs to connect to the Auto Deploy server and the vCenter Server.

**Stateful installs**  You can provision a host with Auto Deploy and set up the host to store the image to disk. On subsequent boots, the host boots from disk.

**Understanding vSphere Auto Deploy**

vSphere Auto Deploy can provision hundreds of physical hosts with ESXi software. You can specify the image to deploy and the hosts to provision with the image. Optionally, you can specify host profiles to apply to the hosts, a vCenter Server location (datacenter, folder or cluster), and assign a script bundle for each host.

**Introduction to vSphere Auto Deploy**

When you start a physical host that is set up for vSphere Auto Deploy, vSphere Auto Deploy uses PXE boot infrastructure in conjunction with vSphere host profiles to provision and customize that host. No state is stored on the host itself. Instead, the vSphere Auto Deploy server manages state information for each host.
State Information for ESXi Hosts

vSphere Auto Deploy stores the information for the ESXi hosts to be provisioned in different locations. Information about the location of image profiles and host profiles is initially specified in the rules that map machines to image profiles and host profiles.

Table 5-15. vSphere Auto Deploy Stores Information for Deployment

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Description</th>
<th>Source of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image state</td>
<td>The executable software to run on an ESXi host.</td>
<td>Image profile, created with vSphere ESXi Image Builder.</td>
</tr>
<tr>
<td>Configuration state</td>
<td>The configurable settings that determine how the host is configured, for example, virtual switches and their settings, driver settings, boot parameters, and so on.</td>
<td>Host profile, created by using the host profile UI. Often comes from a template host.</td>
</tr>
<tr>
<td>Dynamic state</td>
<td>The runtime state that is generated by the running software, for example, generated private keys or runtime databases.</td>
<td>Host memory, lost during reboot.</td>
</tr>
<tr>
<td>Virtual machine state</td>
<td>The virtual machines stored on a host and virtual machine autostart information (subsequent boots only).</td>
<td>Virtual machine information sent by vCenter Server to vSphere Auto Deploy must be available to supply virtual machine information to vSphere Auto Deploy.</td>
</tr>
<tr>
<td>User input</td>
<td>State that is based on user input, for example, an IP address that the user provides when the system starts up, cannot automatically be included in the host profile.</td>
<td>Host customization information, stored by vCenter Server during first boot. You can create a host profile that requires user input for certain values. When vSphere Auto Deploy applies a host profile that requires user provided information, the host is placed in maintenance mode. Use the host profile UI to check the host profile compliance, and respond to the prompt to customize the host.</td>
</tr>
</tbody>
</table>

vSphere Auto Deploy Architecture

The vSphere Auto Deploy infrastructure consists of several components.

For more information, watch the video "Auto Deploy Architecture":

Figure 5-4. vSphere Auto Deploy Architecture

- **vSphere Auto Deploy server**: Serves images and host profiles to ESXi hosts.

- **vSphere Auto Deploy rules engine**: Sends information to the vSphere Auto Deploy server which image profile and which host profile to serve to which host. Administrators use vSphere Auto Deploy to define the rules that assign image profiles and host profiles to hosts. For more information on vSphere Auto Deploy rules and rule sets, see [Rules and Rule Sets](#).

- **Image profiles**: Define the set of VIBs to boot ESXi hosts with.
  - VMware and VMware partners make image profiles and VIBs available in public depots. Use vSphere ESXi Image Builder to examine the depot and use the vSphere Auto Deploy rules engine to specify which image profile to assign to which host.
  - VMware customers can create a custom image profile based on the public image profiles and VIBs in the depot and apply that image profile to the host. See [Customizing Installations with vSphere ESXi Image Builder](#).
Host profiles

Define machine-specific configuration such as networking or storage setup. Use the host profile UI to create host profiles. You can create a host profile for a reference host and apply that host profile to other hosts in your environment for a consistent configuration. For more information, see the vSphere Host Profiles documentation or the Setting Up a vSphere Auto Deploy Reference Host section.

Host customization

Stores information that the user provides when host profiles are applied to the host. Host customization might contain an IP address or other information that the user supplied for that host. For more information about host customizations, see the vSphere Host Profiles documentation.

Host customization was called answer file in earlier releases of vSphere Auto Deploy.

Rules and Rule Sets

You specify the behavior of the vSphere Auto Deploy server by using a set of rules. The vSphere Auto Deploy rules engine checks the rule set for matching host patterns to decide which items (image profile, host profile, vCenter Server location, or script object) to provision each host with.

The rules engine maps software and configuration settings to hosts based on the attributes of the host. For example, you can deploy image profiles or host profiles to two clusters of hosts by writing two rules, each matching on the network address of one cluster.

For hosts that have not yet been added to a vCenter Server system, the vSphere Auto Deploy server checks with the rules engine before serving image profiles, host profiles, and inventory location information to hosts. For hosts that are managed by a vCenter Server system, the image profile, host profile, and inventory location that vCenter Server has stored in the host object is used. If you make changes to rules, you can use the vSphere Web Client or vSphere Auto Deploy cmdlets in a PowerCLI session to test and repair rule compliance. When you repair rule compliance for a host, that host's image profile and host profile assignments are updated.

The rules engine includes rules and rule sets.

Rules

Rules can assign image profiles and host profiles to a set of hosts, or specify the location (folder or cluster) of a host on the target vCenter Server system. A rule can identify target hosts by boot MAC address, SMBIOS information, BIOS UUID, Vendor, Model, or fixed DHCP IP address. In most cases, rules apply to multiple hosts. You create rules by using the vSphere Web Client or vSphere Auto Deploy cmdlets in a PowerCLI session. After you create a rule, you must add it to a rule set. Only two rule sets, the active rule set and the working rule set, are supported. A rule can belong to both sets, the default, or only to the working rule set. After you add a rule to a rule set, you can no longer change the rule. Instead, you copy the rule and replace items or patterns in the copy. If you are managing vSphere Auto Deploy with the vSphere Web Client, you can edit a rule if it is in inactive state.
You can specify the following parameters in a rule.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the rule, specified with the -Name parameter.</td>
</tr>
<tr>
<td>Item</td>
<td>One or more items, specified with the -Item parameter. An item can be an image profile, a host profile, a vCenter Server inventory location (datacenter, folder, cluster) for the target host, or a custom script. You can specify multiple items separated by commas.</td>
</tr>
<tr>
<td>Pattern</td>
<td>The pattern specifies the host or group of hosts to which the rule applies.</td>
</tr>
<tr>
<td>vendor</td>
<td>Machine vendor name.</td>
</tr>
<tr>
<td>model</td>
<td>Machine model name.</td>
</tr>
<tr>
<td>serial</td>
<td>Machine serial number.</td>
</tr>
<tr>
<td>hostname</td>
<td>Machine hostname.</td>
</tr>
<tr>
<td>domain</td>
<td>Domain name.</td>
</tr>
<tr>
<td>ipv4</td>
<td>IPv4 address of the machine.</td>
</tr>
<tr>
<td>ipv6</td>
<td>IPv6 address of the machine. PXE booting with BIOS firmware is possible only with IPv4, PXE booting with UEFI firmware is possible with either IPv4 or IPv6.</td>
</tr>
<tr>
<td>mac</td>
<td>Boot NIC MAC address.</td>
</tr>
<tr>
<td>asset</td>
<td>Machine asset tag.</td>
</tr>
<tr>
<td>oemstring</td>
<td>OEM-specific strings in the SMBIOS.</td>
</tr>
</tbody>
</table>

You can specify -AllHosts to apply the item or items to all hosts.

**Active Rule Set**

When a newly started host contacts the vSphere Auto Deploy server with a request for an image profile, the vSphere Auto Deploy server checks the active rule set for matching rules. The image profile, host profile, vCenter Server inventory location, and script object that are mapped by matching rules are then used to boot the host. If more than one item of the same type is mapped by the rules, the vSphere Auto Deploy server uses the item that is first in the rule set.

**Working Rule Set**

The working rule set allows you to test changes to rules before making the changes active. For example, you can use vSphere Auto Deploy cmdlets for testing compliance with the working rule set. The test verifies that hosts managed by a vCenter Server system are following the rules in the working rule set. By default, cmdlets add the rule to the working rule set and activate the rules. Use the NoActivate parameter to add a rule only to the working rule set.

You use the following workflow with rules and rule sets.

1. Make changes to the working rule set.
2 Test the working rule set rules against a host to make sure that everything is working correctly.
3 Refine and retest the rules in the working rule set.
4 Activate the rules in the working rule set.
   If you add a rule in a PowerCLI session and do not specify the NoActivate parameter, all rules that are currently in the working rule set are activated. You cannot activate individual rules.

See the PowerCLI command-line help and Managing vSphere Auto Deploy with PowerCLI Cmdlets for more information on using vSphere Auto Deploy with PowerCLI cmdlets. See Managing vSphere Auto Deploy with the vSphere Web Client for more information on using vSphere Auto Deploy with the vSphere Web Client.

vSphere Auto Deploy Boot Process

When you boot a host that you want to provision or reprovision with vSphere Auto Deploy, the vSphere Auto Deploy infrastructure supplies the image profile and, optionally, a host profile, a vCenter Server location, and script bundle for that host.

The boot process is different for hosts that have not yet been provisioned with vSphere Auto Deploy (first boot) and for hosts that have been provisioned with vSphere Auto Deploy and added to a vCenter Server system (subsequent boot).

First Boot Prerequisites

Before a first boot process, you must set up your system. Setup includes the following tasks, which are discussed in more detail in Preparing for vSphere Auto Deploy.

- Set up a DHCP server that assigns an IP address to each host upon startup and that points the host to the TFTP server to download the iPXE boot loader from.
- If the hosts that you plan to provision with vSphere Auto Deploy are with legacy BIOS, verify that the vSphere Auto Deploy server has an IPv4 address. PXE booting with legacy BIOS firmware is possible only over IPv4. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.
- Identify an image profile to be used in one of the following ways.
  - Choose an ESXi image profile in a public depot.
  - (Optional) Create a custom image profile by using vSphere ESXi Image Builder, and place the image profile in a depot that the vSphere Auto Deploy server can access. The image profile must include a base ESXi VIB.
  - (Optional) If you have a reference host in your environment, export the host profile of the reference host and define a rule that applies the host profile to one or more hosts. See Setting Up a vSphere Auto Deploy Reference Host.
- Specify rules for the deployment of the host and add the rules to the active rule set.
First Boot Overview

When a host that has not yet been provisioned with vSphere Auto Deploy boots (first boot), the host interacts with several vSphere Auto Deploy components.

1. When the administrator turns on a host, the host starts a PXE boot sequence.
   - The DHCP Server assigns an IP address to the host and instructs the host to contact the TFTP server.

2. The host contacts the TFTP server and downloads the iPXE file (executable boot loader) and an iPXE configuration file.

3. iPXE starts executing.
   - The configuration file instructs the host to make a HTTP boot request to the vSphere Auto Deploy server. The HTTP request includes hardware and network information.

4. In response, the vSphere Auto Deploy server performs these tasks:
   - Queries the rules engine for information about the host.
   - Streams the components specified in the image profile, the optional host profile, and optional vCenter Server location information.

5. The host boots using the image profile.
   - If the vSphere Auto Deploy server provided a host profile, the host profile is applied to the host.

6. vSphere Auto Deploy adds the host to the vCenter Server system that vSphere Auto Deploy is registered with.
   - If a rule specifies a target folder or cluster on the vCenter Server system, the host is placed in that folder or cluster. The target folder must be under a data center.
   - If no rule exists that specifies a vCenter Server inventory location, vSphere Auto Deploy adds the host to the first datacenter displayed in the vSphere Web Client UI.

7. (Optional) If the host profile requires the user to specify certain information, such as a static IP address, the host is placed in maintenance mode when the host is added to the vCenter Server system.
   - You must reapply the host profile and update the host customization to have the host exit maintenance mode. When you update the host customization, answer any questions when prompted.

8. If the host is part of a DRS cluster, virtual machines from other hosts might be migrated to the host after the host has successfully been added to the vCenter Server system.

See Provision a Host (First Boot).
Subsequent Boots Without Updates

For hosts that are provisioned with vSphere Auto Deploy and managed by vCenter Server system, subsequent boots can become completely automatic.

1. The administrator reboots the host.
2. As the host boots up, vSphere Auto Deploy provisions the host with its image profile and host profile.
3. Virtual machines are brought up or migrated to the host based on the settings of the host.
   - Standalone host. Virtual machines are powered on according to autostart rules defined on the host.
   - DRS cluster host. Virtual machines that were successfully migrated to other hosts stay there. Virtual machines for which no host had enough resources are registered to the rebooted host.

If the vCenter Server system is unavailable, the host contacts the vSphere Auto Deploy server and is provisioned with an image profile. The host continues to contact the vSphere Auto Deploy server until vSphere Auto Deploy reconnects to the vCenter Server system.

vSphere Auto Deploy cannot set up vSphere distributed switches if vCenter Server is unavailable, and virtual machines are assigned to hosts only if they participate in an HA cluster. Until the host is reconnected to vCenter Server and the host profile is applied, the switch cannot be created. Because the host is in maintenance mode, virtual machines cannot start. See Reprovision Hosts with Simple Reboot Operations.

Any hosts that are set up to require user input are placed in maintenance mode. See Update the Host Customization in the vSphere Web Client.
Subsequent Boots With Updates

You can change the image profile, host profile, vCenter Server location, or script bundle for hosts. The process includes changing rules and testing and repairing the host's rule compliance.

1. The administrator uses the `Copy-DeployRule` PowerCLI cmdlet to copy and edit one or more rules and updates the rule set. See Overview of the vSphere Auto Deploy Process by Using PowerCLI for an example.

2. The administrator runs the `Test-DeployRulesetCompliance` cmdlet to check whether each host is using the information that the current rule set specifies.

3. The host returns a PowerCLI object that encapsulates compliance information.

4. The administrator runs the `Repair-DeployRulesetCompliance` cmdlet to update the image profile, host profile, or vCenter Server location the vCenter Server system stores for each host.

5. When the host reboots, it uses the updated image profile, host profile, vCenter Server location, or script bundle for the host.

   If the host profile is set up to request user input, the host is placed in maintenance mode. Follow the steps in Update the Host Customization in the vSphere Web Client.

See Test and Repair Rule Compliance.

Figure 5-6. vSphere Auto Deploy Installation, Subsequent Boots

Provisioning of Systems that Have Distributed Switches

You can configure the host profile of a vSphere Auto Deploy reference host with a distributed switch.

When you configure the distributed switch, the boot configuration parameters policy is automatically set to match the network parameters required for host connectivity after a reboot.

When vSphere Auto Deploy provisions the ESXi host with the host profile, the host goes through a two-step process.

1. The host creates a standard virtual switch with the properties specified in the boot configuration parameters field.
2 The host creates the VMkernel NICs. The VMkernel NICs allow the host to connect to vSphere Auto Deploy and to the vCenter Server system.

When the host is added to vCenter Server, vCenter Server removes the standard switch and reapplies the distributed switch to the host.

**Note** Do not change the boot configuration parameters to avoid problems with your distributed switch.

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**Overview of the vSphere Auto Deploy Process by Using the vSphere Web Client**

Getting started with vSphere Auto Deploy requires that you learn how vSphere Auto Deploy works, start the vSphere Auto Deploy and vSphere ESXi Image Builder vCenter Server services, create deploy rules that provision hosts, and power on your hosts to be booted with the image profile you specify.

The workflow for provisioning the hosts in your environment with vSphere Auto Deploy includes the following tasks:

1 **Install vCenter Server and the vCenter Server components, or deploy the vCenter Server Appliance.**

   The vSphere Auto Deploy server is included with the management node.

2 **Configure the vSphere Auto Deploy and vSphere ESXi Image Builder service startup types.**

   See **Prepare Your System for vSphere Auto Deploy**.

3 **Add or import a software depot to the vSphere Auto Deploy inventory.**

   See **Add a Software Depot or Import a Software Depot**.

4 (Optional) If you want to create a custom image profile, clone or create an image profile by using the vSphere Web Client.

   See **Clone an Image Profile or Create an Image Profile**.

5 **Create a deploy rule that assigns the image profile to one host, to multiple hosts specified by a pattern, or to all hosts.**

   See **Create a Deploy Rule**.

**Note** vSphere Auto Deploy is optimized for provisioning hosts that have a fixed MAC address to IP address mapping in DHCP (sometimes called DHCP reservations). If you want to use static IP addresses, you must set up the host profile to prompt for host customization. For more information, see the *vSphere Host Profiles* documentation.

6 **Power on the hosts that you want to provision.**

7 **Set up the host you provisioned as a reference host for your host profile.**

   You can specify the reference host syslog settings, firewall settings, storage, networking, and so on.

8 **Extract a host profile from the reference host.**

   See the *Host Profiles* documentation.

9 **To provision multiple hosts with the host profile, clone or edit the previously created rule by using the vSphere Web Client.**
10 Activate the new rule and deactivate the old one.

See Activate, Deactivate, and Reorder Deploy Rules.

11 Remediate the host associations to apply the new rule to the host.

See Remediate a Non-compliant Host.

12 Verify that the hosts you provisioned meet the following requirements.

- Each host is connected to the vCenter Server system.
- The hosts are not in maintenance mode.
- The hosts have no compliance failures.
- Each host with a host profile that requires user input has up-to-date host customization information.

Remediate host associations and compliance problems and reboot hosts until all hosts meet the requirements.

Read for an introduction to the boot process, differences between first and subsequent boots, and an overview of using host customization.

**Overview of the vSphere Auto Deploy Process by Using PowerCLI**

Getting started with vSphere Auto Deploy requires that you learn how vSphere Auto Deploy works, install the vSphere Auto Deploy server, install PowerCLI, write PowerCLI rules that provision hosts, and power on your hosts to be booted with the image profile you specify. You can customize of the image profile, host profile, and vCenter Server location.

See Set Up vSphere Auto Deploy and Provision Hosts with vSphere PowerCLI for a step-by-step exercise that helps you set up your first vSphere Auto Deploy environment on a Windows Server 2008 system.

To provision the hosts in your environment with vSphere Auto Deploy successfully, you can follow these steps.

1 Install vCenter Server and the vCenter Server components, or deploy the vCenter Server Appliance.

The vSphere Auto Deploy server is included with the management node.

2 Configure the vSphere Auto Deploy service startup type.

See Prepare Your System for vSphere Auto Deploy.

3 Install PowerCLI, which includes vSphere Auto Deploy and vSphere ESXi Image Builder cmdlets.

See Prepare Your System for vSphere Auto Deploy and Using vSphere Auto Deploy Cmdlets.

4 Find the image profile that includes the VIBs that you want to deploy to your hosts.

- In most cases, you add the depots containing the required software to your PowerCLI session, and then select an image profile from one of those depots.
To create a custom image profile, use vSphere ESXi Image Builder cmdlets to clone an existing image profile and add the custom VIBs to the clone. Add the custom image profile to the PowerCLI session.

You must use vSphere ESXi Image Builder for customization only if you have to add or remove VIBs. In most cases, you can add the depot where VMware hosts the image profiles to your PowerCLI session as a URL.

5 Start a PowerCLI session and connect to the vCenter Server system that vSphere Auto Deploy is registered with.

6 Use the `New-DeployRule` PowerCLI cmdlet to write a rule that assigns the image profile to one host, to multiple hosts specified by a pattern, or to all hosts.

   ```powershell
   New-DeployRule -Name "testrule" -Item image-profile -AllHosts
   ```

   See Assign an Image Profile to Hosts.

   **Note** vSphere Auto Deploy is optimized for provisioning hosts that have a fixed MAC address to IP address mapping in DHCP (sometimes called DHCP reservations). If you want to use static IP addresses, you must set up the host profile to prompt for host customization. For more information, see the vSphere Host Profiles documentation.

7 Power on the hosts that you want to provision.

8 Set up the host you provisioned as a reference host for your host profile.

   You can specify the reference host syslog settings, firewall settings, storage, networking, and so on.

9 Set up the host you provisioned as a reference host for your host profile.

   You can specify the reference host syslog settings, firewall settings, storage, networking, and so on.

   See Setting Up a vSphere Auto Deploy Reference Host.

10 Create and export a host profile for the reference host.

   See the Host Profiles documentation.

11 To provision multiple hosts with the host profile, use the `Copy-DeployRule` cmdlet to edit the previously created rule.

   You can revise the rule to assign not only an image profile but also a host profile, a vCenter Server location and a custom script bundle.

   ```powershell
   Copy-DeployRule -DeployRule "testrule" -ReplaceItem
   my_host_profile_from_reference_host,my_target_cluster
   -ReplacePattern "ipv4=192.XXX.1.10-192.XXX.1.20"
   ```

   Where `my_host_profile_from_reference_host` is the name of the reference host profile, and `my_target_cluster` is the name of the target cluster.

12 Perform the test and repair compliance operations to remediate the hosts.
See Test and Repair Rule Compliance.

13 Verify that the hosts you provisioned meet the following requirements.

- Each host is connected to the vCenter Server system.
- The hosts are not in maintenance mode.
- The hosts have no compliance failures.
- Each host with a host profile that requires user input has up-to-date host customization information.

Remediate host associations and compliance problems and reboot hosts until all hosts meet the requirements.

Read for an introduction to the boot process, differences between first and subsequent boots, and an overview of using host customization.

Preparing for vSphere Auto Deploy

Before you can start using vSphere Auto Deploy, you must prepare your environment. You start with server setup and hardware preparation. You must configure the vSphere Auto Deploy service startup type in the vCenter Server system that you plan to use for managing the hosts you provision, and install PowerCLI.

- **Prepare Your System for vSphere Auto Deploy**
  Before you can PXE boot an ESXi host with vSphere Auto Deploy, you must install prerequisite software and set up the DHCP and TFTP servers that vSphere Auto Deploy interacts with.

- **Using vSphere Auto Deploy Cmdlets**
  vSphere Auto Deploy cmdlets are implemented as Microsoft PowerShell cmdlets and included in PowerCLI. Users of vSphere Auto Deploy cmdlets can take advantage of all PowerCLI features.

- **Set Up Bulk Licensing**
  You can use the vSphere Web Client or ESXi Shell to specify individual license keys, or you can set up bulk licensing by using PowerCLI cmdlets. Bulk licensing works for all ESXi hosts, but is especially useful for hosts provisioned with vSphere Auto Deploy.

Prepare Your System for vSphere Auto Deploy

Before you can PXE boot an ESXi host with vSphere Auto Deploy, you must install prerequisite software and set up the DHCP and TFTP servers that vSphere Auto Deploy interacts with.

**Prerequisites**

- Verify that the hosts that you plan to provision with vSphere Auto Deploy meet the hardware requirements for ESXi. See ESXi Hardware Requirements.

- Verify that the ESXi hosts have network connectivity to vCenter Server and that all port requirements are met. See vCenter Server Upgrade.
If you want to use VLANs in your vSphere Auto Deploy environment, you must set up the end to end networking properly. When the host is PXE booting, the firmware driver must be set up to tag the frames with proper VLAN IDs. You must do this set up manually by making the correct changes in the UEFI/BIOS interface. You must also correctly configure the ESXi port groups with the correct VLAN IDs. Ask your network administrator how VLAN IDs are used in your environment.

Verify that you have enough storage for the vSphere Auto Deploy repository. The vSphere Auto Deploy server uses the repository to store data it needs, including the rules and rule sets you create and the VIbs and image profiles that you specify in your rules. Best practice is to allocate 2 GB to have enough room for four image profiles and some extra space. Each image profile requires approximately 350 MB. Determine how much space to reserve for the vSphere Auto Deploy repository by considering how many image profiles you expect to use.

Obtain administrative privileges to the DHCP server that manages the network segment you want to boot from. You can use a DHCP server already in your environment, or install a DHCP server. For your vSphere Auto Deploy setup, replace the gpxelinux.0 file name with snponly64.efi.vmw-hardwired for UEFI or undionly.kpxe.vmw-hardwired for BIOS. For more information on DHCP configurations, see Sample DHCP Configurations.

Secure your network as you would for any other PXE-based deployment method. vSphere Auto Deploy transfers data over SSL to prevent casual interference and snooping. However, the authenticity of the client or the vSphere Auto Deploy server is not checked during a PXE boot.

If you want to manage vSphere Auto Deploy with PowerCLI cmdlets, verify that Microsoft .NET Framework 4.5 or 4.5.x and Windows PowerShell 3.0 or 4.0 are installed on a Windows machine. You can install PowerCLI on the Windows system on which vCenter Server is installed or on a different Windows system. See the vSphere PowerCLI User's Guide.

Set up a remote Syslog server. See the vCenter Server and Host Management documentation for Syslog server configuration information. Configure the first host you boot to use the remote Syslog server and apply that host's host profile to all other target hosts. Optionally, install and use the vSphere Syslog Collector, a vCenter Server support tool that provides a unified architecture for system logging and enables network logging and combining of logs from multiple hosts.

Install ESXi Dump Collector, set up your first host so that all core dumps are directed to ESXi Dump Collector, and apply the host profile from that host to all other hosts. See Configure ESXi Dump Collector with ESXCLI.

If the hosts that you plan to provision with vSphere Auto Deploy are with legacy BIOS, verify that the vSphere Auto Deploy server has an IPv4 address. PXE booting with legacy BIOS firmware is possible only over IPv4. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.

Procedure

1. Install vCenter Server or deploy the vCenter Server Appliance.

   The vSphere Auto Deploy server is included with the management node.
2 Configure the vSphere Auto Deploy service startup type.
   a Log in to your vCenter Server system by using the vSphere Web Client.
   b On the vSphere Web Client Home page, click Administration.
   c Under System Configuration click Services.
   d Select Auto Deploy, click the Actions menu, and select Edit Startup Type.
      ■ On Windows, the vSphere Auto Deploy service is disabled. In the Edit Startup Type window, select Manual or Automatic to enable vSphere Auto Deploy.
      ■ On the vCenter Server Appliance, the vSphere Auto Deploy service by default is set to Manual. If you want the vSphere Auto Deploy service to start automatically upon OS startup, select Automatic.

3 (Optional) If you want to manage vSphere Auto Deploy with the vSphere Web Client, configure the vSphere ESXi Image Builder service startup type.
   a Repeat Step 2a through Step 2c.
   b Select ImageBuilder Service, click the Actions menu, and select Edit Startup Type.
      ■ On Windows, the vSphere ESXi Image Builder service is disabled. In the Edit Startup Type window, select Manual or Automatic to enable the service.
      ■ On the vCenter Server Appliance, the vSphere Auto Deploy service by default is set to Manual. If you want the vSphere ESXi Image Builder service to start automatically upon OS startup, select Automatic.
   c Log out of the vSphere Web Client and log in again.
      The Auto Deploy icon is visible on the Home page of the vSphere Web Client.

4 (Optional) If you want to manage vSphere Auto Deploy with PowerCLI cmdlets, install PowerCLI.
   a Download the latest version of PowerCLI from the VMware Web site.
   b Navigate to the folder that contains the PowerCLI file you downloaded and double-click the executable file.
      If the installation wizard detects an earlier version of PowerCLI on your system, it will attempt to upgrade your existing installation
   c Follow the prompts in the wizard to complete the installation.

5 Configure the TFTP server.
   a In a vSphere Web Client connected to the vCenter Server system, go to the inventory list and select the vCenter Server system.
   b Click the Manage tab, select Settings, and click Auto Deploy.
   c Click Download TFTP Boot Zip to download the TFTP configuration file and unzip the file to the directory in which your TFTP server stores files.
6 Set up your DHCP server to point to the TFTP server on which the TFTP ZIP file is located.
   a Specify the TFTP Server's IP address in DHCP option 66, frequently called next-server.
   b Specify the boot file name, which is snponly64.efi.vmw-hardwired for UEFI or
      undionly.kpxe.vmw-hardwired for BIOS in the DHCP option 67, frequently called boot-
      filename.
7 Set each host you want to provision with vSphere Auto Deploy to network boot or PXE boot, following
   the manufacturer's instructions.
8 (Optional) If you set up your environment to use Thumbprint mode, you can use your own Certificate
   Authority (CA) by replacing the OpenSSL certificate rbd-ca.crt and the OpenSSL private key
   rbd-
   ca.key with your own certificate and key file.
   - On Windows, the files are in the SSL subfolder of the vSphere Auto Deploy installation directory. For
     example, on Windows 7 the default is C:\ProgramData\VMware\VMware vSphere Auto
     Deploy\ssl.
   - On the vCenter Server Appliance, the files are in /etc/vmware-rbd/ssl/.
     By default, vCenter Server 6.0 and later uses VMware Certificate Authority (VMCA).

When you start a host that is set up for vSphere Auto Deploy, the host contacts the DHCP server and is
directed to the vSphere Auto Deploy server, which provisions the host with the image profile specified in
the active rule set.

What to do next
   - Define a rule that assigns an image profile and optional host profile, host location or script bundle to
     the host. For Managing vSphere Auto Deploy with PowerCLI cmdlets, see the Managing vSphere
     Auto Deploy with PowerCLI Cmdlets section. For managing vSphere Auto Deploy with the vSphere
     Web Client, see the Managing vSphere Auto Deploy with the vSphere Web Client section.
   - (Optional) Configure the first host that you provision as a reference host. Use the storage, networking,
     and other settings you want for your target hosts to share. Create a host profile for the reference host
     and write a rule that assigns both the already tested image profile and the host profile to target hosts.
   - (Optional) If you want to have vSphere Auto Deploy overwrite existing partitions, set up a reference
     host to do auto partitioning and apply the host profile of the reference host to other hosts. See
     Configure a Reference Host for Auto-Partitioning.
   - (Optional) If you have to configure host-specific information, set up the host profile of the reference
     host to prompt for user input. For more information about host customizations, see the vSphere Host
     Profiles documentation.

Using vSphere Auto Deploy Cmdlets
vSphere Auto Deploy cmdlets are implemented as Microsoft PowerShell cmdlets and included in
PowerCLI. Users of vSphere Auto Deploy cmdlets can take advantage of all PowerCLI features.

Experienced PowerShell users can use vSphere Auto Deploy cmdlets just like other PowerShell cmdlets.
If you are new to PowerShell and PowerCLI, the following tips might be helpful.
You can type cmdlets, parameters, and parameter values in the PowerCLI shell.

- Get help for any cmdlet by running `Get-Help cmdlet_name`.
- Remember that PowerShell is not case sensitive.
- Use tab completion for cmdlet names and parameter names.
- Format any variable and cmdlet output by using `Format-List` or `Format-Table`, or their short forms `fl` or `ft`. For more information, run the `Get-Help Format-List` cmdlet.

### Passing Parameters by Name

You can pass in parameters by name in most cases and surround parameter values that contain spaces or special characters with double quotes.

```powershell
Copy-DeployRule -DeployRule testrule -ReplaceItem MyNewProfile
```

Most examples in the *vCenter Server Installation and Setup* documentation pass in parameters by name.

### Passing Parameters as Objects

You can pass parameters as objects if you want to perform scripting and automation. Passing in parameters as objects is useful with cmdlets that return multiple objects and with cmdlets that return a single object. Consider the following example.

1. Bind the object that encapsulates rule set compliance information for a host to a variable.

   ```powershell
   $tr = Test-DeployRuleSetCompliance MyEsxi42
   ```

2. View the `itemlist` property of the object to see the difference between what is in the rule set and what the host is currently using.

   ```powershell
   $tr.itemlist
   ```

3. Remediate the host to use the revised rule set by using the `Repair-DeployRuleSetCompliance` cmdlet with the variable.

   ```powershell
   Repair-DeployRuleSetCompliance $tr
   ```

The example remediates the host the next time you boot the host.

### Set Up Bulk Licensing

You can use the vSphere Web Client or ESXi Shell to specify individual license keys, or you can set up bulk licensing by using PowerCLI cmdlets. Bulk licensing works for all ESXi hosts, but is especially useful for hosts provisioned with vSphere Auto Deploy.
Assigning license keys through the vSphere Web Client and assigning licensing by using PowerCLI cmdlets function differently.

**Assign license keys with the vSphere Web Client**
You can assign license keys to a host when you add the host to the vCenter Server system or when the host is managed by a vCenter Server system.

**Assign license keys with LicenseDataManager PowerCLI**
You can specify a set of license keys to be added to a set of hosts. The license keys are added to the vCenter Server database. Each time a host is added to the vCenter Server system or reconnects to it, the host is assigned a license key. A license key that is assigned through PowerCLI is treated as a default license key. When an unlicensed host is added or reconnected, it is assigned the default license key. If a host is already licensed, it keeps its license key.

The following example assigns licenses to all hosts in a data center. You can also associate licenses with hosts and clusters.

The following example is for advanced PowerCLI users who know how to use PowerShell variables.

**Prerequisites**
Prepare Your System for vSphere Auto Deploy.

**Procedure**
1. In a PowerCLI session, connect to the vCenter Server system you want to use and bind the associated license manager to a variable.

   ```powershell
   Connect-VIServer -Server 192.XXX.X.XX -User username -Password password
   $licenseDataManager = Get-LicenseDataManager
   ```

2. Run a cmdlet that retrieves the datacenter in which the hosts for which you want to use the bulk licensing feature are located.

   ```powershell
   $hostContainer = Get-Datacenter -Name Datacenter-X
   ```

   You can also run a cmdlet that retrieves a cluster to use bulk licensing for all hosts in a cluster, or retrieves a folder to use bulk licensing for all hosts in a folder.

3. Create a new `LicenseData` object and a `LicenseKeyEntry` object with associated type ID and license key.

   ```powershell
   $licenseData = New-Object VMware.VimAutomation.License.Types.LicenseData
   $licenseKeyEntry = New-Object VMware.VimAutomation.License.Types.LicenseKeyEntry
   $licenseKeyEntry.TypeId = "vmware-vsphere"
   $licenseKeyEntry.LicenseKey = "XXXXX-XXXXX-XXXXX-XXXXX-XXXXX"
   ```

4. Associate the `LicenseKeys` attribute of the `LicenseData` object you created in step 3 with the `LicenseKeyEntry` object.

   ```powershell
   $licenseData.LicenseKeys += $licenseKeyEntry
   ```
5 Update the license data for the data center with the LicenseData object and verify that the license is associated with the host container.

```powershell
licenseDataManager.UpdateAssociatedLicenseData($hostContainer.Uid, $licenseData)
licenseDataManager.QueryAssociatedLicenseData($hostContainer.Uid)
```

6 Provision one or more hosts with vSphere Auto Deploy and assign them to the data center or to the cluster that you assigned the license data to.

7 You can use the vSphere Web Client to verify that the host is successfully assigned to the default license XXXXX–XXXXX–XXXXX–XXXXX–XXXXX.

All hosts that you assigned to the data center are now licensed automatically.

**Managing vSphere Auto Deploy with PowerCLI Cmdlets**

You can manage vSphere Auto Deploy with PowerCLI cmdlets to create rules that associate hosts with image profiles, host profiles, custom scripts and locations on the vCenter Server target. You can also update hosts by testing rule compliance and repairing compliance issues.

**vSphere Auto Deploy PowerCLI Cmdlet Overview**

You specify the rules that assign image profiles and host profiles to hosts using a set of PowerCLI cmdlets that are included in PowerCLI.

If you are new to PowerCLI, read the PowerCLI documentation and review Using vSphere Auto Deploy Cmdlets. You can get help for any command at the PowerShell prompt.

- Basic help: `Get-Help cmdlet_name`
- Detailed help: `Get-Help cmdlet_name -Detailed`

**Note** When you run vSphere Auto Deploy cmdlets, provide all parameters on the command line when you invoke the cmdlet. Supplying parameters in interactive mode is not recommended.

**Table 5-16. Rule Engine PowerCLI Cmdlets**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get-DeployCommand</td>
<td>Returns a list of vSphere Auto Deploy cmdlets.</td>
</tr>
<tr>
<td>New-DeployRule</td>
<td>Creates a new rule with the specified items and patterns.</td>
</tr>
<tr>
<td>Set-DeployRule</td>
<td>Updates an existing rule with the specified items and patterns. You cannot update a rule that is part of a rule set.</td>
</tr>
<tr>
<td>Get-DeployRule</td>
<td>Retrieves the rules with the specified names.</td>
</tr>
<tr>
<td>Copy-DeployRule</td>
<td>Clones and updates an existing rule.</td>
</tr>
<tr>
<td>Add-DeployRule</td>
<td>Adds one or more rules to the working rule set and, by default, also to the active rule set. Use the NoActivate parameter to add a rule only to the working rule set.</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Remove-DeployRule</td>
<td>Removes one or more rules from the working rule set and from the active rule set. Run this command with the -Delete parameter to completely delete the rule.</td>
</tr>
<tr>
<td>Set-DeployRuleset</td>
<td>Explicitly sets the list of rules in the working rule set.</td>
</tr>
<tr>
<td>Get-DeployRuleset</td>
<td>Retrieves the current working rule set or the current active rule set.</td>
</tr>
<tr>
<td>Switch-ActiveDeployRuleset</td>
<td>Activates a rule set so that any new requests are evaluated through the rule set.</td>
</tr>
<tr>
<td>Get-VMHostMatchingRules</td>
<td>Retrieves rules matching a pattern. For example, you can retrieve all rules that apply to a host or hosts. Use this cmdlet primarily for debugging.</td>
</tr>
<tr>
<td>Test-DeployRulesetCompliance</td>
<td>Checks whether the items associated with a specified host are in compliance with the active rule set.</td>
</tr>
<tr>
<td>Repair-DeployRulesetCompliance</td>
<td>Given the output of Test-DeployRulesetCompliance, this cmdlet updates the image profile, host profile, and location for each host in the vCenter Server inventory. The cmdlet might apply image profiles, apply host profiles, or move hosts to prespecified folders or clusters on the vCenter Server system.</td>
</tr>
<tr>
<td>Apply-EsxImageProfile</td>
<td>Associates the specified image profile with the specified host.</td>
</tr>
<tr>
<td>Get-VMHostImageProfile</td>
<td>Retrieves the image profile in use by a specified host. This cmdlet differs from the Get-EsxImageProfile cmdlet in vSphere ESXi Image Builder.</td>
</tr>
<tr>
<td>Repair-DeployImageCache</td>
<td>Use this cmdlet only if the vSphere Auto Deploy image cache is accidentally deleted.</td>
</tr>
<tr>
<td>Get-VMHostAttributes</td>
<td>Retrieves the attributes for a host that are used when the vSphere Auto Deploy server evaluates the rules.</td>
</tr>
<tr>
<td>Get-DeployMachineIdentity</td>
<td>Returns a string value that vSphere Auto Deploy uses to logically link an ESXi host in vCenter Server to a physical machine.</td>
</tr>
<tr>
<td>Set-DeployMachineIdentity</td>
<td>Logically links a host object in the vCenter Server database to a physical machine. Use this cmdlet to add hosts without specifying rules.</td>
</tr>
<tr>
<td>Get-DeployOption</td>
<td>Retrieves the vSphere Auto Deploy global configuration options. This cmdlet currently supports the vlan- id option, which specifies the default VLAN ID for the ESXi Management Network of a host provisioned with vSphere Auto Deploy. vSphere Auto Deploy uses the value only if the host boots without a host profile.</td>
</tr>
<tr>
<td>Set-DeployOption</td>
<td>Sets the value of a global configuration option. Currently supports the vlan- id option for setting the default VLAN ID for the ESXi Management Network.</td>
</tr>
<tr>
<td>Add-ProxyServer</td>
<td>Adds a proxy server to the vSphere Auto Deploy database. Run the command with the -Address parameter to specify the IPv4 or IPv6 address. The address can include a port number.</td>
</tr>
</tbody>
</table>
### Table 5.16. Rule Engine PowerCLI Cmdlets (Continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>List-ProxyServer</td>
<td>Lists the proxy servers that are currently registered with vSphere Auto Deploy.</td>
</tr>
<tr>
<td>Delete-ProxyServer</td>
<td>Deletes one or more proxy servers from the list of proxy servers that are registered with vSphere Auto Deploy. You can run the command with the –id parameter from the list of proxy servers or with the–Address parameter by specifying the IPv4 or IPv6 address of the proxy server you want to delete.</td>
</tr>
<tr>
<td>Add-ScriptBundle</td>
<td>Adds one or more script bundles to the vSphere Auto Deploy server.</td>
</tr>
<tr>
<td>Get-ScriptBundle</td>
<td>Retrieves the list of script bundles available on the vSphere Auto Deploy server and the scripts they contain.</td>
</tr>
</tbody>
</table>

### Assign an Image Profile to Hosts

Before you can provision a host, you must create rules that assign an image profile to each host that you want to provision by using vSphere Auto Deploy.

vSphere Auto Deploy extensibility rules enforce that VIBs at the CommunitySupported level can only contain files from certain predefined locations, such as the ESXCLI plug-in path, jumpstart plug-in path, and so on. If you add a VIB that is in a different location to an image profile, a warning results. You can override the warning by using the force option.

If you call the New-DeployRule cmdlet on an image profile that includes VIBs at the CommunitySupported level which violate the rule, set $DeployNoSignatureCheck = $true before adding the image profile. With that setting, the system ignores signature validation and does not perform the extensibility rules check.

**Note** Image profiles that include VIBs at the CommunitySupported level are not supported on production systems.

### Prerequisites

### Procedure

1. In a PowerCLI session, run the Connect-VIServer cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.
   ```powershell
   Connect-VIServer ipv4_or_ipv6_address
   ```
   The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2. Determine the location of a public software depot, or define a custom image profile by using vSphere ESXi Image Builder.
3 Run `Add-EsxSoftwareDepot` to add the software depot that contains the image profile to the PowerCLI session.

<table>
<thead>
<tr>
<th>Depot Type</th>
<th>Cmdlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot depot_url</code>.</td>
</tr>
</tbody>
</table>
| ZIP file        | a Download the ZIP file to a local file path.  
|                 | b Run `Add-EsxSoftwareDepot C:\file_path\my_offline_depot.zip`. |

4 In the depot, find the image profile that you want to use by running the `Get-EsxImageProfile` cmdlet.

By default, the ESXi depot includes one base image profile that includes VMware tools and has the string `standard` in its name, and one base image profile that does not include VMware tools.

5 Define a rule in which hosts with certain attributes, for example a range of IP addresses, are assigned to the image profile.

```
New-DeployRule -Name "testrule" -Item "My Profile25" -Pattern "vendor=Acme,Zven", "ipv4=192.XXX.1.10-192.XXX.1.20"
```

Double quotes are required if a name contains spaces, optional otherwise. Specify `-AllHosts` instead of a pattern to apply the item to all hosts.

The cmdlet creates a rule named `testrule`. The rule assigns the image profile named `My Profile25` to all hosts with a vendor of Acme or Zven that also have an IP address in the specified range.

6 Add the rule to the rule set.

```
Add-DeployRule testrule
```

By default, the rule is added to both the working rule set and the active rule set. If you use the `NoActivate` parameter, the working rule set does not become the active rule set.

When the host boots from iPXE, it reports attributes of the machine to the console. Use the same format of the attributes when writing deploy rules.

```
******************************************************************
* Booting through VMware AutoDeploy...                          *
* Machine attributes:                                           *
*   . asset=No Asset Tag                                        *
*   . domain=vmware.com                                         *
*   . hostname=myhost.mycompany.com                             *
*   . ipv4=XX.XX.XXX.XXX                                        *
*   . mac=XX:Xa:Xb:Xc:Xx:XX                                     *
*   . model=MyVendorModel                                       *
*   . oemstring=Product ID: XXXXXX-XXX                          *
```
**What to do next**

- For hosts already provisioned with vSphere Auto Deploy, perform the compliance testing and repair operations to provision them with the new image profile. See [Test and Repair Rule Compliance](#).
- Turn on unprovisioned hosts to provision them with the new image profile.

**Write a Rule and Assign a Host Profile to Hosts**

vSphere Auto Deploy can assign a host profile to one or more hosts. The host profile might include information about storage configuration, network configuration, or other characteristics of the host. If you add a host to a cluster, that cluster's host profile is used.

In many cases, you assign a host to a cluster instead of specifying a host profile explicitly. The host uses the host profile of the cluster.

**Prerequisites**

- Install PowerCLI and all prerequisite software. For information see [vCenter Server Installation and Setup](#).
- Export the host profile that you want to use.

**Procedure**

1. In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

   ```powershell
   Connect-VIServer ipv4_or_ipv6_address
   ```

   The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2. Using the vSphere Web Client, set up a host with the settings you want to use and create a host profile from that host.

3. Find the name of the host profile by running `Get-VMhostProfile` PowerCLI cmdlet, passing in the ESXi host from which you create a host profile.

4. At the PowerCLI prompt, define a rule in which host profiles are assigned to hosts with certain attributes, for example a range of IP addresses.

   ```powershell
   New-DeployRule -Name "testrule2" -Item my_host_profile -Pattern "vendor=Acme,Zven", "ipv4=192.168.1.10-192.168.1.20"
   ```

   The specified item is assigned to all hosts with the specified attributes. This example specifies a rule named testrule2. The rule assigns the specified host profile `my_host_profile` to all hosts with an IP address inside the specified range and with a manufacturer of Acme or Zven.
5 Add the rule to the rule set.

`Add-DeployRule testrule2`

By default, the working rule set becomes the active rule set, and any changes to the rule set become active when you add a rule. If you use the `NoActivate` parameter, the working rule set does not become the active rule set.

**What to do next**

- Assign a host already provisioned with vSphere Auto Deploy to the new host profile by performing compliance test and repair operations on those hosts. For more information, see [Test and Repair Rule Compliance](#).
- Power on unprovisioned hosts to provision them with the host profile.

**Write a Rule and Assign a Host to a Folder or Cluster**

vSphere Auto Deploy can assign a host to a folder or cluster. When the host boots, vSphere Auto Deploy adds it to the specified location on the vCenter Server. Hosts assigned to a cluster inherit the cluster's host profile.

**Prerequisites**

- **Prepare Your System for vSphere Auto Deploy**
- Verify that the folder you select is in a data center or in a cluster. You cannot assign the host to a standalone top-level folder.

**Procedure**

1 In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

`Connect-VIServer ipv4_or_ipv6_address`

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2 Define a rule in which hosts with certain attributes, for example a range of IP addresses, are assigned to a folder or a cluster.

`New-DeployRule -Name testrule3 -Item "my folder" -Pattern "vendor=Acme,Zven", "ipv4=192.XXX.1.10-192.XXX.1.20"`

This example passes in the folder by name. You can instead pass in a folder, cluster, or data center object that you retrieve with the `Get-Folder`, `Get-Cluster`, or `Get-Datacenter` cmdlet.
3 Add the rule to the rule set.

```
Add-DeployRule testrule3
```

By default, the working rule set becomes the active rule set, and any changes to the rule set become active when you add a rule. If you use the NoActivate parameter, the working rule set does not become the active rule set.

**What to do next**

- Assign a host already provisioned with vSphere Auto Deploy to the new folder or cluster location by performing test and repair compliance operation. See Test and Repair Rule Compliance.
- Power on unprovisioned hosts to add them to the specified vCenter Server location.

**Configure a Stateless System by Running a Custom Script**

You can use vSphere Auto Deploy to configure one or more hosts by associating custom scripts with a vSphere Auto Deploy rule.

The scripts run in alphabetical order after the initial ESXi boot workflow of the host.

**Prerequisites**

- Verify that the script bundle you want to associate with a vSphere Auto Deploy rule is in .tgz format, with a maximum size of 10 MB, and written in Python or BusyBox ash scripting language.

**Procedure**

1. In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

```
Connect-VIServer ipv4_or_ipv6_address
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2. Run the `Add-ScriptBundle` cmdlet to add the script bundle that contains the necessary scripts to the vSphere Auto Deploy inventory.

```
Add-ScriptBundle c:/temp/MyScriptBundle.tgz
```

The name of the script bundle without the .tgz extension is the name identifier or object of the script bundle item. You can update an existing script bundle by using the -Update parameter with the `Add-ScriptBundle` cmdlet.

3. (Optional) Run the `Get-ScriptBundle` cmdlet to verify that the script bundle is added to the vSphere Auto Deploy inventory.
Define a rule in which hosts with certain attributes, for example a range of IP addresses, are assigned to the script bundle.

```
New-DeployRule -Name "testrule4" -Item "MyScriptBundle" -Pattern "vendor=Acme,Zven", "ipv4=192.XXX.1.10-192.XXX.1.20"
```

Double quotes are required if a name contains spaces, optional otherwise. Specify -AllHosts instead of a pattern to apply the item to all hosts.

You create a rule named `testrule4`. The rule assigns the script bundle named `My Script Bundle` to all hosts with a vendor of Acme or Zven that also have an IP address in the specified range. You can use the name identifier of the script bundle or the object returned by the `Get-ScriptBundle` cmdlet to identify the script bundle you want to associate with the rule.

Add the rule to the rule set.

```
Add-DeployRule testrule4
```

By default, the rule is added to both the working rule set and the active rule set. If you use the NoActivate parameter, the working rule set does not become the active rule set.

What to do next

- For hosts already provisioned with vSphere Auto Deploy, perform the compliance testing and repair operations to provision them with the new scripts. See Test and Repair Rule Compliance.
- Turn on unprovisioned hosts to provision them with the new scripts.

Test and Repair Rule Compliance

When you add a rule to the vSphere Auto Deploy rule set or make changes to one or more rules, hosts are not updated automatically. vSphere Auto Deploy applies the new rules only when you test their rule compliance and perform remediation.

Prerequisites

- Prepare Your System for vSphere Auto Deploy
- Verify that your infrastructure includes one or more ESXi hosts provisioned with vSphere Auto Deploy, and that the host on which you installed PowerCLI can access those ESXi hosts.

Procedure

1. In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

```
Connect-VIServer ipv4_or_ipv6_address
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.
2 Use PowerCLI to check which vSphere Auto Deploy rules are currently available.

```
Get-DeployRule
```

The system returns the rules and the associated items and patterns.

3 Make a change to one of the available rules.

For example, you can change the image profile and the name of the rule.

```
Copy-DeployRule -DeployRule testrule -ReplaceItem MyNewProfile
```

You cannot edit a rule already added to the active rule set. Instead, you can copy the rule and replace the item or pattern you want to change.

4 Verify that you can access the host for which you want to test rule set compliance.

```
Get-VMHost -Name MyEsxi42
```

5 Run the cmdlet that tests rule set compliance for the host, and bind the return value to a variable for later use.

```
$tr = Test-DeployRuleSetCompliance MyEsxi42
```

6 Examine the differences between the contents of the rule set and configuration of the host.

```
$tr.itemlist
```

The system returns a table of current and expected items if the host for which you want to test the new rule set compliance is compliant with the active rule set.

<table>
<thead>
<tr>
<th>CurrentItem</th>
<th>ExpectedItem</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Profile 25</td>
<td>MyNewProfile</td>
</tr>
</tbody>
</table>

7 Remediate the host to use the revised rule set the next time you boot the host.

```
Repair-DeployRuleSetCompliance $tr
```

**What to do next**

If the rule you changed specified the inventory location, the change takes effect when you repair compliance. For all other changes, reboot your host to have vSphere Auto Deploy apply the new rule and to achieve compliance between the rule set and the host.
Register a Caching Proxy Server Address with vSphere Auto Deploy

Simultaneously booting large number of stateless hosts places a significant load on the vSphere Auto Deploy server. You can load balance the requests between the vSphere Auto Deploy server and one or more proxy servers that you register with vSphere Auto Deploy.

Prerequisites

Procedure

1. In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

```powershell
Connect-VIServer ipv4_or_ipv6_address
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2. Register a caching proxy server addresses with vSphere Auto Deploy by running the `Add-ProxyServer` cmdlet.

```powershell
Add-ProxyServer -Address 'https://proxy_server_ip_address:port_number'
```

You can run the cmdlet multiple times to register multiple proxy servers. The address can contain a port number.

3. (Optional) Run the `List-ProxyServer` cmdlet to verify that the caching proxy server is registered with vSphere Auto Deploy.

Managing vSphere Auto Deploy with the vSphere Web Client

You can add ESXi hosts to the vSphere Auto Deploy inventory and create, monitor, and manage the vSphere Auto Deploy rules and ESXi host associations by using the vSphere Web Client.

Create a Deploy Rule

Before you provision ESXi hosts with vSphere Auto Deploy, you must create rules that assign image profiles, host profiles, and host locations to the hosts. An ESXi host can match more than one vSphere Auto Deploy rule criteria, when this is the case, the rule order is considered.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- If you want to include an image profile to the rule, verify that the software depot you need is added to the inventory. See Add a Software Depot or Import a Software Depot.

Procedure

1. **Start the New Deploy Rule Wizard**

   You can create a new vSphere Auto Deploy rule by using the **New Deploy Rule** wizard.
2 Name the Rule and Define Matching Criteria in the New Deploy Rule Wizard
When you start the New Deploy Rule wizard, you must first enter a rule name and select a pattern to apply the rule to some or all hosts in the inventory.

3 Select an Image Profile in the New Deploy Rule Wizard
In the New Deploy Rule wizard, you can optionally assign an image profile to the hosts that match the rule criteria.

4 Select a Host Profile in the New Deploy Rule Wizard
In the New Deploy Rule wizard, you can optionally assign a host profile to the hosts that match the rule criteria.

5 Select Host Location in the New Deploy Rule Wizard
In the New Deploy Rule wizard, you can optionally add the hosts that match the criteria of the rule to a specific location.

6 View the Summary of the New Deploy Rule Wizard
In the New Deploy Rule wizard, you can review the settings of the new vSphere Auto Deploy rule before completing the wizard.

What to do next
- Activate a vSphere Auto Deploy rule. See Activate, Deactivate, and Reorder Deploy Rules.
- Edit a vSphere Auto Deploy rule. See Editing a Deploy Rule.
- View the image profile, host profile, and location associations of a host. See View Host Associations.
- Remediate non-compliant hosts. See Remediate a Non-compliant Host.
- Change the image profile association of a host. See Edit the Image Profile Association of a Host.

Start the New Deploy Rule Wizard
You can create a new vSphere Auto Deploy rule by using the New Deploy Rule wizard.

Procedure
1 On the vSphere Web Client Home page, click Auto Deploy.
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2 On the Deploy Rules tab, click New Deploy Rule.

The New Deploy Rule wizard appears.

Name the Rule and Define Matching Criteria in the New Deploy Rule Wizard
When you start the New Deploy Rule wizard, you must first enter a rule name and select a pattern to apply the rule to some or all hosts in the inventory.

Procedure
1 On the Name and hosts page of the wizard, enter a name for the new rule.
2 Select a pattern to apply the rule to the hosts in the inventory.

You can select to apply the rule to all the hosts in the inventory or to apply the rule only to hosts that match a specific pattern. You can select one or more patterns.

For example, the rule can apply only to hosts in a vCenter Single Sign-On domain, with a specific host name, or that match a specific IPv4 range.

3 Click Next.

Select an Image Profile in the New Deploy Rule Wizard

In the New Deploy Rule wizard, you can optionally assign an image profile to the hosts that match the rule criteria.

Prerequisites

If you want to include an image profile to the rule, verify that the software depot you need is added to the inventory. See Add a Software Depot or Import a Software Depot.

Procedure

1 On the Select image profile page of the wizard, select an image profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to assign an image profile to the selected hosts</td>
<td>Select the <strong>No image profile</strong> check box.</td>
</tr>
<tr>
<td>If you want to assign an image profile to the selected hosts</td>
<td>1 Select a software depot from the drop-down menu.</td>
</tr>
<tr>
<td></td>
<td>2 Select an image profile from the list.</td>
</tr>
<tr>
<td></td>
<td>3 (Optional) If you want to bypass the acceptance level verification for the image profile, select the <strong>Skip image profile signature check</strong> check box.</td>
</tr>
</tbody>
</table>

2 Click Next.

Select a Host Profile in the New Deploy Rule Wizard

In the New Deploy Rule wizard, you can optionally assign a host profile to the hosts that match the rule criteria.

Procedure

1 On the Select host profile page of the wizard, select a host profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to assign a host profile to the selected hosts</td>
<td>Select the <strong>Do not include a host profile</strong> check box.</td>
</tr>
<tr>
<td>If you want to assign a host profile to the selected hosts</td>
<td>Select a host profile from the list.</td>
</tr>
</tbody>
</table>

2 Click Next.
Select Host Location in the New Deploy Rule Wizard

In the New Deploy Rule wizard, you can optionally add the hosts that match the criteria of the rule to a specific location.

Procedure

1. On the Select host location page of the wizard, select a location for the hosts that match the rule.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to select a host location</td>
<td>Select the Do not include a location check box.</td>
</tr>
<tr>
<td>If you want to select a specific location for the selected hosts</td>
<td>Select a data center, folder, or cluster as host location.</td>
</tr>
</tbody>
</table>

2. Click Next.

View the Summary of the New Deploy Rule Wizard

In the New Deploy Rule wizard, you can review the settings of the new vSphere Auto Deploy rule before completing the wizard.

Procedure

1. On the Ready to complete page, review the summary information for the new rule.
2. Click Finish.

You can view the newly created rule listed on the Deploy Rules tab.

Clone a Deploy Rule

You can use a vSphere Auto Deploy rule as a template and modify only parts of the rule instead of creating a new one.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.
- If you want to include an image profile to the rule, verify that the software depot you need is added to the inventory. See Add a Software Depot or Import a Software Depot.

Procedure

1. Start the Clone Deploy Rule Wizard
   You can clone an existing vSphere Auto Deploy rule by using the Clone Deploy Rule wizard.

2. Name the Rule and Define Matching Criteria in the Clone Deploy Rule Wizard
   When you start the Clone Deploy Rule wizard to clone a vSphere Auto Deploy rule, you must first choose whether to keep the default name of the cloned rule and whether to change the matching criteria of the rule.
Select an Image Profile in the Clone Deploy Rule Wizard
In the Clone Deploy Rule wizard, you can optionally assign an image profile to the hosts that match the rule criteria or keep the same image profile that the cloned rule uses.

Select a Host Profile in the Clone Deploy Rule Wizard
In the Clone Deploy Rule wizard, you can optionally assign a host profile to the hosts that match the rule criteria or keep the same host profile used in the cloned rule.

Select Host Location in the Clone Deploy Rule
In the Clone Deploy Rule wizard, you can optionally add the hosts that match the criteria of the rule to a specific location or keep the location that the cloned rule uses.

View the Summary of the Clone Deploy Rule Wizard
You can review the settings of the cloned vSphere Auto Deploy rule before completing the wizard.

What to do next
- Activate a vSphere Auto Deploy rule. See Activate, Deactivate, and Reorder Deploy Rules.
- Edit a vSphere Auto Deploy rule. See Editing a Deploy Rule.

Start the Clone Deploy Rule Wizard
You can clone an existing vSphere Auto Deploy rule by using the Clone Deploy Rule wizard.

Procedure
1. On the vSphere Web Client Home page, click Auto Deploy.
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.
2. On the Deploy Rules tab, select a rule from the list.
3. Click the Clone icon.
   The Clone Deploy Rule wizard appears.

Name the Rule and Define Matching Criteria in the Clone Deploy Rule Wizard
When you start the Clone Deploy Rule wizard to clone a vSphere Auto Deploy rule, you must first choose whether to keep the default name of the cloned rule and whether to change the matching criteria of the rule.

Procedure
1. On the Name and hosts page of the wizard, enter a name for the new rule.
2. Select a pattern to apply the rule to the hosts in the inventory.
   You can select to apply the rule to all the hosts in the inventory or to apply the rule only to hosts that match a specific pattern. You can select one or more patterns.
   For example, the rule can apply only to hosts in a vCenter Single Sign-On domain, with a specific host name, or that match a specific IPv4 range.
3 Click Next.

Select an Image Profile in the Clone Deploy Rule Wizard

In the Clone Deploy Rule wizard, you can optionally assign an image profile to the hosts that match the rule criteria or keep the same image profile that the cloned rule uses.

Prerequisites

If you want to include an image profile to the rule, verify that the software depot you need is added to the inventory. See Add a Software Depot or Import a Software Depot.

Procedure

1 On the Select image profile page of the wizard, select an image profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to change the image profile</td>
<td>Select the Same image profile option.</td>
</tr>
<tr>
<td>If you do not want to assign an image profile to the selected hosts</td>
<td>Select the No image profile option.</td>
</tr>
</tbody>
</table>
| If you want to assign a new image profile to the selected hosts | 1 Select the Browse for Image Profile option.  
2 Select a software depot from the drop-down menu.  
3 Select an image profile from the list.  
4 (Optional) If you want to bypass the acceptance level verification for the image profile, select the Skip image profile signature check check box. |

2 Click Next.

Select a Host Profile in the Clone Deploy Rule Wizard

In the Clone Deploy Rule wizard, you can optionally assign a host profile to the hosts that match the rule criteria or keep the same host profile used in the cloned rule.

Procedure

◆ On the Select host profile page of the wizard, select a host profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you want to keep the host profile used in the cloned rule</td>
<td>Click Next.</td>
</tr>
<tr>
<td>If you do not want to assign a host profile to the selected hosts</td>
<td>Select the Do not include a host profile check box and click Next.</td>
</tr>
<tr>
<td>If you want to assign a new host profile to the selected hosts</td>
<td>Select a host profile from the list and click Next.</td>
</tr>
</tbody>
</table>

Select Host Location in the Clone Deploy Rule

In the Clone Deploy Rule wizard, you can optionally add the hosts that match the criteria of the rule to a specific location or keep the location that the cloned rule uses.
Procedure

1. On the Select host location page of the wizard, select a location for the hosts that match the rule.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you want to keep the host location used in the cloned rule</td>
<td>Leave the default location.</td>
</tr>
<tr>
<td>If you do not want the rule to include a host location</td>
<td>Select the Do not include a host profile check box.</td>
</tr>
<tr>
<td>If you want to select a new location for the selected hosts</td>
<td>Select a data center, folder, or cluster as host location.</td>
</tr>
</tbody>
</table>

2. Click Next.

View the Summary of the Clone Deploy Rule Wizard

You can review the settings of the cloned vSphere Auto Deploy rule before completing the wizard.

Procedure

1. On the Ready to complete page, review the summary information for the new rule.

2. Click Finish.

You can view the newly created rule listed on the Deploy Rules tab.

Editing a Deploy Rule

You can edit a vSphere Auto Deploy rule only if it is in inactive state in the inventory. You can edit the name of the rule, the matching hosts, the assigned image profile, host profile, and host location.

- Edit the Name and Matching Hosts of a Rule
  
  If a rule in the inventory is in inactive state, you can edit its name and change the selection of hosts that match the rule criteria.

- Edit a Rule to Assign a Different Image Profile to Hosts
  
  If a rule in the inventory is in inactive state, you can edit the rule and assign a different image profile to the hosts matching it.

- Edit a Rule to Assign a Different Host Profile to Hosts
  
  If a rule in the inventory is in inactive state, you can edit the rule and assign a different host profile to the hosts that match the criteria for the rule.

- Edit the Host Location of a Rule
  
  If a rule in the inventory is in inactive state, you can edit the rule and assign a different host location to the hosts that match the rule criteria.

Edit the Name and Matching Hosts of a Rule

If a rule in the inventory is in inactive state, you can edit its name and change the selection of hosts that match the rule criteria.
Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.

Procedure

1. On the vSphere Web Client Home page, click Auto Deploy.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2. On the Deploy Rules tab, from the list of rules in the inventory select the rule that you want to edit and click Edit.
   
   The Edit Deploy Rule dialog box appears.

3. Select the Name and hosts page and enter a new name of the rule.

4. Select a pattern to apply the rule to the hosts in the inventory.
   
   You can select to apply the rule to all the hosts in the inventory or to apply the rule only to hosts that match a specific pattern. You can select one or more patterns.
   
   For example, the rule can apply only to hosts in a vCenter Single Sign-On domain, with a specific host name, or that match a specific IPv4 range.

5. Click OK.

Edit a Rule to Assign a Different Image Profile to Hosts

If a rule in the inventory is in inactive state, you can edit the rule and assign a different image profile to the hosts matching it.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.

Procedure

1. On the vSphere Web Client Home page, click Auto Deploy.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2. On the Deploy Rules tab, from the list of rules in the inventory select the rule that you want to edit and click Edit.
   
   The Edit Deploy Rule dialog box appears.
3 Select the Select image profile page to assign an image profile to the hosts that match the rule criteria.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to change the image profile</td>
<td>Select the Same image profile option.</td>
</tr>
<tr>
<td>If you do not want to assign an image profile to the selected hosts</td>
<td>Select the No image profile option.</td>
</tr>
</tbody>
</table>
| If you want to assign a new image profile to the selected hosts | 1. Select the Browse for Image Profile option.  
2. Select a software depot from the drop-down menu.  
3. Select an image profile from the list.  
4. (Optional) If you want to bypass the acceptance level verification for the image profile, select the Skip image profile signature check check box. |

4 Click OK.

Edit a Rule to Assign a Different Host Profile to Hosts

If a rule in the inventory is in inactive state, you can edit the rule and assign a different host profile to the hosts that match the criteria for the rule.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.

Procedure

1 On the vSphere Web Client Home page, click Auto Deploy.

   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2 On the Deploy Rules tab, from the list of rules in the inventory select the rule that you want to edit and click Edit.

   The Edit Deploy Rule dialog box appears.

3 Select the Select host profile page and assign a new host profile to the hosts matching the rule.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to assign a host profile to the selected hosts</td>
<td>Select the Do not include a host profile check box.</td>
</tr>
<tr>
<td>If you want to assign a host profile to the selected hosts</td>
<td>Select a host profile from the list.</td>
</tr>
</tbody>
</table>

4 Click OK.

Edit the Host Location of a Rule

If a rule in the inventory is in inactive state, you can edit the rule and assign a different host location to the hosts that match the rule criteria.
Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.

Procedure

1. On the vSphere Web Client Home page, click Auto Deploy.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2. On the Deploy Rules tab, from the list of rules in the inventory select the rule that you want to edit and click Edit.
   
   The Edit Deploy Rule dialog box appears.

3. Select the Select host location page and select a host location for the hosts matching the rule.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to select a host location</td>
<td>Select the Do not include a location check box.</td>
</tr>
<tr>
<td>If you want to select a specific location for the selected hosts</td>
<td>Select a data center, folder, or cluster as host location.</td>
</tr>
</tbody>
</table>

4. Click OK.

Activate, Deactivate, and Reorder Deploy Rules

After you create a vSphere Auto Deploy rule, the rule is in inactive state. You must activate the rule for it to take effect. You can use the Activate and Reorder wizard to activate, deactivate, and change the order of the rules.

The upper list on the Activate and Reorder page of the wizard displays the rules in the active rule set. The lower list displays the inactive rules.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see Prepare Your System for vSphere Auto Deploy.
- Create a vSphere Auto Deploy rule. See Create a Deploy Rule.

Procedure

1. On the vSphere Web Client Home page, click Auto Deploy.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

   
   The Activate and Reorder wizard appears.

3. (Optional) If you want to deactivate an active rule, select the rule from the active rules list and click the Deactivate button.

4. From the list of inactive rules, select the rule that you want to activate and click the Activate button.
5 (Optional) If you want to reorder the rules in the active rule list, select a rule that you want to move up or down in the list and click the **Move up** or **Move down** icon above the list of active rules.

The rules are listed by priority. For example, if two or more rules apply to the same host but are set to provision the host with different image profiles, host profiles, and locations, the rule that is highest in the list takes effect on the host.

6 (Optional) If you want to test an inactive rule before activation, select the **Test rules before activation** check box and click **Next**.

   a On the Select test targets page of the wizard, from the **Filter** tab select the hosts on which to test the inactive rule and click **Next**.
   
   The **Selected** tab displays only the selected hosts.

   b On the Preview test results page of the wizard, select a host from the list to view the current status of the host and the changes that are expected after the activation of the rule.
   
   If the host is compliant with the rule, you do not need to remediate the host after you activate the rule.

   c (Optional) If you want to remediate the selected hosts after the rule activation, select the **Remediate listed host associations after rule activation** check box.

7 Click **Next**.

8 Review the list of active rules and click **Finish**.

On the **Deploy Rules** tab, the rule is listed as active in the Status column.

**What to do next**

- View the image profile, host profile, and location associations of a host. See **View Host Associations**.
- Remediate non-compliant hosts. See **Remediate a Non-compliant Host**.

**View Host Associations**

Some of the hosts in the vSphere Auto Deploy inventory might not be compliant with the active deploy rules. To verify that one or more ESXi hosts are compliant with the active rule set, you must check the host associations compliance.

**Prerequisites**

- Prepare your system and install the Auto Deploy Server. For more information, see **Prepare Your System for vSphere Auto Deploy**.
- Create a vSphere Auto Deploy rule. See **Create a Deploy Rule**.
- Activate a vSphere Auto Deploy rule. See **Activate, Deactivate, and Reorder Deploy Rules**.

**Procedure**

1 On the vSphere Web Client Home page, click **Auto Deploy**.

   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.
2 Check the host associations compliance

The **Check Host Associations Compliance** window displays the current status of the host and whether the host is compliant with the active rule set. You can view the currently assigned image profile, host profile, host location, script bundle, and the associations that will take effect after a remediation of the host. You can assign a script bundle to a host only by using PowerCLI cmdlets.

<table>
<thead>
<tr>
<th>Option</th>
<th>Steps</th>
</tr>
</thead>
</table>
| If you want to check the host associations compliance of a single host | 1 On the **Deployed Hosts** tab, select an ESXi host.  
2 Click **Check Host Associations Compliance**.  
3 Check if the host associations are compliant with the current active rule set.  
4 Close the **Check Host Associations Compliance** window.  
   ■ If you want to remediate the host, click **Remediate**.  
   ■ If you do not want to remediate the host, click **Close**. |
| If you want to check the host associations compliance of multiple hosts | 1 On the **Deployed Hosts** tab, use Shift+left-click or Ctrl+left-click to select multiple ESXi hosts.  
2 Click **Check Host Associations Compliance**.  
3 Confirm that you want to check the compliance of all selected hosts.  
4 Review the compliance status of the hosts in the left pane.  
5 (Optional) In the left pane, select a host to view the compliance status details in the right pane.  
6 (Optional) Select one or multiple hosts and click **Remediate Selected Hosts** to remediate them.  
   ■ Click the check box of each host you want to select.  
   ■ Click the **Hosts** check box to select all hosts.  
7 Click **Close** to close the **Check Host Associations Compliance** window. |

**What to do next**

- Remediate non-compliant hosts. See **Remediate a Non-compliant Host**.
- Edit the image profile association of a host. See **Edit the Image Profile Association of a Host**.
- Edit a vSphere Auto Deploy rule. See **Editing a Deploy Rule**.

**Edit the Image Profile Association of a Host**

You can edit the image profile association of a single host if the host is not associated with a vSphere Auto Deploy rule or if you do not want to change the image profile association of multiple hosts by editing a rule.

**Prerequisites**

- Prepare your system and install the Auto Deploy Server. For more information, see **Prepare Your System for vSphere Auto Deploy**.
- Create a vSphere Auto Deploy rule. See **Create a Deploy Rule**.
- Activate a vSphere Auto Deploy rule. See **Activate, Deactivate, and Reorder Deploy Rules**.
Procedure

1. On the vSphere Web Client Home page, click **Auto Deploy**.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2. On the **Deployed Hosts** tab, select an ESXi host.

3. Click **Edit Image Profile Association**.
   
   The Edit Image Profile Association dialog box appears.

4. Edit the image profile association of the host.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to change the image profile</td>
<td>Select the <strong>Same image profile</strong> option.</td>
</tr>
</tbody>
</table>
| If you want to assign a new image profile to the selected hosts | 1. Select the **Browse for Image Profile** option.  
  2. Select a software depot from the drop-down menu.  
  3. Select an image profile from the list.  
  4. (Optional) If you want to bypass the acceptance level verification for the image profile, select the **Skip image profile signature check** check box. |

5. Click **OK**.

The new image profile is listed in the Image Profile column after a refresh of the page.

What to do next

- View the image profile, host profile, and location associations of a host. See [View Host Associations](#).
- If the host is associated with a rule and you want to revert to the image profile defined in the rule, remediate the host. See [Remediate a Non-compliant Host](#).

Remediate a Non-compliant Host

When you add a rule to the vSphere Auto Deploy active rule set or make changes to one or more rules, hosts are not updated automatically. You must remediate the host associations to apply the new rules to the host.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see [Prepare Your System for vSphere Auto Deploy](#).
- Create a vSphere Auto Deploy rule. See [Create a Deploy Rule](#).
- Activate a vSphere Auto Deploy rule. See [Activate, Deactivate, and Reorder Deploy Rules](#).
- If the remediation of a host, results in a change in its location, the host must be placed in maintenance mode.
Procedure

1. On the vSphere Web Client Home page, click **Auto Deploy**.
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2. On the **Deployed Hosts** tab, select an ESXi host.
   You can use Shift+left-click or Ctrl+left-click to select multiple hosts.

3. Click **Remediate Host Associations**.
   If you remediate a host that has an edited image profile association, the host reverts to the settings defined in the rule that it matches.
   You can monitor the progress of the remediation process in the Recent Tasks pane.

What to do next

- View the image profile, host profile, and location associations of a host. See [View Host Associations](#).
- Change the image profile association of a host. See [Edit the Image Profile Association of a Host](#).

Add a Host to the vSphere Auto Deploy Inventory

You can view the hosts that do not match any vSphere Auto Deploy rule and manually add a host to the vSphere Auto Deploy inventory.

To add a host to the current vSphere Auto Deploy inventory of deployed hosts, you can create a new rule or edit an existing rule to include a host that is not deployed with vSphere Auto Deploy and associate it with a specific image profile, host profile and location. Alternatively, you can add a host manually to the inventory by assigning to it an image profile, host profile, and location.

Prerequisites

- Prepare your system and install the Auto Deploy Server. For more information, see [Prepare Your System for vSphere Auto Deploy](#).
- To assign an image profile to the host, add the software depot that you need to the inventory. See [Add a Software Depot or Import a Software Depot](#).

Procedure

1. **Start the Add to Inventory Wizard**
   You can add a host that does not correspond to any vSphere Auto Deploy rule to the list of deployed hosts by using the Add to Inventory wizard.

2. **Select an Image Profile in the Add to Inventory Wizard**
   You can assign an image profile to a host that you want to add to the vSphere Auto Deploy inventory.

3. **Select a Host Profile in the Add to Inventory Wizard**
   You can optionally assign a host profile to a host that you want to add to the vSphere Auto Deploy inventory.
4 Select a Host Location in the Add to Inventory Wizard
You can assign a location to a host that you want to add to the vSphere Auto Deploy inventory.

5 View the Summary of the Add to Inventory Wizard
You can review the host associations before you complete the Add to Inventory wizard.

What to do next
- Edit a vSphere Auto Deploy rule. See Editing a Deploy Rule.
- View the image profile, host profile, and location associations of a host. See View Host Associations.
- Remediate non-compliant hosts. See Remediate a Non-compliant Host.

Start the Add to Inventory Wizard
You can add a host that does not correspond to any vSphere Auto Deploy rule to the list of deployed hosts by using the Add to Inventory wizard.

Procedure
1 On the vSphere Web Client Home page, click Auto Deploy.
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.
2 On the Discovered Hosts tab, select one or more hosts that you want to provision with an image profile, host profile, and location.
3 Select Add to Inventory.
   The Add to Inventory wizard appears.

Select an Image Profile in the Add to Inventory Wizard
You can assign an image profile to a host that you want to add to the vSphere Auto Deploy inventory.

Prerequisites
To assign an image profile to the host, add the software depot that you need to the inventory. See Add a Software Depot or Import a Software Depot.

Procedure
1 Select a software depot from the drop-down menu.
2 Select an image profile from the list of image profiles in the selected depot.
3 If you want to bypass the acceptance level verification of the image profile, select the Skip image profile signature check check box.
4 Select an image profile.
5 Click Next.

Select a Host Profile in the Add to Inventory Wizard
You can optionally assign a host profile to a host that you want to add to the vSphere Auto Deploy inventory.
Procedure

1 On the Select host profile page of the wizard, select a host profile.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to assign a host profile to the selected hosts</td>
<td>Select the <strong>Do not include a host profile</strong> check box.</td>
</tr>
<tr>
<td>If you want to assign a host profile to the selected hosts</td>
<td>Select a host profile from the list.</td>
</tr>
</tbody>
</table>

2 Click **Next**.

Select a Host Location in the Add to Inventory Wizard

You can assign a location to a host that you want to add to the vSphere Auto Deploy inventory.

Procedure

1 Select a data center, folder, or cluster as the location for the host.

2 Click **Next**.

View the Summary of the Add to Inventory Wizard

You can review the host associations before you complete the Add to Inventory wizard.

Procedure

1 On the Ready to complete page, review the selected host associations.

2 Click **Finish**.

Provisioning ESXi Systems with vSphere Auto Deploy

vSphere Auto Deploy can provision hundreds of physical hosts with ESXi software. You can provision hosts that did not previously run ESXi software (first boot), reboot hosts, or reprovision hosts with a different image profile, host profile, custom script, or folder or cluster location.

The vSphere Auto Deploy process differs depending on the state of the host and on the changes that you want to make.

Provision a Host (First Boot)

Provisioning a host that has never been provisioned with vSphere Auto Deploy (first boot) differs from subsequent boot processes. You must prepare the host and fulfill all other prerequisites before you can provision the host. You can optionally define a custom image profile with vSphere ESXi Image Builder by using the vSphere Web Client or PowerCLI cmdlets.

Prerequisites

- Make sure your host meets the hardware requirements for ESXi hosts. See [ESXi Hardware Requirements](#).
- Prepare the system for vSphere Auto Deploy. See [Preparing for vSphere Auto Deploy](#).
Write rules that assign an image profile to the host and optionally assign a host profile and a vCenter Server location to the host. See Managing vSphere Auto Deploy with PowerCLI Cmdlets or Managing vSphere Auto Deploy with the vSphere Web Client.

When the setup is complete, the vSphere Auto Deploy service is enabled, DHCP setup is complete, and rules for the host that you want to provision are in the active rule set.

**Procedure**

1. Turn on the host.

   The host contacts the DHCP server and downloads iPXE from the location the server points it to. Next, the vSphere Auto Deploy server provisions the host with the image specified by the rule engine. The vSphere Auto Deploy server might also apply a host profile to the host if one is specified in the rule set. Finally, vSphere Auto Deploy adds the host to the vCenter Server system that is specified in the rule set.

2. (Optional) If vSphere Auto Deploy applies a host profile that requires user input such as an IP address, the host is placed in maintenance mode. Reapply the host profile with the vSphere Web Client and provide the user input when prompted.

   After the first boot process, the host is running and managed by a vCenter Server system. The vCenter Server stores the host's image profile, host profile, and location information.

   You can now reboot the host as needed. Each time you reboot, the host is reprovisioned by the vCenter Server system.

**What to do next**

Reprovision hosts as needed. See Reprovisioning Hosts.

If you want to change the image profile, host profile, custom script, or location of the host, update the rules and activate them by using the vSphere Web Client or perform a test and repair compliance operation in a PowerCLI session. See Rules and Rule Sets or Test and Repair Rule Compliance.

**Reprovisioning Hosts**

vSphere Auto Deploy supports multiple reprovisioning options. You can perform a simple reboot or reprovision with a different image profile or a different host profile.

A first boot using vSphere Auto Deploy requires that you set up your environment and add rules to the rule set. See Preparing for vSphere Auto Deploy.

The following reprovisioning operations are available.

- Simple reboot.
- Reboot of hosts for which the user answered questions during the boot operation.
- Reprovision with a different image profile.
- Reprovision with a different host profile.
Reprovision Hosts with Simple Reboot Operations

A simple reboot of a host that is provisioned with vSphere Auto Deploy requires only that all prerequisites are still met. The process uses the previously assigned image profile, host profile, custom script, and vCenter Server location.

Prerequisites

- Verify that the setup you performed during the first boot operation is in place. See Provision a Host (First Boot).
- Verify that all associated items like are available. An item can be an image profile, host profile, custom script or vCenter Server inventory location.
- Verify that the host has the identifying information (asset tag, IP address) it had during previous boot operations.

Procedure

1. Place the host in maintenance mode.

<table>
<thead>
<tr>
<th>Host Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host is part of a DRS cluster</td>
<td>VMware DRS migrates virtual machines to appropriate hosts when you place the host in maintenance mode.</td>
</tr>
<tr>
<td>Host is not part of a DRS cluster</td>
<td>You must migrate all virtual machines to different hosts and place each host in maintenance mode.</td>
</tr>
</tbody>
</table>

2. Reboot the host.

The host shuts down. When the host reboots, it uses the image profile that the vSphere Auto Deploy server provides. The vSphere Auto Deploy server also applies the host profile stored on the vCenter Server system.

Reprovision a Host with a New Image Profile by Using PowerCLI

You can use vSphere Auto Deploy to reprovision a host with a new image profile in a PowerCLI session by changing the rule for the host and performing a test and repair compliance operation.

Several options for reprovisioning hosts exist.

- If the VIBs that you want to use support live update, you can use an `esxcli software vib` command. In that case, you must also update the rule set to use an image profile that includes the new VIBs.
- During testing, you can apply an image profile to an individual host with the `Apply-EsxImageProfile` cmdlet and reboot the host so the change takes effect. The `Apply-EsxImageProfile` cmdlet updates the association between the host and the image profile but does not install VIBs on the host.
- In all other cases, use this procedure.
Prerequisites

- Verify that the image profile you want to use to reprovision the host is available. Use vSphere ESXi Image Builder in a PowerCLI session. See Customizing Installations with vSphere ESXi Image Builder.
- Verify that the setup you performed during the first boot operation is in place.

Procedure

1. At the PowerShell prompt, run the `Connect-VIServer` PowerCLI cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

   ```powershell
   Connect-VIServer ipv4_or_ipv6_address
   ```

   The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2. Determine the location of a public software depot that contains the image profile that you want to use, or define a custom image profile with vSphere ESXi Image Builder.

3. Run `Add-EsxSoftwareDepot` to add the software depot that contains the image profile to the PowerCLI session.

<table>
<thead>
<tr>
<th>Depot Type</th>
<th>Cmdlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote depot</td>
<td>Run <code>Add-EsxSoftwareDepot depot_url</code>.</td>
</tr>
</tbody>
</table>
   | ZIP file          | a Download the ZIP file to a local file path or create a mount point local to the PowerCLI machine.  
   |                   | b Run `Add-EsxSoftwareDepot C:\file_path\my_offline_depot.zip`. |

4. Run `Get-EsxImageProfile` to see a list of image profiles, and decide which profile you want to use.

5. Run `Copy-DeployRule` and specify the `ReplaceItem` parameter to change the rule that assigns an image profile to hosts.

   The following cmdlet replaces the current image profile that the rule assigns to the host with the `my_new_imageprofile` profile. After the cmdlet completes, `myrule` assigns the new image profile to hosts. The old version of `myrule` is renamed and hidden.

   ```powershell
   Copy-DeployRule myrule -ReplaceItem my_new_imageprofile
   ```
6 Test the rule compliance for each host that you want to deploy the image to.
   a Verify that you can access the host for which you want to test rule set compliance.
      
      ```powershell
      Get-VMHost -Name ESXi_hostname
      ```
   b Run the cmdlet that tests rule set compliance for the host, and bind the return value to a variable for later use.
      
      ```powershell
      $tr = Test-DeployRuleSetCompliance ESXi_hostname
      ```
   c Examine the differences between the contents of the rule set and configuration of the host.
      
      ```powershell
      $tr.itemlist
      ```
      
      The system returns a table of current and expected items if the host for which you want to test the new rule set compliance is compliant with the active rule set.

      | CurrentItem          | ExpectedItem          |
      |---------------------|-----------------------|
      | my_old_imageprofile | my_new_imageprofile   |

d Remediate the host to use the revised rule set the next time you boot the host.

   ```powershell
   Repair-DeployRuleSetCompliance $tr
   ```

7 Reboot the host to provision it with the new image profile.

**Reprovision a Host with a New Image Profile by Using the vSphere Web Client**

You can use vSphere Auto Deploy to reprovision a host with a new image profile with the vSphere Web Client by changing the rule that the host corresponds to and activating the rule.

**Prerequisites**

- Verify that the image profile you want to use to reprovision the host is available. See Create an Image Profile.
- Verify that the setup you performed during the first boot operation is in place.

**Procedure**

1 On the vSphere Web Client Home page, click **Auto Deploy**.
   
   By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

2 On the **Deploy Rules** tab, from the list of rules in the inventory select the rule that you want to edit and click **Edit**.
   
   The Edit Deploy Rule dialog box appears.
3 Select the **Select image profile** page to assign an image profile to the hosts that match the rule criteria.

<table>
<thead>
<tr>
<th>Option</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you do not want to change the image profile</td>
<td>Select the <strong>Same image profile</strong> option.</td>
</tr>
<tr>
<td>If you do not want to assign an image profile to the selected hosts</td>
<td>Select the <strong>No image profile</strong> option.</td>
</tr>
</tbody>
</table>
| If you want to assign a new image profile to the selected hosts | 1. Select the **Browse for Image Profile** option.  
   2. Select a software depot from the drop-down menu.  
   3. Select an image profile from the list.  
   4. (Optional) If you want to bypass the acceptance level verification for the image profile, select the **Skip image profile signature check** check box. |

4 Click **Activate/Deactivate rules**.

5 From the list of inactive rules, select the rule that you want to activate and click the **Activate** button.

6 (Optional) If you want to reorder the rules in the active rule list, select a rule that you want to move up or down in the list and click the **Move up** or **Move down** icon above the list of active rules.

   The rules are listed by priority. For example, if two or more rules apply to the same host but are set to provision the host with different image profiles, host profiles, and locations, the rule that is highest in the list takes effect on the host.

7 (Optional) If you want to test an inactive rule before activation, select the **Test rules before activation** check box and click **Next**.

   a On the Select test targets page of the wizard, from the **Filter** tab select the hosts on which to test the inactive rule and click **Next**.

      The **Selected** tab displays only the selected hosts.

   b On the Preview test results page of the wizard, select a host from the list to view the current status of the host and the changes that are expected after the activation of the rule.

      If the host is compliant with the rule, you do not need to remediate the host after you activate the rule.

   c (Optional) If you want to remediate the selected hosts after the rule activation, select the **Remediate listed host associations after rule activation** check box.

8 Click **Next**.

9 Review the list of active rules and click **Finish**.

10 Reboot the host to provision it with the new image profile.

**Update the Host Customization in the vSphere Web Client**

If a host required user input during a previous boot, the answers are saved with the vCenter Server. If you want to prompt the user for new information, you must remediate the host.
Prerequisites

Attach a host profile that prompts for user input to the host.

Procedure

1. Migrate all virtual machines to different hosts, and place the host into maintenance mode.

<table>
<thead>
<tr>
<th>Host Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host is part of a DRS cluster</td>
<td>VMware DRS migrates virtual machines to appropriate hosts when you place the host in maintenance mode.</td>
</tr>
<tr>
<td>Host is not part of a DRS cluster</td>
<td>You must migrate all virtual machines to different hosts and place each host in maintenance mode.</td>
</tr>
</tbody>
</table>

2. On the vSphere Web Client Home page, click Auto Deploy.

By default, only the Administrator role has privileges to use the vSphere Auto Deploy service.

3. On the Deployed Hosts tab, select an ESXi host.

4. Click Remediate Host Associations.

You can monitor the progress of the remediation process in the Recent Tasks pane.

5. When prompted, provide the user input.

6. Direct the host to exit maintenance mode.

The host customization is saved and takes effect the next time you boot the host.

Using vSphere Auto Deploy for Stateless Caching and Stateful Installs

The vSphere Auto Deploy stateless caching feature lets you cache the host’s image. The vSphere Auto Deploy stateful installs feature lets you install hosts over the network. After the initial network boot, these hosts boot like other ESXi hosts.

The stateless caching solution is primarily intended for situations when several hosts boot simultaneously. The locally cached image helps prevent a bottleneck that results if several hundreds of hosts connect to the vSphere Auto Deploy server simultaneously. After the boot operation is complete, hosts connect to vSphere Auto Deploy to complete the setup.

The stateful installs feature lets you provision hosts with the image profile over the network without having to set up the PXE boot infrastructure.

- Introduction to Stateless Caching and Stateful Installs
  You can use the System Cache Configuration host profile to provision hosts with vSphere Auto Deploy stateless caching and stateful installs.

- Understanding Stateless Caching and Stateful Installs
  When you want to use vSphere Auto Deploy with stateless caching or stateful installs, you must set up a host profile, apply the host profile, and set the boot order.
Configure a Host Profile to Use Stateless Caching

When a host is set up to use stateless caching, the host uses a cached image if the vSphere Auto Deploy Server is not available. To use stateless caching, you must configure a host profile. You can apply that host profile to other hosts that you want to set up for stateless caching.

Configure a Host Profile to Enable Stateful Installs

To set up a host provisioned with vSphere Auto Deploy to boot from disk, you must configure a host profile. You can apply that host profile to other hosts that you want to set up for stateful installs.

Introduction to Stateless Caching and Stateful Installs

You can use the System Cache Configuration host profile to provision hosts with vSphere Auto Deploy stateless caching and stateful installs.

Examples of Stateless Caching and Stateful Installs

Hosts provisioned with vSphere Auto Deploy cache the image (stateless caching)

Set up and apply a host profile for stateless caching. You can cache the image on a local disk, a remote disk, or a USB drive. Continue provisioning this host with vSphere Auto Deploy. If the vSphere Auto Deploy server becomes unavailable, for example because hundreds of hosts attempt to access it simultaneously, the host boots from the cache. The host attempts to reach the vSphere Auto Deploy server after the boot operation to complete configuration.

Hosts provisioned with vSphere Auto Deploy become stateful hosts

Set up and apply a host profile for stateful installs. When you provision a host with vSphere Auto Deploy, the image is installed on the local disk, a remote disk, or a USB drive. For subsequent boots, you boot from the disk. The host no longer uses vSphere Auto Deploy.

Preparation

To successfully use stateless caching or stateful installs, decide how to configure the system and set the boot order.
Table 5-17. Preparation for Stateless Caching or Stateful Installs

<table>
<thead>
<tr>
<th>Requirement or Decision</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decide on VMFS partition overwrite</td>
<td>When you install ESXi by using the interactive installer, you are prompted whether you want to overwrite an existing VMFS datastore. The System Cache Configuration host profile provides an option to overwrite existing VMFS partitions. The option is not available if you set up the host profile to use a USB drive.</td>
</tr>
<tr>
<td>Decide whether you need a highly available environment</td>
<td>If you use vSphere Auto Deploy with stateless caching, you can set up a highly available vSphere Auto Deploy environment to guarantee that virtual machines are migrated on newly provisioned hosts and that the environment supports vNetwork Distributed Switch even if the vCenter Server system becomes temporarily unavailable.</td>
</tr>
<tr>
<td>Set the boot order</td>
<td>The boot order you specify for your hosts depends on the feature you want to use.</td>
</tr>
<tr>
<td></td>
<td>- To set up vSphere Auto Deploy with stateless caching, configure your host to first attempt to boot from the network, and to then attempt to boot from disk. If the vSphere Auto Deploy server is not available, the host boots using the cache.</td>
</tr>
<tr>
<td></td>
<td>- To set up vSphere Auto Deploy for stateful installs on hosts that do not currently have a bootable disk, configure your hosts to first attempt to boot from disk, and to then attempt to boot from the network.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> If you currently have a bootable image on the disk, configure the hosts for one-time PXE boot, and provision the host with vSphere Auto Deploy to use a host profile that specifies stateful installs.</td>
</tr>
</tbody>
</table>

Stateless Caching and Loss of Connectivity

If the ESXi hosts that run your virtual machines lose connectivity to the vSphere Auto Deploy server, the vCenter Server system, or both, some limitations apply the next time you reboot the host.

- If vCenter Server is available but the vSphere Auto Deploy server is unavailable, hosts do not connect to the vCenter Server system automatically. You can manually connect the hosts to the vCenter Server, or wait until the vSphere Auto Deploy server is available again.

- If both vCenter Server and vSphere Auto Deploy are unavailable, you can connect to each ESXi host by using the VMware Host Client, and add virtual machines to each host.

- If vCenter Server is not available, vSphere DRS does not work. The vSphere Auto Deploy server cannot add hosts to the vCenter Server. You can connect to each ESXi host by using the VMware Host Client, and add virtual machines to each host.

- If you make changes to your setup while connectivity is lost, the changes are lost when the connection to the vSphere Auto Deploy server is restored.
Understanding Stateless Caching and Stateful Installs

When you want to use vSphere Auto Deploy with stateless caching or stateful installs, you must set up a host profile, apply the host profile, and set the boot order.

When you apply a host profile that enables caching to a host, vSphere Auto Deploy partitions the specified disk. What happens next depends on how you set up the host profile and how you set the boot order on the host.

- vSphere Auto Deploy caches the image when you apply the host profile if **Enable stateless caching on the host** is selected in the System Cache Configuration host profile. No reboot is required. When you later reboot, the host continues to use the vSphere Auto Deploy infrastructure to retrieve its image. If the vSphere Auto Deploy server is not available, the host uses the cached image.

- vSphere Auto Deploy installs the image if **Enable stateful installs on the host** is selected in the System Cache Configuration host profile. When you reboot, the host initially boots using vSphere Auto Deploy to complete the installation. A reboot is then issued automatically, after which the host boots from disk, similar to a host that was provisioned with the installer. vSphere Auto Deploy no longer provisions the host.

You can apply the host profile from the vSphere Web Client, or write a vSphere Auto Deploy rule in a PowerCLI session that applies the host profile.

Using the vSphere Web Client to Set Up vSphere Auto Deploy for Stateless Caching or Stateful Installs

You can create a host profile on a reference host and apply that host profile to additional hosts or to a vCenter Server folder or cluster. The following workflow results.

1. You provision a host with vSphere Auto Deploy and edit that host's System Image Cache Configuration host profile.

2. You place one or more target hosts in maintenance mode, apply the host profile to each host, and instruct the host to exit maintenance mode.

3. What happens next depends on the host profile you selected.

   - If the host profile enabled stateless caching, the image is cached to disk. No reboot is required.
   - If the host profile enabled stateful installs, the image is installed. When you reboot, the host uses the installed image.

Using PowerCLI to Set Up vSphere Auto Deploy for Stateless Caching or Stateful Installs

You can create a host profile for a reference host and write a vSphere Auto Deploy rule that applies that host profile to other target hosts in a PowerCLI session. The following workflow results.

1. You provision a reference host with vSphere Auto Deploy and create a host profile to enable a form of caching.

2. You write a rule that provisions additional hosts with vSphere Auto Deploy and that applies the host profile of the reference host to those hosts.
vSphere Auto Deploy provisions each host with the image profile or by using the script bundle associated with the rule. The exact effect of applying the host profile depends on the host profile you selected.

- For stateful installs, vSphere Auto Deploy proceeds as follows:
  - During first boot, vSphere Auto Deploy installs the image on the host.
  - During subsequent boots, the host boots from disk. The hosts do not need a connection to the vSphere Auto Deploy server.

- For stateless caching, vSphere Auto Deploy proceeds as follows:
  - During first boot, vSphere Auto Deploy provisions the host and caches the image.
  - During subsequent boots, vSphere Auto Deploy provisions the host. If vSphere Auto Deploy is unavailable, the host boots from the cached image, however, setup can only be completed when the host can reach the vSphere Auto Deploy server.

### Configure a Host Profile to Use Stateless Caching

When a host is set up to use stateless caching, the host uses a cached image if the vSphere Auto Deploy Server is not available. To use stateless caching, you must configure a host profile. You can apply that host profile to other hosts that you want to set up for stateless caching.

#### Prerequisites

- Decide which disk to use for caching and determine whether the caching process will overwrite an existing VMFS partition.
- In production environments, protect the vCenter Server system and the vSphere Auto Deploy server by including them in a highly available environment. Having the vCenter Server in a management cluster guarantees that VDS and virtual machine migration are available. If possible, also protect other elements of your infrastructure. See Set Up Highly Available vSphere Auto Deploy Infrastructure.
- Set up your environment for vSphere Auto Deploy. See Preparing for vSphere Auto Deploy.
- Verify that a disk with at least 1GB of free space is available. If the disk is not yet partitioned, partitioning happens when you apply the host profile.
- Set up the host to attempt a network boot first and to boot from disk if network boot fails. See your hardware vendor’s documentation.
- Create a host profile. See the Host Profiles documentation.

#### Procedure

1. On the vSphere Web Client Home page, click Host Profiles.
2. Select the host profile you want to configure and select the Manage tab.
3. Click Edit Host Profile.
4. Leave the name and description and click Next.
5. On the Edit host profile page of the wizard, select **Advanced Configuration Settings > System Image Cache Configuration > System Image Cache Configuration**.

6. In the **System Image Cache Profile Settings** drop-down menu, choose a policy option.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable stateless caching on the host</td>
<td>Caches the image to disk.</td>
</tr>
<tr>
<td>Enable stateless caching to a USB disk on the host</td>
<td>Caches the image to a USB disk attached to the host.</td>
</tr>
</tbody>
</table>

7. (Optional) If you select **Enable stateless caching on the host**, specify the information about the disk to use.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arguments for first disk</td>
<td>By default, the system attempts to replace an existing ESXi installation, and then attempts to write to the local disk.</td>
</tr>
<tr>
<td></td>
<td>You can use the <strong>Arguments for first disk</strong> field to specify a comma-separated list of disks to use, in order of preference. You can specify more than one disk. Use <strong>esx</strong> for the first disk with ESX installed on it, use model and vendor information, or specify the name of the vmkernel device driver. For example, to have the system first look for a disk with the model name ST3120814A, second for any disk that uses the mptsas driver, and third for the local disk, specify ST3120814A,mptsas,local as the value of this field. The first disk setting in the host profile specifies the search order for determining which disk to use for the cache. The search order is specified as a comma delimited list of values. The default setting localesx,local specifies that vSphere Auto Deploy should first look for an existing local cache disk. The cache disk is identified as a disk with an existing ESXi software image. If vSphere Auto Deploy cannot find an existing cache disk, it searches for an available local disk device. When searching for an available disk vSphere Auto Deploy uses the first empty disk that does not have an existing VMFS partition. You can use the first disk argument only to specify the search order. You cannot explicitly specify a disk. For example, you cannot specify a specific LUN on a SAN.</td>
</tr>
<tr>
<td>Check to overwrite any VMFS volumes on the selected disk</td>
<td>If you select this check box, the system overwrites existing VMFS volumes if not enough space is available to store the image, image profile, and host profile.</td>
</tr>
<tr>
<td>Check to ignore any SSD devices connected to the host</td>
<td>If you select this check box, the system ignores any existing SSD devices and does not store image profiles and host profiles on them.</td>
</tr>
</tbody>
</table>

8. Click **Finish** to complete the host profile configuration.

**What to do next**

Apply the host profile to individual hosts by using the host profiles feature in the vSphere Web Client. See the **Host Profiles** documentation. Alternatively, you can create a rule to assign the host profile to hosts with the vSphere Web Client or by using PowerCLI. See **Write a Rule and Assign a Host Profile to Hosts**.

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see **Write a Rule and Assign a Host Profile to Hosts**.
For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see Test and Repair Rule Compliance.

Power on unprovisioned hosts to provision them with the new host profile.

Configure a Host Profile to Enable Stateful Installs

To set up a host provisioned with vSphere Auto Deploy to boot from disk, you must configure a host profile. You can apply that host profile to other hosts that you want to set up for stateful installs.

You can configure the host profile on a single host. You can also create a host profile on a reference host and apply that host profile to other hosts.

Prerequisites

- Decide which disk to use for storing the image, and determine whether the new image will overwrite an existing VMFS partition.
- Set up your environment for vSphere Auto Deploy. See Preparing for vSphere Auto Deploy.
- Verify that a disk with at least 1GB of free space is available. If the disk is not yet partitioned, partitioning happens when you apply the host profile.
- Set up the host to boot from disk. See your hardware vendor's documentation.
- Create a host profile. See the Host Profiles documentation.

Procedure

1. On the vSphere Web Client Home page, click Host Profiles.
2. Select the host profile you want to configure and select the Manage tab.
3. Click Edit Host Profile.
4. Leave the name and description and click Next.
6. In the System Image Cache Profile Settings drop-down menu, choose a policy option.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable stateful installs on the host</td>
<td>Caches the image to a disk.</td>
</tr>
<tr>
<td>Enable stateful installs to a USB disk on the host</td>
<td>Caches the image to a USB disk attached to the host.</td>
</tr>
</tbody>
</table>
7  (Optional) If you select **Enable stateful installs on the host**, specify information about the disk to use.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arguments for first disk</td>
<td>By default, the system attempts to replace an existing ESXi installation, and then attempts to write to the local disk. You can use the <strong>Arguments for first disk</strong> field to specify a comma-separated list of disks to use, in order of preference. You can specify more than one disk. Use esx for the first disk with ESX installed on it, use model and vendor information, or specify the name of the vmkernel device driver. For example, to have the system first look for a disk with the model name ST3120814A, second for any disk that uses the mptsas driver, and third for the local disk, specify ST3120814A,mptsas,local as the value of this field. The first disk setting in the host profile specifies the search order for determining which disk to use for the cache. The search order is specified as a comma delimited list of values. The default setting localesx,local specifies that vSphere Auto Deploy should first look for an existing local cache disk. The cache disk is identified as a disk with an existing ESXi software image. If vSphere Auto Deploy cannot find an existing cache disk, it searches for an available local disk device. When searching for an available disk vSphere Auto Deploy uses the first empty disk that does not have an existing VMFS partition. You can use the first disk argument only to specify the search order. You cannot explicitly specify a disk. For example, you cannot specify a specific LUN on a SAN.</td>
</tr>
<tr>
<td>Check to overwrite any VMFS volumes on the selected disk</td>
<td>If you select this check box, the system overwrites existing VMFS volumes if not enough space is available to store the image, image profile, and host profile.</td>
</tr>
<tr>
<td>Check to ignore any SSD devices connected to the host</td>
<td>If you select this check box, the system ignores any existing SSD devices and does not store image profiles and host profiles on them.</td>
</tr>
</tbody>
</table>

8  Click **Finish** to complete the host profile configuration.

**What to do next**

Apply the host profile to individual hosts by using the host profiles feature in the vSphere Web Client. See the *Host Profiles* documentation. Alternatively, you can create a rule to assign the host profile to hosts with the vSphere Web Client or by using PowerCLI. See *Write a Rule and Assign a Host Profile to Hosts*.

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see *Write a Rule and Assign a Host Profile to Hosts*.
- For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see *Test and Repair Rule Compliance*.
- Power on unprovisioned hosts to provision them with the new host profile.
Setting Up a vSphere Auto Deploy Reference Host

In an environment where no state is stored on the host, a reference host helps you set up multiple hosts with the same configuration. You configure the reference host with the logging, coredump, and other settings that you want, save the host profile, and write a rule that applies the host profile to other hosts as needed.

You can configure the storage, networking, and security settings on the reference host and set up services such as syslog and NTP.

Understanding Reference Host Setup

A well-designed reference host connects to all services such as syslog, NTP, and so on. The reference host setup might also include security, storage, networking, and ESXi Dump Collector. You can apply such a host's setup to other hosts by using host profiles.

The exact setup of your reference host depends on your environment, but you might consider the following customization.

NTP Server Setup

When you collect logging information in large environments, you must make sure that log times are coordinated. Set up the reference host to use the NTP server in your environment that all hosts can share. You can specify an NTP server by running the `vicfg-ntp` command. You can start and stop the NTP service for a host with the `vicfg-ntp` command, or the vSphere Web Client.

Syslog Server Setup

All ESXi hosts run a syslog service (`vmsyslogd`), which logs messages from the VMkernel and other system components to a file. You can specify the log host and manage the log location, rotation, size, and other attributes by running the `esxcli system syslog vCLI` command or by using the vSphere Web Client. Setting up logging on a remote host is especially important for hosts provisioned with vSphere Auto Deploy that have no local storage. You can optionally install the vSphere Syslog Collector to collect logs from all hosts.

Core Dump Setup

You can set up your reference host to send core dumps to a shared SAN LUN, or you can install ESXi Dump Collector in your environment and configure the reference host to use ESXi Dump Collector. See Configure ESXi Dump Collector with ESXCLI. You can either install ESXi Dump Collector by using the vCenter Server installation media or use the ESXi Dump Collector that is included in the vCenter Server Appliance. After setup is complete, VMkernel memory is sent to the specified network server when the system encounters a critical failure.

Security Setup

In most deployments, all hosts that you provision with vSphere Auto Deploy must have the same security settings. You can, for example, set up the firewall to allow certain services to access the ESXi system, set up the security configuration, user configuration, and user group configuration for
the reference host with the vSphere Web Client or with vCLI commands. Security setup includes shared user access settings for all hosts. You can achieve unified user access by setting up your reference host to use Active Directory. See the vSphere Security documentation.

**Note** If you set up Active Directory by using host profiles, the passwords are not protected. Use the vSphere Authentication Service to set up Active Directory to avoid exposing the Active Directory password.

 Networking and Storage Setup

If you reserve a set of networking and storage resources for use by hosts provisioned with vSphere Auto Deploy, you can set up your reference host to use those resources.

In very large deployments, the reference host setup supports an Enterprise Network Manager, which collects all information coming from the different monitoring services that are running in the environment.

**Figure 5-7. vSphere Auto Deploy Reference Host Setup**

Options for Configuration of a vSphere Auto Deploy Reference Host explains how to perform this setup.

Watch the video "Auto Deploy Reference Hosts" for information about the reference host setup:

[YouTube video link](http://link.brightcove.com/services/player/bcpid2296383276001?bctid=ref:video_auto_deploy_reference_hosts)

**Options for Configuration of a vSphere Auto Deploy Reference Host**

You can configure a reference host by using the vSphere Web Client, vCLI, or host profiles.
To set up a reference host, you can use the approach that suits you best.

**vSphere Web Client**
The vSphere Web Client supports setup of networking, storage, security, and most other aspects of an ESXi host. Set up your environment and create a host profile from the reference host for use by vSphere Auto Deploy.

**vSphere Command-Line Interface**
You can use vCLI commands for setup of many aspects of your host. vCLI is suitable for configuring many of the services in the vSphere environment. Commands include `vicfg-ntp` for setting up an NTP server, `esxcli system syslog` for setting up a syslog server, `esxcli network route` for adding routes and set up the default route, and `esxcli system coredump` for configuring Esxi Dump Collector.

**Host Profiles Feature**
Best practice is to set up a host with vSphere Web Client or vCLI and create a host profile from that host. You can instead use the Host Profiles feature in the vSphere Web Client and save that host profile.

vSphere Auto Deploy applies all common settings from the host profile to all target hosts. If you set up the host profile to prompt for user input, all hosts provisioned with that host profile come up in maintenance mode. You must reapply the host profile or reset host customizations to be prompted for the host-specific information.

**Configure ESXi Dump Collector with ESXCLI**
Hosts provisioned with vSphere Auto Deploy do not have a local disk to store core dumps on. You can configure ESXi Dump Collector by using ESXCLI commands and keep core dumps on a network server for use during debugging.

A core dump is the state of working memory in the event of host failure. By default, a core dump is saved to the local disk. ESXi Dump Collector is especially useful for vSphere Auto Deploy, but is supported for any ESXi host. ESXi Dump Collector supports other customization, including sending core dumps to the local disk and is included with the vCenter Server management node.

If you intend to use IPv6, and if both the ESXi host and ESXi Dump Collector are on the same local link, both can use either local link scope IPv6 addresses or global scope IPv6 addresses.

If you intend to use IPv6, and if ESXi and ESXi Dump Collector are on different hosts, both require global scope IPv6 addresses. The traffic routes through the default IPv6 gateway.

**Prerequisites**
Install vCLI if you want to configure the host to use ESXi Dump Collector. In troubleshooting situations, you can use ESXCLI in the ESXi Shell instead.
Procedure

1 Set up an ESXi system to use ESXi Dump Collector by running `esxcli system coredump` in the local ESXi Shell or by using vCLI.

```
esxcli system coredump network set --interface-name vmk0 --server-ip 10.xx.xx.xx --server-port 6500
```

You must specify a VMkernel NIC and the IP address and optional port of the server to send the core dumps to. You can use an IPv4 address or an IPv6 address. If you configure an ESXi system that is running on a virtual machine that is using a vSphere standard switch, you must select a VMkernel port that is in promiscuous mode.

2 Enable ESXi Dump Collector.

```
esxcli system coredump network set --enable true
```

3 (Optional) Verify that ESXi Dump Collector is configured correctly.

```
esxcli system coredump network check
```

The host on which you have set up ESXi Dump Collector is configured to send core dumps to the specified server by using the specified VMkernel NIC and optional port.

What to do next

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see Write a Rule and Assign a Host Profile to Hosts.
- For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see Test and Repair Rule Compliance.
- Power on unprovisioned hosts to provision them with the new host profile.

Configure ESXi Dump Collector from the Host Profiles Feature in the vSphere Web Client

Hosts provisioned with vSphere Auto Deploy do not have a local disk to store core dumps on. You can configure a reference host to use ESXi Dump Collector by using the Host Profiles feature in the vSphere Web Client.

Best practice is to set up hosts to use ESXi Dump Collector with the `esxcli system coredump` command and save the host profile. For more information, see Configure ESXi Dump Collector with ESXCLI.

Prerequisites

- Verify that you have created the host profile on which you want to configure a coredump policy. For more information on how to create a host profile, see the vSphere Host Profiles documentation.
- Verify that at least one partition has sufficient storage capability for core dumps from multiple hosts provisioned with vSphere Auto Deploy.

**Procedure**

1. In the vSphere Web Client, click **Policies and Profiles**, and select **Host Profiles**.
2. Right-click the host profile you want to modify and select **Edit Settings**.
3. Leave the name and description unchanged and click **Next**.
4. On the Edit host profile page of the wizard, select **Networking Configuration > Network Coredump Settings**.
5. Select the **Enabled** check box.
6. Specify the host NIC to use, the Network Coredump Server IP, and the Network Coredump Server Port.
7. Click **Finish** to save the host profile settings.

**What to do next**

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see Write a Rule and Assign a Host Profile to Hosts.
- For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see Test and Repair Rule Compliance.
- Power on unprovisioned hosts to provision them with the new host profile.

**Configure Syslog from the Host Profiles Feature in the vSphere Web Client**

Hosts provisioned with vSphere Auto Deploy usually do not have sufficient local storage to save system logs. You can specify a remote syslog server for those hosts by setting up a reference host, saving the host profile, and applying that host profile to other hosts as needed.

Best practice is to set up the syslog server on the reference host with the vSphere Web Client or the esxcli system syslog command and to save the host profile. You can also set up syslog from the Host Profiles feature in the vSphere Web Client.

**Prerequisites**

- If you intend to use a remote syslog host, set up that host before you customize host profiles.
- Verify that you have access to a vSphere Web Client that can connect to the vCenter Server system.

**Procedure**

1. In the vSphere Web Client, click **Policies and Profiles**, and select **Host Profiles**.
2. (Optional) If no reference host exists in your environment, click the **Extract Profile from Host** icon to create a host profile.
3. Right-click the host profile you want to modify and select **Edit Settings**.
4 Leave the name and description unchanged and click Next.

5 On the Edit host profile page of the wizard, select Advanced Configuration Settings > Advanced Options > Advanced configuration options.

You can select specific sub-profiles and edit the syslog settings.

6 If you are setting up an ESXi 5.0 host that did not have a previously configured syslog server, you have to create an advanced configuration option.
   a Click the Add sub-profile icon.
   b Select the new sub-profile Advanced configuration option at the top of the list.
   c From the Advanced option drop-down list select Configure a fixed option.
   d Specify Syslog.global.loghost as the option, and your host as the value.
   
   If you are configuring an ESXi host version 5.1 or later or an ESXi 5.0 host that has syslog configured, Syslog.global.loghost is already in the list of advanced options.

7 Click Finish to save the host profile settings.

What to do next

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see Write a Rule and Assign a Host Profile to Hosts.
- For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see Test and Repair Rule Compliance.
- Power on unprovisioned hosts to provision them with the new host profile.

Enable NTP Client on a Reference Host in the vSphere Web Client

When you collect logging information in large environments, you must ensure that log times are coordinated. You can set up the reference host to use the NTP server in your environment, extract the host profile and create a vSphere Auto Deploy rule to apply it to other hosts.

Procedure

1 In the vSphere Web Client navigator, browse to the host that you want to use as a reference host.

2 Select the Manage tab and select Settings.

3 Under System, select Time Configuration and click Edit.

4 Select the Use Network Time Protocol (Enable NTP client) radio button.
   
   This option synchronizes the time and date of the host with an NTP server. The NTP service on the host periodically takes the time and date from the NTP server.

5 From the NTP Service Startup Policy drop-down list, select Start and stop with host.

6 In the NTP Servers text box, type the IP addresses or host names of the NTP servers that you want to use.
7  Click OK.

**What to do next**

- Extract a host profile from the reference host. See the *Host Profiles* documentation.
- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see *Write a Rule and Assign a Host Profile to Hosts*.

**Configure Networking for Your vSphere Auto Deploy Host in the vSphere Web Client**

You can set up networking for your vSphere Auto Deploy reference host and apply the host profile to all other hosts to guarantee a fully functional networking environment.

**Prerequisites**

Provision the host you want to use as your reference host with an ESXi image by using vSphere Auto Deploy.

**Procedure**

1  In the vSphere Web Client navigator, browse to the host that you want to use as a reference host.
2  Select the **Manage** tab and select **Networking**.
3  Perform the networking setup.
   - If you are using virtual switches and not vSphere Distributed Switch, do not add other VMkernel NICs to vSwitch0.
4  After the reference host is configured, reboot the system to verify that vmk0 is connected to the Management Network.
5  If no host profile exists for your reference host, create a host profile.

**What to do next**

- Create a rule that applies the host profile to all hosts that you want to provision with the settings specified in the reference host. For writing a rule in a PowerCLI session, see *Write a Rule and Assign a Host Profile to Hosts*.
- For hosts that are already provisioned with vSphere Auto Deploy, perform the test and repair compliance operations in a PowerCLI session, see *Test and Repair Rule Compliance*.
- Power on unprovisioned hosts to provision them with the new host profile.
Configure a Reference Host for Auto-Partitioning

By default, vSphere Auto Deploy provisions hosts only if a partition is available on the host. The auto-partitioning option creates a VMFS datastore on your host's local storage. You can set up a reference host to auto-partition all hosts that you provision with vSphere Auto Deploy.

**Caution** If you change the default auto-partitioning behavior, vSphere Auto Deploy overwrites existing partitions regardless of their content. If you turn on this option, ensure that no unintended data loss results.

To ensure that local SSDs remain unpartitioned during auto-partitioning, you must set the parameter `skipPartitioningSsds=TRUE` on the reference host.

For more information about preventing SSD formatting during auto-partitioning, see the [vSphere Storage documentation](#).

**Prerequisites**

- Provision the host that you want to use as your reference host with an ESXi image by using vSphere Auto Deploy.
- Verify that you have access to avSphere Web Client that can connect to the vCenter Server system.

**Procedure**

1. In the vSphere Web Client navigator, browse to the host that you want to use as a reference host.
2. Select the **Manage** tab and select **Settings**.
3. Under **System**, select **Advanced System Settings** and click **Edit**.
4. Scroll to `VMkernel.Boot.autoPartition` and select the **Enabled** check box.
5. (Optional) If you want the local SSDs to remain unpartitioned, scroll to `VMkernel.Boot.skipPartitioningSsds` and select the **Enabled** check box.
6. Click **OK**.
7. If no host profile exists for your reference host, create a host profile.

Auto-partitioning is performed when the hosts boot.

**What to do next**

- Use vSphere Auto Deploy to create a rule that applies the host profile of your reference host to all hosts immediately when they boot. To create a rule with the vSphere Web Client, see [Create a Deploy Rule](#). For writing a rule in a PowerCLI session, see [Write a Rule and Assign a Host Profile to Hosts](#).
vSphere Auto Deploy Best Practices and Security Consideration

Follow best practices when installing vSphere Auto Deploy and when using vSphere Auto Deploy with other vSphere components. Set up a highly available vSphere Auto Deploy infrastructure in large production environments or when using stateless caching. Follow all security guidelines that you would follow in a PXE boot environment, and consider the recommendations in this chapter.

vSphere Auto Deploy Best Practices

You can follow several vSphere Auto Deploy best practices, set up networking, configure vSphere HA, and otherwise optimize your environment for vSphere Auto Deploy.

See the VMware Knowledge Base for additional best practice information.

vSphere Auto Deploy and vSphere HA Best Practices

You can improve the availability of the virtual machines running on hosts provisioned with vSphere Auto Deploy by following best practices.

Some environments configure the hosts provisioned with vSphere Auto Deploy with a distributed switch or configure virtual machines running on the hosts with Auto Start Manager. In such environments, deploy the vCenter Server system so that its availability matches the availability of the vSphere Auto Deploy server. Several approaches are possible.

- Install vCenter Server on a Windows virtual machine or physical server or deploy the vCenter Server Appliance. Auto Deploy is deployed together with the vCenter Server system.

- Deploy the vCenter Server system on a virtual machine. Run the vCenter Server virtual machine in a vSphere HA enabled cluster and configure the virtual machine with a vSphere HA restart priority of high. Include two or more hosts in the cluster that are not managed by vSphere Auto Deploy and pin the vCenter Server virtual machine to these hosts by using a rule (vSphere HA DRS required VM to host rule). You can set up the rule and then disable DRS if you do not want to use DRS in the cluster. The greater the number of hosts that are not managed by vSphere Auto Deploy, the greater your resilience to host failures.

Note: This approach is not suitable if you use Auto Start Manager. Auto Start Manager is not supported in a cluster enabled for vSphere HA.
vSphere Auto Deploy Networking Best Practices

Prevent networking problems by following vSphere Auto Deploy networking best practices.

**vSphere Auto Deploy and IPv6**

Because vSphere Auto Deploy takes advantage of the iPXE infrastructure, if the hosts that you plan to provision with vSphere Auto Deploy are with legacy BIOS, the vSphere Auto Deploy server must have an IPv4 address. PXE booting with legacy BIOS firmware is possible only over IPv4. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.

**IP Address Allocation**

Use DHCP reservations for address allocation. Fixed IP addresses are supported by the host customization mechanism, but providing input for each host is not recommended.

**VLAN Considerations**

Use vSphere Auto Deploy in environments that do not use VLANs. If you intend to use vSphere Auto Deploy in an environment that uses VLANs, make sure that the hosts that you want to provision can reach the DHCP server. How hosts are assigned to a VLAN depends on the setup at your site. The VLAN ID might be assigned by the switch or the router, or might be set in the host's BIOS or through the host profile. Contact your network administrator to determine the steps for allowing hosts to reach the DHCP server.

vSphere Auto Deploy and VMware Tools Best Practices

When you provision hosts with vSphere Auto Deploy, you can select an image profile that includes VMware Tools, or select the smaller image associated with the image profile that does not contain VMware Tools.

You can download two image profiles from the VMware download site.

- **xxxxx-standard**: An image profile that includes the VMware Tools binaries, required by the guest operating system running inside a virtual machine. The image is usually named esxi-version-xxxxx-standard.

- **xxxxx-no-tools**: An image profile that does not include the VMware Tools binaries. This image profile is usually smaller has a lower memory overhead, and boots faster in a PXE-boot environment. This image is usually named esxi-version-xxxxx-no-tools.

With vSphere 5.0 Update 1 and later, you can deploy ESXi using either image profile.

- If the network boot time is of no concern, and your environment has sufficient extra memory and storage overhead, use the image that includes VMware Tools.

- If you find the network boot time too slow when using the standard image, or if you want to save some space on the hosts, you can use the image profile that does not include VMware Tools, and place the VMware Tools binaries on shared storage. See, Provision ESXi Host by Using an Image Profile Without VMware Tools.
vSphere Auto Deploy Load Management Best Practices

Simultaneously booting large numbers of hosts places a significant load on the vSphere Auto Deploy server. Because vSphere Auto Deploy is a Web server at its core, you can use existing Web server scaling technologies to help distribute the load. For example, one or more caching reverse proxy servers can be used with vSphere Auto Deploy. The reverse proxies serve up the static files that make up the majority of an ESXi boot image. Configure the reverse proxy to cache static content and pass all requests through to the vSphere Auto Deploy server. For more information, watch the video "Using Reverse Web Proxy Servers for vSphere Auto Deploy Scalability":

Using Reverse Web Proxy Servers for vSphere Auto Deploy Scalability

Use multiple TFTP servers to point to different proxy servers. Use one TFTP server for each reverse proxy server. After that, set up the DHCP server to send different hosts to different TFTP servers.

When you boot the hosts, the DHCP server redirects them to different TFTP servers. Each TFTP server redirects hosts to a different server, either the vSphere Auto Deploy server or a reverse proxy server, significantly reducing the load on the vSphere Auto Deploy server.

After a massive power outage, bring up the hosts on a per-cluster basis. If you bring multiple clusters online simultaneously, the vSphere Auto Deploy server might experience CPU bottlenecks. All hosts might come up after a delay. The bottleneck is less severe if you set up the reverse proxy.

vSphere Auto Deploy Logging and Troubleshooting Best Practices

To resolve problems that you encounter with vSphere Auto Deploy, use the vSphere Auto Deploy logging information from the vSphere Web Client and set up your environment to send logging information and core dumps to remote hosts.

### vSphere Auto Deploy Logs

Download the vSphere Auto Deploy logs by going to the vSphere Auto Deploy page in the vSphere Web Client. See, Download vSphere Auto Deploy Logs.

### Setting Up Syslog

Set up a remote syslog server. See the vCenter Server and Host Management documentation for syslog server configuration information. Configure the first host you boot to use the remote syslog server and apply that host's host profile to all other target hosts. Optionally, install and use the vSphere Syslog Collector, a vCenter Server support tool that provides a unified architecture for system logging, enables network logging, and lets you combine logs from multiple hosts.

### Setting Up ESXi Dump Collector

Hosts provisioned with vSphere Auto Deploy do not have a local disk to store core dumps on. Install ESXi Dump Collector and set up your first host so that all core dumps are directed to ESXi Dump Collector, and apply the host profile from that host to all other hosts. See Configure ESXi Dump Collector with ESXCLI.
Using vSphere Auto Deploy in a Production Environment

When you move from a proof of concept setup to a production environment, take care to make the environment resilient.

- Protect the vSphere Auto Deploy server. See vSphere Auto Deploy and vSphere HA Best Practices.
- Protect all other servers in your environment, including the DHCP server and the TFTP server.
- Follow VMware security guidelines, including those outlined in vSphere Auto Deploy Security Considerations.

Set Up Highly Available vSphere Auto Deploy Infrastructure

In many production situations, a highly available vSphere Auto Deploy infrastructure is required to prevent data loss. Such infrastructure is also a prerequisite for using vSphere Auto Deploy with stateless caching.

Figure 5-8. Highly Available vSphere Auto Deploy Infrastructure
Prerequisites

For the management cluster, install ESXi on three hosts. Do not provision the management cluster hosts with vSphere Auto Deploy.

Watch the video "Highly Available vSphere Auto Deploy Infrastructure" for information about the implementation of a highly available vSphere Auto Deploy infrastructure:

Procedure

1. Enable vSphere HA and vSphere DRS on the management cluster.
2. Set up the following virtual machines on the management cluster.

<table>
<thead>
<tr>
<th>Infrastructure Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PXE boot infrastructure</td>
<td>TFTP and DHCP servers.</td>
</tr>
<tr>
<td>Infrastructure VM</td>
<td>Active Directory, DNS, vCenter Server.</td>
</tr>
<tr>
<td>vSphere Auto Deploy environment</td>
<td>PowerCLI, vSphere Auto Deploy server, vCenter Server. Set up this environment on a single virtual machine or on three separate virtual machines in production systems.</td>
</tr>
</tbody>
</table>

The vCenter Server on the infrastructure virtual machine differs from the vCenter Server in the vSphere Auto Deploy environment.

3. Set up vSphere Auto Deploy to provision other hosts as needed.

Because the components on the management cluster are protected with vSphere HA, high availability is supported.

vSphere Auto Deploy Security Considerations

When you use vSphere Auto Deploy, pay careful attention to networking security, boot image security, and potential password exposure through host profiles to protect your environment.

Networking Security

Secure your network just as you secure the network for any other PXE-based deployment method. vSphere Auto Deploy transfers data over SSL to prevent casual interference and snooping. However, the authenticity of the client or of the Auto Deploy server is not checked during a PXE boot.

You can greatly reduce the security risk of Auto Deploy by completely isolating the network where Auto Deploy is used.

Boot Image and Host Profile Security

The boot image that the vSphere Auto Deploy server downloads to a machine can have the following components.

- The VIB packages that the image profile consists of are always included in the boot image.
- The host profile and host customization are included in the boot image if Auto Deploy rules are set up to provision the host with a host profile or host customization.
- The administrator (root) password and user passwords that are included with host profile and host customization are MD5 encrypted.
- Any other passwords associated with profiles are in the clear. If you set up Active Directory by using host profiles, the passwords are not protected.

  Use the vSphere Authentication Proxy to avoid exposing the Active Directory passwords. If you set up Active Directory using host profiles, the passwords are not protected.

- The host's public and private SSL key and certificate are included in the boot image.

### Using the Device Alias Configuration Host Profile

In vSphere 6.7 and later, you can persistently map a device (bus address) to a device name (alias). You can modify the mapping by using the Device Alias Configuration host profile. Using persistent mapping can help avoid compliance warnings for stateless hosts, and is also useful for stateful hosts.

The Device Alias Configuration host profile is selected by default, which means that aliases are assigned to each device. For example, if a host does not recognize one of the NICs during the boot process, the NIC aliases no longer change. That can help for management with scripts, and if you apply a host profile from a reference host.

**Note** To avoid errors, do not disable or edit the Device Alias Configuration host profile.

To ensure uniform, persistent, and stable device naming across all hosts, use the device alias profile with homogeneous hosts only. These are hosts that are identically configured with the same network and storage cards in the PCI bus.

**Note** Always bring the BIOS up to the latest level. For systems with earlier versions of the BIOS, the BIOS might not provide accurate location information for on-board devices. ESXi applies heuristics for this case to keep the alias stable, even for these devices, this might not work under all conditions, for example if changes are made in the BIOS setting or if the devices fail.

### Device Alias Configuration Compliance Failures

For hosts are not fully homogenous, for example, the hosts contain different PCI cards or have different BIOS levels, if you apply the host profile from a reference host, a compliance check might result in a compliance failure. The compliance check ignores extra devices on the host that were not on the reference host. Select the host with the fewest devices as the reference host.

If the compliance check shows that he hosts are not fully homogeneous, the compliance failure cannot be remediated without modifying the hardware itself.

If the compliance check shows that the device aliases, for example, names such as vmhba3, are different from those on the reference host, remediation might be possible.

- To remediate a host that is not provisioned with vSphere Auto Deploy, perform host profile remediation and reboot the host.

- To remediate a host that is provisioned with vSphere Auto Deploy, reprovision a host.
Upgrading Systems for Device Alias Profiles

In ESXi versions earlier than 5.5, the Device Alias Configuration profile does not exist. Consider the following problems when you upgrade from previous versions of ESXi to a current version:

- For installed hosts, that is, hosts not provisioned with vSphere Auto Deploy, upgrading the ESXi host preserves aliases. After they are upgraded, aliases remain stable as long as the BIOS provides the information.

- When you upgrade a cluster of ESXi host provisioned with vSphere Auto Deploy image, the aliases do not change because ESXi uses the same algorithm to generate aliases as earlier versions. Generate a new host profile for the reference host. This host profile includes the Device Alias Configuration profile. Set up vSphere Auto Deploy to apply the reference host's host profile to all other hosts for consistent device naming across your cluster.

- When upgrading a system, do not flash the BIOS, because this action can change aliases. Flashing the BIOS to the latest level is more appropriate for a new install.

Provision ESXi Host by Using an Image Profile Without VMware Tools

When you provision ESXi hosts with vSphere Auto Deploy, you can select to provision the host by using the image profile that does not contain VMware Tools binaries. This image profile is usually smaller, has a lower memory overhead, and boots faster in a PXE-boot environment.

If you find the network boot time too slow when using the standard image, or if you want to save some space on the hosts, you can use the image profile that does not include VMware Tools, and place the VMware Tools binaries on a shared storage.

Prerequisites

Download the xxxxxx-no-tools `image profile from the VMware download site.

Procedure

1. Boot an ESXi host that was not provisioned with vSphere Auto Deploy.
2. Copy the /productLocker directory from the ESXi host to a shared storage.
3. Change the UserVars.ProductLockerLocation variable to point to the /productLocker directory.
   a. In the vSphere Web Client, select the reference host and click the Manage tab.
   b. Select Settings and click Advanced System Settings.
   c. Filter the settings for uservars, and select UserVars.ProductLockerLocation.
   d. Click the pen icon and edit the location so it points to the shared storage.
4. Create a host profile from the reference host.
5. Create a vSphere Auto Deploy rule that assigns the xxxxxx-no-tools image profile and host profile from the reference host to all other hosts.
6. Boot your target hosts with the rule so they pick up the product locker location from the reference host.
Download vSphere Auto Deploy Logs

You can use the vSphere Auto Deploy logging information from the vSphere Web Client to resolve problems that you encounter with vSphere Auto Deploy.

Prerequisites

Use the vSphere Web Client to log in to the vCenter Server instance that vSphere Auto Deploy is registered with.

Procedure

1. From Administration select Deployment > System Configuration.
2. Click one of the Nodes for which you want to retrieve a support bundle. The support bundle holds the services logs.
3. From the Actions menu, select the Export Support Bundles... option.
4. Select only VirtualAppliance > Auto Deploy.
5. Click the Export Support Bundle...button to download the log files.

Set Up vSphere Auto Deploy and Provision Hosts with vSphere PowerCLI

In this scenario you are going to set up and configure a working vSphere Auto Deploy environment that includes four hosts. You will create rules and provision two of the hosts with an image profile and the other two with the same image profile and a host profile that is set up to prompt for user input.

This scenario can provide you with the basis for a production environment. The task descriptions assume that you are using a flat network with no VLAN tagging between the physical hosts and the rest of your environment.
To perform the tasks in this scenario, you should have the following background knowledge and privileges.

- Experience with vSphere (vCenter Server and ESXi).
- Basic knowledge of Microsoft PowerShell and PowerCLI.
- Administrator rights to the target Windows and vCenter Server systems.

Follow the tasks in the order presented in this scenario. Some steps can be performed in a different order, but the order used here limits repeated manipulation of some components.
vSphere Auto Deploy takes advantage of the iPXE infrastructure and PXE booting with legacy BIOS firmware is possible only over IPv4. If the hosts that you want to provision with vSphere Auto Deploy are with legacy BIOS, the vSphere Auto Deploy server must have an IPv4 address. PXE booting with UEFI firmware is possible with either IPv4 or IPv6.
Procedure

1 vSphere Auto Deploy Preinstallation Checklist
   Before you can start the tasks in this vSphere Auto Deploy scenario, make sure that your
   environment meets the hardware and software requirements, and that you have the necessary
   permissions for the components included in the setup.

2 Install the TFTP Server
   To set up a vSphere Auto Deploy infrastructure, you must install a TFTP server in your
   environment. vSphere Auto Deploy relies on a TFTP server for sending the boot image to the hosts
   that it provisions.

3 Install PowerCLI
   Before you can manage vSphere Auto Deploy with rules that you create with PowerCLI cmdlets, you
   must install PowerCLI.

4 Prepare the vSphere Auto Deploy Target Hosts
   You must configure the BIOS settings of the four hosts and reconfirm the MAC address of the
   primary network device to prepare the target hosts for provisioning with vSphere Auto Deploy.

5 Prepare the DHCP Server for vSphere Auto Deploy Provisioning
   When you prepare the vSphere Auto Deploy target hosts, you must set up the DHCP server in this
   scenario to serve each target host with an iPXE binary.

6 Configure the vSphere Auto Deploy and TFTP Environment in the vSphere Web Client
   After you prepare the DHCP server, you must start the vSphere Auto Deploy vCenter Server service
   and configure the TFTP server. You must download a TFTP Boot ZIP file from your vSphere Auto
   Deploy server. The customized FTP server serves the boot images that vSphere Auto Deploy
   provides.

7 Prepare the ESXi Software Depot and Write a Rule
   After you configure the vSphere Auto Deploy infrastructure, you must add an ESXi software depot,
   specify an image profile, write a rule, and add it to the active rule set.

8 Provision the First Host with vSphere Auto Deploy
   After creating a rule and adding it to the active rule set, you can provision the first host and check its
   vCenter Server location to complete verification of the image provisioning of your setup.

9 Extract and Configure a Host Profile from the Reference Host
   After provisioning the first host, you can extract and configure a host profile that can be used to
   apply the same configuration to other target hosts. Configuration that differs for different hosts, such
   as a static IP address, can be managed through the host customization mechanism.

10 Create a Rule that Provisions Hosts from a Specific IP Range
    After creating a host profile from a reference host, you can create a rule that applies the previously
    verified image profile and the host profile that you extracted to target hosts from a specific IP range.
11 Provision Hosts and Set Up Host Customizations

With the rule in place that provisions hosts using an image profile and a host profile, you can provision specific target hosts. If any host profile items are set to prompt the user for input, the host comes up in maintenance mode. You apply the host profile or check host compliance to be prompted for the information. The system associates the host customization with the host.

vSphere Auto Deploy Preinstallation Checklist

Before you can start the tasks in this vSphere Auto Deploy scenario, make sure that your environment meets the hardware and software requirements, and that you have the necessary permissions for the components included in the setup.

This scenario is customized for vCenter Server 6.0 and later. For earlier versions of vCenter Server, go to the corresponding VMware Documentation Center.

For your setup, your system must meet specific software and hardware requirements.

Table 5-18. Preinstallation Checklist

<table>
<thead>
<tr>
<th>Required Software and Hardware</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>A Windows Server 2008 R2 system or later supported Windows system with Microsoft PowerShell preinstalled. For a full list of supported operating systems, see <a href="https://www.vmware.com/support/pubs/vcenter_server.html">Supported host Operating Systems for VMware vCenter Server installation</a>.</td>
</tr>
<tr>
<td>vCenter Server</td>
<td>vCenter Server version 6.0 or later to be installed on a Windows system. You can also install PowerCLI on a different Windows system. The vSphere Auto Deploy server is part of vCenter Server. You must enable and start the vSphere Auto Deploy service on the vCenter Server system. You can perform many of the setup tasks by logging in to the Windows system, either directly into the console or by using Remote Desktop (RDP). See <a href="https://www.vmware.com/support/pubs/vcenter_server.html">Prepare Your System for vSphere Auto Deploy</a>.</td>
</tr>
<tr>
<td>Storage</td>
<td>At least 4 GB of free space on the Windows system where vCenter Server is running. Preferably a second volume or hard drive. Storage for ESXi datastores NFS, iSCSI, or FibreChannel, with servers and storage arrays that are configured so the servers can detect the LUNs.</td>
</tr>
<tr>
<td></td>
<td>● A list of target IP addresses for NFS or iSCSI.</td>
</tr>
<tr>
<td></td>
<td>● A list of target volume information for NFS or iSCSI.</td>
</tr>
<tr>
<td>Host information (for four ESXi hosts)</td>
<td>A list of target IP addresses for NFS or iSCSI. A list of target volume information for NFS or iSCSI.</td>
</tr>
<tr>
<td></td>
<td>● Default route, net mask, and primary and secondary DNS server IP addresses.</td>
</tr>
<tr>
<td></td>
<td>● IP address and net mask for the VMkernel primary management network.</td>
</tr>
<tr>
<td></td>
<td>● IP address and net mask for other VMkernel networks such as storage, vSphere FT, or VMware vMotion. vSphere Auto Deploy does not overwrite existing partitions by default.</td>
</tr>
</tbody>
</table>

VMware, Inc.
Table 5-18. Preinstallation Checklist (Continued)

<table>
<thead>
<tr>
<th>Required Software and Hardware</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESXi software depot</td>
<td>The location of the ESXi software depot on the Downloads page of the VMware Web site. You use a URL to point to the image profile stored at that location, or you download a ZIP file to work with a local depot. Do not download the ESXi image.</td>
</tr>
<tr>
<td>TFTP server</td>
<td>TFTP installer software such as WinAgents TFTP server. The TFTP server included in Windows Server 2008 is closely tied to Windows network deployment and is not suitable.</td>
</tr>
<tr>
<td>DHCP server</td>
<td>The DHCP server included with Windows Server 2008.</td>
</tr>
<tr>
<td>DNS server</td>
<td>A working DNS server. You must add entries in both Forward (A Record) and Reverse (PTR Record) Zones for each target host.</td>
</tr>
</tbody>
</table>

You also need information about and administrator privileges to the core servers of the environment, including the ActiveDirectory server, DNS server, DHCP server, NTP server, and so on.

You must have complete control of the broadcast domain of the subnet in which you will deploy the setup. Ensure that no other DHCP, DNS, or TFTP server are on this subnet.

Install the TFTP Server

To set up a vSphere Auto Deploy infrastructure, you must install a TFTP server in your environment. vSphere Auto Deploy relies on a TFTP server for sending the boot image to the hosts that it provisions.

This task only installs the TFTP server. You later download a configuration file to the server. See Configure the vSphere Auto Deploy and TFTP Environment in the vSphere Web Client.

Procedure

1. Log in to the console of the Windows system on which vCenter Server is installed with administrator privileges, either directly or by using RDP.

2. Download and install the TFTP server software.
   
   This sample setup uses the TFTP server from WinAgents. The TFTP server that is included with Windows 2008 is closely tied to Windows network deployment and not suitable for vSphere Auto Deploy.

3. Configure the TFTP root directory as D:\Drive or a similar location (for example, D:\TFTP_Root\).

What to do next

Install PowerCLI, to manage vSphere Auto Deploy with PowerCLI cmdlets.

Install PowerCLI

Before you can manage vSphere Auto Deploy with rules that you create with PowerCLI cmdlets, you must install PowerCLI.
In this scenario, you install PowerCLI on the same system as the vCenter Server system. You can also install PowerCLI on a different Windows system.

**Prerequisites**
- Verify that Microsoft .NET Framework 4.5 or 4.5.x is installed, or install it from the Microsoft Web site.
- Verify that Windows PowerShell 3.0 or 4.0 is installed, or install it from the Microsoft Web site.

**Procedure**
1. Log in with administrator privileges to the console of the Windows system on which vCenter Server is installed, either directly or by using RDP.
2. Download PowerCLI from the Download page of the VMware Web site and install the PowerCLI software.
3. Confirm that PowerCLI is working.
   a. Start a PowerCLI session.
   b. (Optional) If an SSL error appears, check the thumbprint and ignore the error.
   c. Run the `Get-DeployCommand` cmdlet.
      
      PowerCLI displays a list of cmdlets and their definitions in the PowerCLI window.
4. (Optional) If `Get-DeployCommand` does not return the list of cmdlets, check your PowerCLI version and uninstall and reinstall it if necessary.

**What to do next**
Configure the settings of your target hosts to prepare them for provisioning with vSphere Auto Deploy.

**Prepare the vSphere Auto Deploy Target Hosts**
You must configure the BIOS settings of the four hosts and reconfirm the MAC address of the primary network device to prepare the target hosts for provisioning with vSphere Auto Deploy.

**Prerequisites**
Hosts that you want to provision with vSphere Auto Deploy must meet the requirements for ESXi.

See ESXi Hardware Requirements.

**Procedure**
1. Change the BIOS settings of each of the four physical hosts to force the hosts to boot from the primary network device.
2. Reconfirm the MAC address of the primary network device.

**What to do next**
Set up the DHCP server to serve each target host with an iPXE binary.
Prepare the DHCP Server for vSphere Auto Deploy Provisioning

When you prepare the vSphere Auto Deploy target hosts, you must set up the DHCP server in this scenario to serve each target host with an iPXE binary.

The environment in this scenario uses Active Directory with DNS and DHCP. The DHCP server is included with Windows 2008.

Procedure

1. Log in to your DHCP Server with administrator privileges.
2. Create a DHCP scope for your IP address range.
   a. Click **Start > Settings > Control Panel > Administrative Tools** and click **DHCP**.
   b. Navigate to **DHCP > hostname > IPv4**.
   c. Right-click **IPv4** and select **New Scope**.
   d. On the Welcome screen, click **Next**, and specify a name and description for the scope.
   e. Specify an IP address range and click **Next**.
   f. Click **Next** until you reach the Configure DHCP Options screen and select **No, I will configure this option later**.
3. Create a DHCP reservation for each target ESXi host.
   a. In the DHCP window, navigate to **DHCP > hostname > IPv4 > Autodeploy Scope > Reservations**.
   b. Right-click **Reservations** and select **New Reservation**.
   c. In the New Reservation window, specify a name, IP address, and the MAC address for one of the hosts. Do not include the colon (:) in the MAC address.
   d. Repeat the process for each of the other hosts.
4 Set up the DHCP Server to point the hosts to the TFTP Server.
   a In the DHCP window, navigate to **DHCP > hostname > IPv4 > Autodeploy Scope > Scope Options**.
   b Right click **Scope Options** and choose **Configure Options**.
   c In the Scope Options window, click the **General** tab.
   d Click **066 Boot Server Host Name** and enter the address of the TFTP server that you installed in the String value field below the Available Options.
   e Click **067 Bootfile Name** and enter **undionly.kpxe.vmw-hardwired**.
      The undionly.kpxe.vmw-hardwired iPXE binary will be used to boot the ESXi hosts.
   f Click **Apply** and click **OK** to close the window.

5 In the DHCP window, right-click **DHCP > hostname > IPv4 > Scope > Activate** and click **Activate**.

6 Do not log out from the DHCP Server if you are using Active Directory for DHCP and DNS, or log out otherwise.

**What to do next**

Start the vCenter Server service of vSphere Auto Deploy and configure the TFTP server.

**Configure the vSphere Auto Deploy and TFTP Environment in the vSphere Web Client**

After you prepare the DHCP server, you must start the vSphere Auto Deploy vCenter Server service and configure the TFTP server. You must download a TFTP Boot ZIP file from your vSphere Auto Deploy server. The customized FTP server serves the boot images that vSphere Auto Deploy provides.

**Procedure**

1 Use the vSphere Web Client to connect to the vCenter Server system that manages the vSphere Auto Deploy server.
2 When the Certificate warning appears, continue to the vCenter Server system.
3 Start the vSphere Auto Deploy service.
   a On the vSphere Web Client Home page, click Administration.
   b Under System Configuration click Services.
   c Select Auto Deploy, click the Actions menu, and select Start.
      On Windows, the vSphere Auto Deploy service can be disabled. You can enable the service by changing the vSphere Auto Deploy service startup type.

4 In the inventory, navigate to the vCenter Server system.

5 On the Manage tab, select Settings, and click Auto Deploy.

6 Click the Download TFTP Boot Zip link to download the TFTP configuration file.

7 Save the file Deploy-tftp.zip to the TFTP_Root directory that you created when you installed the TFTP Server, and unzip the file.

What to do next
Add a software depot to your inventory and use an image profile from the depot to create a rule for host provisioning.

Prepare the ESXi Software Depot and Write a Rule
After you configure the vSphere Auto Deploy infrastructure, you must add an ESXi software depot, specify an image profile, write a rule, and add it to the active rule set.

vSphere Auto Deploy provisions hosts with image profiles that define the set of VIBs that an ESXi installation process uses. Image profiles are stored in software depots. You must make sure the correct image profile is available before you start provisioning hosts. When you add a software depot to a PowerCLI session, it is available only during the current session. It does not persist across sessions.

The steps in this task instruct you to run PowerCLI cmdlets. For additional information about the vSphere Auto Deploy cmdlets that you can run in a PowerCLI session, see vSphere Auto Deploy PowerCLI Cmdlet Overview.

Prerequisites
Verify that you can access the ESXi hosts that you want to provision from the system on which you run PowerCLI.

Procedure
1 Log in as an administrator to the console of the Windows system on which vCenter Server is installed, either directly or by using RDP.

   This task assumes that you installed PowerCLI on the system on which the vCenter Server system is running.
In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

```
Connect-VIServer ipv4_address
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate issues occur. In a development environment, you can ignore the warning.

Enter the vCenter Server credentials.

Run `Add-EsxSoftwareDepot` to add the online depot to the PowerCLI session.

```
```

Adding the software depot is required each time you start a new PowerCLI session.

Validate that you successfully added the software depot by checking the contents of the depot with the `Get-EsxImageProfile` cmdlet.

The cmdlet returns information about all image profiles in the depot.

Create a new rule by running the `New-DeployRule` cmdlet.

```
New-DeployRule -Name "InitialBootRule" -Item ESXi-6.0.0-2494585-standard -AllHosts
```

The cmdlet creates a rule that assigns the specified image profile to all hosts in the inventory.

Add the new rule to the active rule set to make the rule available to the vSphere Auto Deploy server.

```
Add-DeployRule -DeployRule "InitialBootRule"
```

**What to do next**

Provision your first host with vSphere Auto Deploy and verify its image provisioning.

**Provision the First Host with vSphere Auto Deploy**

After creating a rule and adding it to the active rule set, you can provision the first host and check its vCenter Server location to complete verification of the image provisioning of your setup.

**Procedure**

1. Open a console session to the physical host that you want to use as the first ESXi target host, boot the host, and look for messages that indicate a successful iPXE boot.

   During the boot process, DHCP assigns an IP address to the host. The IP address matches the name you specified earlier in the DNS server. The host contacts the vSphere Auto Deploy server and downloads the ESXi binaries from the HTTP URL indicated in the iPXE tramp file that you downloaded earlier to the TFTP_Root directory. Each instance of vSphere Auto Deploy produces a custom set of files for the TFTP Server.

2. Use the vSphere Web Client to connect to the vCenter Server system that manages the vSphere Auto Deploy server.
3 On the vSphere Web Client Home page, click **Hosts and Clusters**.

4 Verify that the newly provisioned host is now in the vCenter Server inventory at the datacenter level.

   By default, vSphere Auto Deploy adds hosts at the datacenter level when the boot process completes.

**What to do next**

Extract a host profile from the host and configure it to require user input.

**Extract and Configure a Host Profile from the Reference Host**

After provisioning the first host, you can extract and configure a host profile that can be used to apply the same configuration to other target hosts. Configuration that differs for different hosts, such as a static IP address, can be managed through the host customization mechanism.

vSphere Auto Deploy can provision each host with the same host profile. vSphere Auto Deploy can also use host customization that allows you to specify different information for different hosts. For example, if you set up a VMkernel port for vMotion or for storage, you can specify a static IP address for the port by using the host customization mechanism.

**Procedure**

1 Use the vSphere Web Client to connect to the vCenter Server system that manages the vSphere Auto Deploy server.

2 Click **Policies and Profiles** and select **Host Profiles**.

3 Click **Extract profile from a host**.

4 On the Select Host page of the wizard, select the reference host that you configured earlier and click **Next**.

5 On the Name and Description page of the wizard, name the profile **ESXiGold**, add a description, and click **Next**.

6 Review the host profile settings and click **Finish**.

7 Right-click the new ESXiGold host profile and click **Edit Settings**.

8 Leave the name and description unchanged and click **Next**.

9 On the Edit host profile page of the wizard, select **Security and Services > Security Settings > Security > User Configuration > root**.

10 In **Password policy** on the right panel, select **User Input Password configuration**.

11 Click **Finish** to save the host profile settings.

**What to do next**

Create a vSphere Auto Deploy rule to apply the host profile to other ESXi hosts.
Create a Rule that Provisions Hosts from a Specific IP Range

After creating a host profile from a reference host, you can create a rule that applies the previously verified image profile and the host profile that you extracted to target hosts from a specific IP range.

Procedure

1. Log in with administrator privileges to the console of the Windows system on which vCenter Server is installed, either directly or by using RDP.

2. In a PowerCLI session, run the `Connect-VIServer` cmdlet to connect to the vCenter Server system that vSphere Auto Deploy is registered with.

   ```PowerCLI
   Connect-VIServer ipv4_address
   ```

   The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate issues occur. In a development environment, you can ignore the warning.

3. Run `Add-EsxSoftwareDepot` to add the online depot to the PowerCLI session.

   ```PowerCLI
   ```

   Adding the software depot is required each time you start a new PowerCLI session.

4. Display the rules in the active rule set by running the `Get-DeployRuleset` cmdlet.

5. Create a rule that instructs vSphere Auto Deploy to provision the set of hosts from a specified IP range with the image profile that you previously selected and the host profile that you created from the reference host.

   ```PowerCLI
   New-DeployRule -name "Production01Rule" -item "image_profile",ESXiGold -Pattern "ipv4=IP_range"
   ```

6. Add the new rule to the active rule set.

   ```PowerCLI
   Add-DeployRule -DeployRule "Production01Rule"
   ```

7. Check the active rule set by running the `Get-DeployRuleset` command.

   PowerCLI displays information similar to the following example.

   ```plaintext
   Name:              Production01Rule
   PatternList:       {ipv4=address_range}
   ItemList:          {ESXi-version-XXXXXXXX-standard, Compute01, ESXiGold}
   ```

What to do next

Provision the hosts and set up the host customizations.
Provision Hosts and Set Up Host Customizations

With the rule in place that provisions hosts using an image profile and a host profile, you can provision specific target hosts. If any host profile items are set to prompt the user for input, the host comes up in maintenance mode. You apply the host profile or check host compliance to be prompted for the information. The system associates the host customization with the host.

Procedure

1. Boot the remaining hosts.
   vSphere Auto Deploy boots the hosts, applies the host profile, and adds the hosts to the vCenter Server inventory. The hosts remain in maintenance mode because the host profile from the reference host is set up to require user input for each host.

2. Use the vSphere Web Client to connect to the vCenter Server system that manages the vSphere Auto Deploy server.

3. Click Policies and Profiles and select Host Profiles.

4. Right-click the previously created ESXiGold profile and click Edit Host Customizations.

5. Enter the required host customizations and save them.

6. Apply the host profile to each of the hosts and get the hosts out of maintenance mode. Alternatively, you can reboot each host.
   When the reboot progress completes, all hosts are running with the image you specify and use the configuration in the reference host profile. The cluster shows that all hosts are fully compliant.

All hosts are now configured with the shared information through the reference host profile and with the host-specific information through the host customization mechanism. The next time you boot the hosts, they receive the complete Host Profile information, including the host-specific information, and boot up completely configured and out of Maintenance Mode.

Troubleshooting vSphere Auto Deploy

The vSphere Auto Deploy troubleshooting topics offer solutions for situations when provisioning hosts with vSphere Auto Deploy does not work as expected.

vSphere Auto Deploy TFTP Timeout Error at Boot Time

A TFTP Timeout error message appears when a host provisioned with vSphere Auto Deploy boots. The text of the message depends on the BIOS.

Problem

A TFTP Timeout error message appears when a host provisioned with vSphere Auto Deploy boots. The text of the message depends on the BIOS.

Cause

The TFTP server is down or unreachable.
Solution

- Ensure that your TFTP service is running and reachable by the host that you are trying to boot.
- To view the diagnostic logs for details on the present error, see your TFTP service documentation.

vSphere Auto Deploy Host Boots with Wrong Configuration

A host is booting with a different ESXi image, host profile, or folder location than the one specified in the rules.

Problem

A host is booting with a different ESXi image profile or configuration than the image profile or configuration that the rules specify. For example, you change the rules to assign a different image profile, but the host still uses the old image profile.

Cause

After the host has been added to a vCenter Server system, the boot configuration is determined by the vCenter Server system. The vCenter Server system associates an image profile, host profile, or folder location with the host.

Solution

- Use the Test-DeployRuleSetCompliance and Repair-DeployRuleSetCompliance vSphere PowerCLI cmdlets to reevaluate the rules and to associate the correct image profile, host profile, or folder location with the host.

Host Is Not Redirected to vSphere Auto Deploy Server

During boot, a host that you want to provision with vSphere Auto Deploy loads iPXE. The host is not redirected to the vSphere Auto Deploy server.

Problem

During boot, a host that you want to provision with vSphere Auto Deploy loads iPXE. The host is not redirected to the vSphere Auto Deploy server.

Cause

The tramp file that is included in the TFTP ZIP file has the wrong IP address for the vSphere Auto Deploy server.

Solution

- Correct the IP address of the vSphere Auto Deploy server in the tramp file, as explained in the vSphere Installation and Setup documentation.
Package Warning Message When You Assign an Image Profile to a vSphere Auto Deploy Host

When you run a vSphere PowerCLI cmdlet that assigns an image profile that is not vSphere Auto Deploy ready, a warning message appears.

**Problem**

When you write or modify rules to assign an image profile to one or more hosts, the following error results:

Warning: Image Profile <name-here> contains one or more software packages that are not stateless-ready. You may experience problems when using this profile with Auto Deploy.

**Cause**

Each VIB in an image profile has a `stateless-ready` flag that indicates that the VIB is meant for use with vSphere Auto Deploy. You get the error if you attempt to write a vSphere Auto Deploy rule that uses an image profile in which one or more VIBs have that flag set to FALSE.

**Note**  You can use hosts provisioned with vSphere Auto Deploy that include VIBs that are not stateless ready without problems. However booting with an image profile that includes VIBs that are not stateless ready is treated like a fresh install. Each time you boot the host, you lose any configuration data that would otherwise be available across reboots for hosts provisioned with vSphere Auto Deploy.

**Solution**

1. Use vSphere ESXi Image Builder cmdlets in a vSphere PowerCLI session to view the VIBs in the image profile.
2. Remove any VIBs that are not stateless-ready.
3. Rerun the vSphere Auto Deploy cmdlet.

vSphere Auto Deploy Host with a Built-In USB Flash Drive Does Not Send Coredumps to Local Disk

If your vSphere Auto Deploy host has a built-in USB flash drive, and an error results in a coredump, the coredump is lost. Set up your system to use ESXi Dump Collector to store coredumps on a networked host.

**Problem**

If your vSphere Auto Deploy host has a built-in USB Flash, and if it encounters an error that results in a coredump, the coredump is not sent to the local disk.

**Solution**

1. Install ESXi Dump Collector on a system of your choice.
   
   ESXi Dump Collector is included with the vCenter Server installer.
2 Use ESXCLI to configure the host to use ESXi Dump Collector.

```
esxcli conn_options system coredump network set IP-addr,port
esxcli system coredump network set -e true
```

3 Use ESXCLI to disable local coredump partitions.

```
esxcli conn_options system coredump partition set -e false
```

**vSphere Auto Deploy Host Reboots After Five Minutes**

A vSphere Auto Deploy host boots and displays iPXE information, but reboots after five minutes.

**Problem**

A host to be provisioned with vSphere Auto Deploy boots from iPXE and displays iPXE information on the console. However, after five minutes, the host displays the following message to the console and reboots.

```
This host is attempting to network-boot using VMware AutoDeploy. However, there is no ESXi image associated with this host. Details: No rules containing an Image Profile match this host. You can create a rule with the New-DeployRule PowerCLI cmdlet and add it to the rule set with Add-DeployRule or Set-DeployRuleSet. The rule should have a pattern that matches one or more of the attributes listed below.
```

The host might also display the following details:

```
Details: This host has been added to VC, but no Image Profile is associated with it. You can use Apply-ESXImageProfile in the PowerCLI to associate an Image Profile with this host. Alternatively, you can reevaluate the rules for this host with the Test-DeployRuleSetCompliance and Repair-DeployRuleSetCompliance cmdlets.
```

The console then displays the host's machine attributes including vendor, serial number, IP address, and so on.

**Cause**

No image profile is currently associated with this host.

**Solution**

You can assign an image profile to the host by running the Apply-EsxImageProfile cmdlet, or by creating the following rule:

1 Run the New-DeployRule cmdlet to create a rule that includes a pattern that matches the host with an image profile.

2 Run the Add-DeployRule cmdlet to add the rule to a ruleset.
3 Run the Test-DeployRuleSetCompliance cmdlet and use the output of that cmdlet as the input to the Repair-DeployRuleSetCompliance cmdlet.

vSphere Auto Deploy Host Cannot Contact TFTP Server

The host that you provision with vSphere Auto Deploy cannot contact the TFTP server.

Problem

When you attempt to boot a host provisioned with vSphere Auto Deploy, the host performs a network boot and is assigned a DHCP address by the DHCP server, but the host cannot contact the TFTP server.

Cause

The TFTP server might have stopped running, or a firewall might block the TFTP port.

Solution

- If you installed the WinAgents TFTP server, open the WinAgents TFTP management console and verify that the service is running. If the service is running, check the Windows firewall's inbound rules to make sure the TFTP port is not blocked. Turn off the firewall temporarily to see whether the firewall is the problem.

- For all other TFTP servers, see the server documentation for debugging procedures.

vSphere Auto Deploy Host Cannot Retrieve ESXi Image from vSphere Auto Deploy Server

The host that you provision with vSphere Auto Deploy stops at the iPXE boot screen.

Problem

When you attempt to boot a host provisioned with vSphere Auto Deploy, the boot process stops at the iPXE boot screen and the status message indicates that the host is attempting to get the ESXi image from the vSphere Auto Deploy server.

Cause

The vSphere Auto Deploy service might be stopped or the vSphere Auto Deploy server might be unaccessible.

Solution

1 Log in to the system on which you installed the vSphere Auto Deploy server.

2 Check that the vSphere Auto Deploy server is running.

   a Click Start > Settings > Control Panel > Administrative Tools.

   b Double-click Services to open the Services Management panel.

   c In the Services field, look for the VMware vSphere Auto Deploy Waiter service and restart the service if it is not running.
3. Open a Web browser, enter the following URL, and check whether the vSphere Auto Deploy server is accessible.

https://Auto_Deploy_Server_IP_Address:Auto_Deploy_Server_Port/vmw/rdb

**Note**  Use this address only to check whether the server is accessible.

4. If the server is not accessible, a firewall problem is likely.
   a. Try setting up permissive TCP Inbound rules for the vSphere Auto Deploy server port.
      The port is 6501 unless you specified a different port during installation.
   b. As a last resort, disable the firewall temporarily and enable it again after you verified whether it blocked the traffic. Do not disable the firewall on production environments.
      To disable the firewall, run `netsh firewall set opmode disable`. To enable the firewall, run `netsh firewall set opmode enable`.

**vSphere Auto Deploy Host Does Not Get a DHCP Assigned Address**

The host you provision with vSphere Auto Deploy fails to get a DHCP Address.

**Problem**

When you attempt to boot a host provisioned with vSphere Auto Deploy, the host performs a network boot but is not assigned a DHCP address. The vSphere Auto Deploy server cannot provision the host with the image profile.

**Cause**

You might have a problem with the DHCP service or with the firewall setup.

**Solution**

1. Check that the DHCP server service is running on the Windows system on which the DHCP server is set up to provision hosts.
   a. Click **Start > Settings > Control Panel > Administrative Tools**.
   b. Double-click **Services** to open the Services Management panel.
   c. In the Services field, look for the DHCP server service and restart the service if it is not running.

2. If the DHCP server is running, recheck the DHCP scope and the DHCP reservations that you configured for your target hosts.
   If the DHCP scope and reservations are configured correctly, the problem most likely involves the firewall.
3  As a temporary workaround, turn off the firewall to see whether that resolves the problem.
   a  Open the command prompt by clicking **Start > Program > Accessories > Command prompt**.
   b  Type the following command to temporarily turn off the firewall. Do not turn off the firewall in a production environment.
       ```
       netsh firewall set opmode disable
       ```
   c  Attempt to provision the host with vSphere Auto Deploy.
   d  Type the following command to turn the firewall back on.
       ```
       netsh firewall set opmode enable
       ```
4  Set up rules to allow DHCP network traffic to the target hosts.
   See the firewall documentation for DHCP and for the Windows system on which the DHCP server is running for details.

**vSphere Auto Deploy Host Does Not Network Boot**

The host you provision with vSphere Auto Deploy comes up but does not network boot.

**Problem**

When you attempt to boot a host provisioned with vSphere Auto Deploy, the host does not start the network boot process.

**Cause**

You did not enable your host for network boot.

**Solution**

1  Reboot the host and follow the on-screen instructions to access the BIOS configuration.
2  In the BIOS configuration, enable Network Boot in the Boot Device configuration.

**Recovering from Database Corruption on the vSphere Auto Deploy Server**

In some situations, you might have a problem with the vSphere Auto Deploy database. The most efficient recovery option is to replace the existing database file with the most recent backup.

**Problem**

When you use vSphere Auto Deploy to provision the ESXi hosts in your environment, you might encounter a problem with the vSphere Auto Deploy database.

**Important**  This is a rare problem. Follow all other vSphere Auto Deploy troubleshooting strategies before you replace the current database file. Rules or associations that you created since the backup you choose are lost.

**Cause**

This problem happens only with hosts that are provisioned with vSphere Auto Deploy.
Solution

1. Stop the vSphere Auto Deploy server service.
2. Find the vSphere Auto Deploy log by going to the vSphere Auto Deploy page in the vSphere Web Client.
3. Check the logs for the following message:
   
   DatabaseError: database disk image is malformed.
   
   If you see the message, replace the existing database with the most recent backup.
4. Go to the vSphere Auto Deploy data directory.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>File Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>vCenter Server appliance</td>
<td>/var/lib/rbd</td>
</tr>
<tr>
<td>Microsoft Windows</td>
<td>%VMWARE_DATA_DIR%\autodeploy\Data</td>
</tr>
</tbody>
</table>

   The directory contains a file named db, and backup files named db-yyyy-mm-dd.
5. Rename the current db file.
   
   VMware Support might ask for that file if you call for assistance.
6. Rename the most recent backup to db.
7. Restart the vSphere Auto Deploy server service.
8. If the message still appears in the log, repeat the steps to use the next recent backup until vSphere Auto Deploy works without database errors.

Setting Up ESXi

These topics provide information about using the direct console user interface and configuring defaults for ESXi.

ESXi Autoconfiguration

When you turn on the ESXi host for the first time or after resetting the configuration defaults, the host enters an autoconfiguration phase. This phase configures system network and storage devices with default settings.

By default, Dynamic Host Configuration Protocol (DHCP) configures IP, and all visible blank internal disks are formatted with the virtual machine file system (VMFS) so that virtual machines can be stored on the disks.

About the Direct Console ESXi Interface

Use the direct console interface for initial ESXi configuration and troubleshooting.

Connect a keyboard and monitor to the host to use the direct console. After the host completes the autoconfiguration phase, the direct console appears on the monitor. You can examine the default network configuration and change any settings that are not compatible with your network environment.
Key operations available to you in the direct console include:

- Configuring hosts
- Setting up administrative access
- Troubleshooting

You can also use vSphere Web Client to manage the host by using vCenter Server.

Table 5-19. Navigating in the Direct Console

<table>
<thead>
<tr>
<th>Action</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>View and change the configuration</td>
<td>F2</td>
</tr>
<tr>
<td>Change the user interface to high-contrast mode</td>
<td>F4</td>
</tr>
<tr>
<td>Shut down or restart the host</td>
<td>F12</td>
</tr>
<tr>
<td>View the VMkernel log</td>
<td>Alt+F12</td>
</tr>
<tr>
<td>Switch to the shell console</td>
<td>Alt+F1</td>
</tr>
<tr>
<td>Switch to the direct console user interface</td>
<td>Alt+F2</td>
</tr>
<tr>
<td>Move the selection between fields</td>
<td>Arrow keys</td>
</tr>
<tr>
<td>Select a menu item</td>
<td>Enter</td>
</tr>
<tr>
<td>Toggle a value</td>
<td>Spacebar</td>
</tr>
<tr>
<td>Confirm sensitive commands, such as resetting configuration defaults</td>
<td>F11</td>
</tr>
<tr>
<td>Save and exit</td>
<td>Enter</td>
</tr>
<tr>
<td>Exit without saving</td>
<td>Esc</td>
</tr>
<tr>
<td>Exit system logs</td>
<td>q</td>
</tr>
</tbody>
</table>

Configure the Keyboard Layout for the Direct Console

You can configure the layout for the keyboard that you use with the direct console.

Procedure

1. From the direct console, select Configure Keyboard and press Enter.
2. Select the layout to use.
3. Press the spacebar to toggle selections on and off.
4. Press Enter.

Create a Security Banner for the Direct Console

A security banner is a message that is displayed on the direct console Welcome screen.

Procedure

1. From the vSphere Web Client, connect to the vCenter Server.
2 Select the host in the inventory.
3 Click the Manage tab.
4 Click Settings.
5 Under System, select Advanced System Settings.
6 Select Annotations.
7 Click the Edit icon.
8 Enter a security message.

The message is displayed on the direct console Welcome screen.

Redirecting the Direct Console to a Serial Port

To manage your ESXi host remotely from a serial console, you can redirect the direct console to a serial port.

vSphere supports the VT100 terminal type and the PuTTy terminal emulator to view the direct console over the serial port.

You can redirect the direct console to a serial port in several ways.

- **Redirect the Direct Console to a Serial Port by Setting the Boot Options Manually**
  When you redirect the direct console to a serial port by setting the boot options, the change does not persist for subsequent boots.

- **Redirect the Direct Console to a Serial Port from the vSphere Web Client**
  You can manage the ESXi host remotely from a console that is connected to the serial port by redirecting the direct console to either of the serial ports com1 or com2. When you use the vSphere Web Client to redirect the direct console to a serial port, the boot option that you set persists after subsequent reboots.

- **Redirect the Direct Console to a Serial Port in a Host Deployed with Auto Deploy**
  After you redirect the direct console to a serial port, you can make that setting part of the host profile that persists when you reprovision the host with Auto Deploy.

Redirect the Direct Console to a Serial Port by Setting the Boot Options Manually

When you redirect the direct console to a serial port by setting the boot options, the change does not persist for subsequent boots.

**Prerequisites**

Verify that the serial port is not in use for serial logging and debugging.

**Procedure**

1 Start the host.
2 When the Loading VMware Hypervisor window appears, press Shift+O to edit boot options.
3 Disable the logPort and gdbPort on com1 and set tty2Port to com1 by entering the following boot options:

"gdbPort=none logPort=none tty2Port=com1";

To use com2 instead, replace com1 with com2.

The direct console is redirected to the serial port until you reboot the host. To redirect the direct console for subsequent boots, see Redirect the Direct Console to a Serial Port from the vSphere Web Client.

Redirect the Direct Console to a Serial Port from the vSphere Web Client

You can manage the ESXi host remotely from a console that is connected to the serial port by redirecting the direct console to either of the serial ports com1 or com2. When you use the vSphere Web Client to redirect the direct console to a serial port, the boot option that you set persists after subsequent reboots.

**Prerequisites**

- Verify that you can access the host from the vSphere Web Client.
- Verify that the serial port is not in use for serial logging and debugging, or for ESX Shell (tty1Port).

**Procedure**

1. From the vSphere Web Client, connect to the vCenter Server.
2. Select the host in the inventory.
3. Click the Manage tab.
4. Click Settings.
6. Make sure that the VMkernel.Boot.logPort and VMkernel.Boot.gdbPort fields are not set to use the com port that you want to redirect the direct console to.
7. Set VMkernel.Boot.tty2Port to the serial port to redirect the direct console to: com1 or com2.
8. Reboot the host.

You can now manage the ESXi host remotely from a console that is connected to the serial port.

Redirect the Direct Console to a Serial Port in a Host Deployed with Auto Deploy

After you redirect the direct console to a serial port, you can make that setting part of the host profile that persists when you reprovision the host with Auto Deploy.

**Prerequisites**

The serial port must not already be in use for serial logging and debugging.

**Procedure**

1. From the vSphere Web Client, connect to the vCenter Server.
2. Select the host in the inventory.
3 Click the Manage tab.

4 Select Settings.

5 Select Advanced System Settings.

6 Make sure that the `VMkernel.Boot.logPort` and `VMkernel.Boot.gdbPort` fields are not set to use the com port that you want to redirect the direct console to.

7 Set `VMkernel.Boot.tty2Port` to the serial port to redirect the direct console to: `com1` or `com2`.

8 Click OK.

9 Save the host profile and attach the host to the profile. See the vSphere Host Profiles documentation.

The setting to redirect the direct console to a serial port is stored by vCenter Server and persists when you reprovision the host with Auto Deploy.

Enable ESXi Shell and SSH Access with the Direct Console User Interface

Use the direct console user interface to enable the ESXi Shell.

Procedure

1 From the Direct Console User Interface, press F2 to access the System Customization menu.

2 Select Troubleshooting Options and press Enter.

3 From the Troubleshooting Mode Options menu, select a service to enable.

   - Enable ESXi Shell
   - Enable SSH

4 Press Enter to enable the service.

5 (Optional) Set the timeout for the ESXi Shell.

   By default, timeouts for the ESXi Shell is 0 (disabled).

   The availability timeout setting is the number of minutes that can elapse before you must log in after the ESXi Shell is enabled. After the timeout period, if you have not logged in, the shell is disabled.

   **Note** If you are logged in when the timeout period elapses, your session will persist. However, the ESXi Shell will be disabled, preventing other users from logging in.

   a From the Troubleshooting Mode Options menu, select Modify ESXi Shell and SSH timeouts and press Enter.

   b Enter the availability timeout in minutes.

   The availability timeout is the number of minutes that can elapse before you must log in after the ESXi Shell is enabled.
c Press Enter.
d Enter the idle timeout.
The idle timeout is the number of minutes that can elapse before the user is logged out of an idle interactive sessions. Changes to the idle timeout apply the next time a user logs in to the ESXi Shell and do not affect existing sessions.

6 Press Esc until you return to the main menu of the Direct Console User Interface.

Managing ESXi Remotely
You can use the VMware Host Client, the vSphere Web Client and vCenter Server to manage your ESXi hosts.

For instructions about downloading and installing vCenter Server and the vCenter Server components or for downloading and deploying the vCenter Server Appliance, see vCenter Server Installation and Setup. For information about installing the VMware Host Client, see vSphere Single Host Management.

Set the Password for the Administrator Account
You can use the direct console to set the password for the administrator account (root).
The administrative user name for the ESXi host is root. By default, the administrative password is not set.

Procedure
1 From the direct console, select Configure Password.
2 (Optional) If a password is already set up, type the password in the Old Password line and press Enter.
3 In the New Password line, type a new password and press Enter.
4 Retype the new password and press Enter.

Configuring the BIOS Boot Settings
If your server has multiple drives, you might need to configure the BIOS settings.
The BIOS boot configuration determines how your server boots. Generally, the CD-ROM device is listed first.

Note If you are using ESXi Embedded, the BIOS boot configuration determines whether your server boots into the ESXi boot device or another boot device. Generally, the USB flash device is listed first in the BIOS boot settings on the machine that hosts ESXi.
You can change the boot setting by configuring the boot order in the BIOS during startup or by selecting a boot device from the boot device selection menu. When you change the boot order in the BIOS, the new setting affects all subsequent reboots. When you select a boot device from the boot device selection menu, the selection affects the current boot only.

Some servers do not have a boot device selection menu, in which case you must change the boot order in the BIOS even for one-time boots, and then change it back again during a subsequent reboot.

**Change the BIOS Boot Setting for ESXi**

Configure the BIOS boot setting for ESXi if you want the server to boot into ESXi by default.

ESXi Installable and ESXi Embedded cannot exist on the same host.

**Procedure**

1. While the ESXi host is powering on, press the key required to enter your host's BIOS setup.

   Depending on your server hardware, the key might be a function key or Delete. The option to enter the BIOS setup might be different for your server.

2. Select the BIOS boot setting.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are using the installable version of ESXi</td>
<td>Select the disk on which you installed the ESXi software and move it to the first position in the list. The host boots into ESXi.</td>
</tr>
<tr>
<td>If you are using ESXi Embedded</td>
<td>Select the USB flash device and move it to the first position in the list. The host starts in ESXi mode.</td>
</tr>
</tbody>
</table>

**Configure the Boot Setting for Virtual Media**

If you are using remote management software to set up ESXi, you might need to configure the boot setting for virtual media.

Virtual media is a method of connecting a remote storage media such as CD-ROM, USB mass storage, ISO image, and floppy disk to a target server that can be anywhere on the network. The target server has access to the remote media, and can read from and write to it as if it were physically connected to the server's USB port.

**Prerequisites**

ESXi Installable and ESXi Embedded cannot exist on the same host.

**Procedure**

1. Connect the media to the virtual device.

   For example, if you are using a Dell server, log in to the Dell Remote Access Controller (DRAC) or a similar remote management interface and select a physical floppy or CD-ROM drive, or provide a path to a floppy image or CD-ROM image.

2. Reboot the server.
3 While the server is powering on, enter the device selection menu. Depending on your server hardware, the key might be a function key or Delete.

4 Follow the instructions to select the virtual device.

The server boots from the configured device once and goes back to the default boot order for subsequent boots.

**Configuring Network Settings**

ESXi requires one IP address for the management network. To configure basic network settings, use the vSphere Web Client or the direct console.

Use the vSphere Web Client if you are satisfied with the IP address assigned by the DHCP server.

Use the direct console for network configuration in the following cases:

- You are not satisfied with the IP address assigned by the DHCP server.
- You are not allowed to use the IP address assigned by the DHCP server.
- ESXi does not have an IP address. This situation might occur if the autoconfiguration phase did not succeed in configuring DHCP.
- The wrong network adapter was selected during the autoconfiguration phase.

**Network Access to Your ESXi Host**

The default behavior is to configure the ESXi management network using DHCP. You can override the default behavior and use static IP settings for the management network after the installation is completed.

<table>
<thead>
<tr>
<th>Table 5-20. Network Configuration Scenarios Supported by ESXi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario</strong></td>
</tr>
<tr>
<td>You want to accept the DHCP-configured IP settings.</td>
</tr>
<tr>
<td>One of the following is true:</td>
</tr>
<tr>
<td>- You do not have a DHCP server.</td>
</tr>
<tr>
<td>- The ESXi host is not connected to a DHCP server.</td>
</tr>
<tr>
<td>- Your connected DHCP server is not functioning properly.</td>
</tr>
<tr>
<td>The ESXi host is connected to a functioning DHCP server, but you do not want to use the DHCP-configured IP address.</td>
</tr>
<tr>
<td>Your security deployment policies do not permit unconfigured hosts to be powered on the network.</td>
</tr>
</tbody>
</table>
ESXi Networking Security Recommendations

Isolation of network traffic is essential to a secure ESXi environment. Different networks require different access and level of isolation.

Your ESXi host uses several networks. Use appropriate security measures for each network, and isolate traffic for specific applications and functions. For example, ensure that VMware vSphere vMotion® traffic does not travel over networks where virtual machines are located. Isolation prevents snooping. Having separate networks is also recommended for performance reasons.

- vSphere infrastructure networks are used for features such as vSphere vMotion, VMware vSphere Fault Tolerance, and storage. Isolate these networks for their specific functions. It is often not necessary to route these networks outside a single physical server rack.

- A management network isolates client traffic, command-line interface (CLI) or API traffic, and third-party software traffic from other traffic. This network should be accessible only by system, network, and security administrators. Use jump box or virtual private network (VPN) to secure access to the management network. Strictly control access within this network.

- Virtual machine traffic can flow over one or many networks. You can enhance the isolation of virtual machines by using virtual firewall solutions that set firewall rules at the virtual network controller. These settings travel with a virtual machine as it migrates from host to host within your vSphere environment.

Choose Network Adapters for the Management Network

Traffic between an ESXi host and any external management software is transmitted through an Ethernet network adapter on the host. You can use the direct console to choose the network adapters that are used by the management network.

Examples of external management software include the vCenter Server and SNMP client. Network adapters on the host are named vmnicN, where N is a unique number identifying the network adapter, for example, vmnic0, vmnic1, and so forth.

During the autoconfiguration phase, the ESXi host chooses vmnic0 for management traffic. You can override the default choice by manually choosing the network adapter that carries management traffic for the host. In some cases, you might want to use a Gigabit Ethernet network adapter for your management traffic. Another way to help ensure availability is to select multiple network adapters. Using multiple network adapters enables load balancing and failover capabilities.

Procedure

1. From the direct console, select Configure Management Network and press Enter.
2. Select Network Adapters and press Enter.
3. Select a network adapter and press Enter.

After the network is functional, you can use the vSphere Web Client to connect to the ESXi host through vCenter Server.
Set the VLAN ID

You can set the virtual LAN (VLAN) ID number of the ESXi host.

Procedure

1. From the direct console, select Configure Management Network and press Enter.
2. Select VLAN and press Enter.
3. Enter a VLAN ID number from 1 through 4094.

Configuring IP Settings for ESXi

By default, DHCP sets the IP address, subnet mask, and default gateway.

For future reference, write down the IP address.

For DHCP to work, your network environment must have a DHCP server. If DHCP is not available, the host assigns the link local IP address, which is in the subnet 169.254.x.x/16. The assigned IP address appears on the direct console. If you do not have physical monitor access to the host, you can access the direct console using a remote management application. See Using Remote Management Applications

When you have access to the direct console, you can optionally configure a static network address. The default subnet mask is 255.255.0.0.

Configure IP Settings from the Direct Console

If you have physical access to the host or remote access to the direct console, you can use the direct console to configure the IP address, subnet mask, and default gateway.

Procedure

1. Select Configure Management Network and press Enter.
2. Select IP Configuration and press Enter.
3. Select Set static IP address and network configuration.
4. Enter the IP address, subnet mask, and default gateway and press Enter.

Configure IP Settings from the vSphere Web Client

If you do not have physical access to the host, you can use the vSphere Web Client to configure static IP settings.

Procedure

1. Log in to the vCenter Server from the vSphere Web Client.
2. Select the host in the inventory.
3. On the Manage tab, select Networking.
4. Select Virtual adapters.
5. Select vmk0 Management Network and click the edit icon.
6 Select IPv4 settings.
7 Select Use static IPv4 settings.
8 Enter or change the static IPv4 address settings.
9 (Optional) Set static IPv6 addresses.
   a Select IPv6 settings.
   b Select Static IPv6 addresses.
   c Click the add icon.
   d Type the IPv6 address and click OK.
10 Click OK.

Configuring DNS for ESXi

You can select either manual or automatic DNS configuration of the ESXi host.

The default is automatic. For automatic DNS to work, your network environment must have a DHCP server and a DNS server.

In network environments where automatic DNS is not available or not desirable, you can configure static DNS information, including a host name, a primary name server, a secondary name server, and DNS suffixes.

Configure DNS Settings from the Direct Console

If you have physical access to the host or remote access to the direct console, you can use the direct console to configure DNS information.

Procedure

1 Select Configure Management Network and press Enter.
2 Select DNS Configuration and press Enter.
3 Select Use the following DNS server addresses and hostname.
4 Enter the primary server, an alternative server (optional), and the host name.

Configure DNS Suffixes

If you have physical access to the host, you can use the direct console to configure DNS information. By default, DHCP acquires the DNS suffixes.

Procedure

1 From the direct console, select Configure Management Network.
2 Select Custom DNS Suffixes and press Enter.
3 Enter new DNS suffixes.
Configure the Network Settings on a Host That Is Not Attached to the Network

Some highly secure environments do not permit unconfigured hosts on the network to be powered on. You can configure the host before you attach the host to the network.

Prerequisites
Verify that no network cables are connected to the host.

Procedure
1. Power on the host.
2. Use the direct console user interface to configure the password for the administrator account (root).
3. Use the direct console user interface to configure a static IP address.
4. Connect a network cable to the host.
5. (Optional) Use the vSphere Web Client to connect to a vCenter Server system.
6. (Optional) Add the host to the vCenter Server inventory.

Test the Management Network
You can use the direct console to do simple network connectivity tests.

The direct console performs the following tests.
- Pings the default gateway
- Pings the primary DNS name server
- Pings the secondary DNS nameserver
- Resolves the configured host name

Procedure
1. From the direct console, select Test Management Network and press Enter.
2. Press Enter to start the test.

Restart the Management Agents
The management agents synchronize VMware components and let you access the ESXi host by using the vSphere Web Client and vCenter Server. They are installed with the vSphere software. You might need to restart the management agents if remote access is interrupted.

Restarting the management agents restarts all management agents and services that are installed and running in /etc/init.d on the ESXi host. Typically, these agents include hostd, ntpd, sfcbd, slpd, wsman, and vobd. The software also restarts the Fault Domain Manager (FDM) if installed.

Users accessing this host by using the vSphere Web Client and vCenter Server lose connectivity when you restart management agents.
Procedure

1. From the direct console, select **Troubleshooting Options** and press Enter.
2. Select **Restart Management Agents** and press Enter.
3. Press F11 to confirm the restart.

The ESXi host restarts the management agents and services.

**Restart the Management Network**

Restarting the management network interface might be required to restore networking or to renew a DHCP lease.

Restarting the management network will result in a brief network outage that might temporarily affect running virtual machines.

If a renewed DHCP lease results in a new network identity (IP address or host name), remote management software will be disconnected.

Procedure

1. From the direct console, select **Restart Management Network** and press Enter.
2. Press F11 to confirm the restart.

**Test Connectivity to Devices and Networks**

You can use the direct console to perform some simple network connectivity tests. In addition to the management network, you can specify other devices and networks.

Procedure

1. From the direct console, select **Test Management Network** and press Enter.
2. Type addresses to ping or another DNS host name to resolve.
3. Press Enter to start the test.

**Restoring the Standard Switch**

A vSphere Distributed Switch functions as a single virtual switch across all associated hosts. Virtual machines can maintain a consistent network configuration as they migrate across multiple hosts. If you migrate an existing standard switch, or virtual adapter, to a Distributed Switch and the Distributed Switch becomes unnecessary or stops functioning, you can restore the standard switch to ensure that the host remains accessible.

When you restore the standard switch, a new virtual adapter is created and the management network uplink that is currently connected to Distributed Switch is migrated to the new virtual switch.

You might need to restore the standard switch for the following reasons:

- The Distributed Switch is not needed or is not functioning.
The Distributed Switch needs to be repaired to restore connectivity to vCenter Server and the hosts need to remain accessible.

You do not want vCenter Server to manage the host. When the host is not connected to vCenter Server, most Distributed Switch features are unavailable to the host.

Prerequisites

Verify that your management network is connected to a distributed switch.

Procedure

1. From the direct console, select **Restore Standard Switch** and press Enter.
   
   If the host is on a standard switch, this selection is dimmed, and you cannot select it.

2. Press F11 to confirm.

Storage Behavior

When you start ESXi, the host enters an autoconfiguration phase during which system storage devices are configured with defaults.

When you reboot the ESXi host after installing the ESXi image, the host configures the system storage devices with default settings. By default, all visible blank internal disks are formatted with VMFS, so you can store virtual machines on the disks. In ESXi Embedded, all visible blank internal disks with VMFS are also formatted by default.

**Caution**

ESXi overwrites any disks that appear to be blank. Disks are considered to be blank if they do not have a valid partition table or partitions. If you are using software that uses such disks, in particular if you are using logical volume manager (LVM) instead of, or in addition to, conventional partitioning schemes, ESXi might cause local LVM to be reformatted. Back up your system data before you power on ESXi for the first time.

On the hard drive or USB device that the ESXi host is booting from, the disk-formatting software retains existing diagnostic partitions that the hardware vendor creates. In the remaining space, the software creates the partitions described in Table 5-21.
Table 5-21. Partitions Created by ESXi on the Host Drive

<table>
<thead>
<tr>
<th>ESXi Version</th>
<th>Partitions Created</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESXi Installable</td>
<td>For fresh installations, several new partitions are created for the boot banks, the scratch partition, and the locker. Fresh ESXi installations use GUID Partition Tables (GPT) instead of MSDOS-based partitioning. The partition table itself is fixed as part of the binary image, and is written to the disk at the time the system is installed. The ESXi installer leaves the scratch and VMFS partitions blank and ESXi creates them when the host is rebooted for the first time after installation or upgrade. One 4GB VFAT scratch partition is created for system swap. See About the Scratch Partition. The VFAT scratch partition is created only on the disk from which the ESXi host is booting. <strong>Note</strong> To create the VMFS volume and a scratch partition with the installation, the ESXi installer requires a minimum of 5.2GB of free space on the installation disk. The installer affects only the installation disk. The installer does not affect other disks of the server. When you install on a disk, the installer overwrites the entire disk. When the installer autoconfigures storage, the installer does not overwrite hardware vendor partitions. During ESXi installation, the installer creates a 110MB diagnostic partition for core dumps.</td>
</tr>
<tr>
<td>ESXi Embedded</td>
<td>One 110MB diagnostic partition for core dumps, if this partition is not present on another disk. The VFAT scratch and diagnostic partitions are created only on the disk from which the ESXi host is booting. On other disks, the software creates one VMFS5 partition per blank disk, using the whole disk. Only blank disks are formatted.</td>
</tr>
<tr>
<td>Both ESXi Installable and ESXi Embedded</td>
<td>One VMFS5 partition on the remaining free space.</td>
</tr>
</tbody>
</table>

You might want to override this default behavior if, for example, you use shared storage devices instead of local storage. To prevent automatic disk formatting, detach the local storage devices from the host under the following circumstances:

- Before you start the host for the first time.
- Before you start the host after you reset the host to the configuration defaults.

To override the VMFS formatting if automatic disk formatting already occurred, you can remove the datastore. See the *vCenter Server and Host Management* documentation.

**About the Scratch Partition**

For new installations of ESXi, during the autoconfiguration phase, a 4-GB VFAT scratch partition is created if the partition is not present on another disk.

**Note** Partitioning for hosts that are upgraded to ESXi 5.x from ESXi versions earlier than version 5.0 differs significantly from partitioning for new installations of ESXi 5.x. See the *vSphere Upgrade* documentation.
When ESXi boots, the system tries to find a suitable partition on a local disk to create a scratch partition.

The scratch partition is not required. It is used to store vm-support output, which you need when you create a support bundle. If the scratch partition is not present, vm-support output is stored in a ramdisk. In low-memory situations, you might want to create a scratch partition if one is not present.

For the installable version of ESXi, the partition is created during installation and is selected. VMware recommends that you do not modify the partition.

**Note** To create the VMFS volume and scratch partition, the ESXi installer requires a minimum of 5.2 GB of free space on the installation disk.

For ESXi Embedded, if a partition is not found, but an empty local disk exists, the system formats it and creates a scratch partition. If no scratch partition is created, you can configure one, but a scratch partition is not required. You can also override the default configuration. You might want to create the scratch partition on a remote NFS-mounted directory.

**Note** The installer can create multiple VFAT partitions. The VFAT designation does not always indicate that the partition is a scratch partition. Sometimes, a VFAT partition can simply lie idle.

### Set the Scratch Partition from the vSphere Web Client

If a scratch partition is not set up, you might want to configure one, especially if low memory is a concern. When a scratch partition is not present, vm-support output is stored in a ramdisk.

**Prerequisites**

The directory to use for the scratch partition must exist on the host.

**Procedure**

1. From the vSphere Web Client, connect to the vCenter Server.
2. Select the host in the inventory.
3. Click the **Manage** tab.
4. Select **Settings**.
5. Select **Advanced System Settings**.
   - The setting `ScratchConfig.CurrentScratchLocation` shows the current location of the scratch partition.
6. In the `ScratchConfig.ConfiguredScratchLocation` text box, enter a directory path that is unique for this host.
   - For example, `/vmfs/volumes/DatastoreUUID/DatastoreFolder`.
7. Reboot the host for the changes to take effect.
Configuring System Logging

The ESXi hosts run the syslog service (vmsyslogd), which writes messages from the VMkernel and other system components to log files.

You can configure the amount and location of the log. You can also create and apply log filters to modify the logging policy of an ESXi host.

Configure Syslog on ESXi Hosts

You can use the vSphere Web Client or the esxcli system syslog vCLI command to configure the syslog service.

For information about using the esxcli system syslog command and other vCLI commands, see Getting Started with vSphere Command-Line Interfaces.

Procedure

1. In the vSphere Web Client inventory, select the host.
2. Click Configure.
4. Filter for syslog.
5. To set up logging globally, select the setting to change and click Edit.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syslog.global.defaultRotate</td>
<td>Maximum number of archives to keep. You can set this number globally and for individual subloggers.</td>
</tr>
<tr>
<td>Syslog.global.defaultSize</td>
<td>Default size of the log, in KB, before the system rotates logs. You can set this number globally and for individual subloggers.</td>
</tr>
<tr>
<td>Syslog.global.LogDir</td>
<td>Directory where logs are stored. The directory can be located on mounted NFS or VMFS volumes. Only the /scratch directory on the local file system is persistent across reboots. Specify the directory as [datastorename] path_to_file, where the path is relative to the root of the volume backing the datastore. For example, the path [storage1] /systemlogs maps to the path /vmfs/volumes/storage1/systemlogs.</td>
</tr>
<tr>
<td>Syslog.global.logDirUnique</td>
<td>Selecting this option creates a subdirectory with the name of the ESXi host under the directory specified by Syslog.global.LogDir. A unique directory is useful if the same NFS directory is used by multiple ESXi hosts.</td>
</tr>
<tr>
<td>Syslog.global.LogHost</td>
<td>Remote host to which syslog messages are forwarded and port on which the remote host receives syslog messages. You can include the protocol and the port, for example, ssl://hostName1:1514. UDP (default), TCP, and SSL are supported. The remote host must have syslog installed and correctly configured to receive the forwarded syslog messages. See the documentation for the syslog service installed on the remote host for information on configuration.</td>
</tr>
</tbody>
</table>
6  (Optional) To overwrite the default log size and log rotation for any of the logs.
   a  Click the name of the log that you want to customize.
   b  Click Edit and enter the number of rotations and the log size you want.
7  Click OK.

Changes to the syslog options take effect immediately.

Configure Log Filtering on ESXi Hosts

The log filtering capability lets you modify the logging policy of the syslog service that is running on an
ESXi host. You can create log filters to reduce the number of repetitive entries in the ESXi logs and to
blacklist specific log events entirely.

Log filters affect all log events that are processed by the ESXi host vmsyslogd daemon, whether they are
recorded to a log directory or to a remote syslog server.

When you create a log filter, you set a maximum number of log entries for the log messages. The logs
messages are generated by one or more specified system components and that match a specified
phrase. You must enable the log filtering capability and reload the syslog daemon to activate the log filters
on the ESXi host.

Important  Setting a limit to the amount of logging information, restricts your ability to troubleshoot
potential system failures properly. If a log rotate occurs after the maximum number of log entries is
reached, you might lose all instances of a filtered message.

Procedure

1  Log in to the ESXi Shell as root.
2  In the /etc/vmware/logfilters file, add the following entry to create a log filter.

```
numLogs | ident | logRegexp
```

where:

- **numLogs** sets the maximum number of log entries for the specified log messages. After reaching
  this number, the specified log messages are filtered and ignored. Use 0 to filter and ignore all the
  specified log messages.

- **ident** specifies one or more system components to apply the filter to the log messages that these
  components generate. For information about the system components that generate log
  messages, see the values of the idents parameters in the syslog configuration files. The files
  are located in the /etc/vmsyslog.conf.d directory. Use a comma-separated list to apply a filter
to more than one system component. Use * to apply a filter to all system components.
- `logRegexp` specifies a case-sensitive phrase with Python regular expression syntax to filter the log messages by their content.

For example, to set a limit of maximum two-log entries from the hostd component for messages that resemble the `SOCKET connect failed, error 2: No such file or directory` phrase with any error number, add the following entry:

```
2 | hostd | SOCKET connect failed, error .*: No such file or directory
```

**Note** A line starting with `#` denotes a comment and the rest of the line is ignored.

3 In the `/etc/vmsyslog.conf` file, add the following entry to enable the log filtering capability.

```
enable_logfilters = true
```

4 Run the `esxcli system syslog reload` command to reload the syslog daemon and apply the configuration changes.

### Set the Host Image Profile Acceptance Level

The Host Image Profile acceptance level determines which vSphere installation bundles (VIBs) are accepted for installation.

VIB signatures are checked and accepted for installation based on a combination of the VIB acceptance level and the host image profile acceptance level. VIBs are tagged with an acceptance level that depends on their signature status.

See [Acceptance Levels](#).

**Prerequisites**


**Procedure**

1 From the vSphere Web Client, connect to the vCenter Server.
2 Select the host in the inventory.
3 Click the Manage tab.
4 Click Settings.
5 Under System, select Security Profile.
6 Scroll down to Host Image Profile Acceptance Level, and click Edit.
Select the acceptance level and click OK.

### Table 5-22. Host Image Profile Acceptance Levels

<table>
<thead>
<tr>
<th>Host Image Profile Acceptance Level</th>
<th>Accepted Levels of VIBs</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware Certified</td>
<td>VMware Certified</td>
</tr>
<tr>
<td>VMware Accepted</td>
<td>VMware Certified, VMware Accepted</td>
</tr>
<tr>
<td>Partner Supported</td>
<td>VMware Certified, VMware Accepted, Partner Supported</td>
</tr>
<tr>
<td>Community Supported</td>
<td>VMware Certified, VMware Accepted, Partner Supported, Community Supported</td>
</tr>
</tbody>
</table>

Remove All Custom Packages on ESXi

After adding custom packages, you might decide to remove them.

**Prerequisites**

Before you remove custom packages, shut down or migrate running virtual machines off of the ESXi host.

**Procedure**

1. Reboot the ESXi host.
2. In the direct console, select **Remove Custom Extensions** and press F11 to confirm.
3. Reboot the host.

All custom packages are removed.

Disable Support for Non-ASCII Characters in Virtual Machine File and Directory Names

By default, ESXi supports the use of non-ASCII characters for virtual machine file and directory names. You can disable this support by modifying the `/etc/vmware/hostd/config.xml` file.

After you disable this support, you can still enter non-ASCII characters for virtual machine names. vSphere user interfaces display the virtual machine names in the non-ASCII characters, but ESXi converts the actual file and directory names to ASCII strings.

**Procedure**

1. Using a text editor, open the `/etc/vmware/hostd/config.xml` file for the ESXi host.
2. Within the `<config>` tag, add the following code.
   
   `<g11nSupport>false</g11nSupport>`

3. Save and close the file.
4. Reboot the host.
Reset the System Configuration

If you are having trouble determining the source of a problem with your ESXi host, you can reset the system configuration.

Changes in the system configuration can be related to various problems, including problems with connectivity to the network and devices. Resetting the system configuration might solve such problems. If resetting the system configuration does not solve the problem, it can still rule out configuration changes made since the initial setup as the source of the problem.

When you reset the configuration, the software overrides all your configuration changes, deletes the password for the administrator account (root), and reboots the host. Configuration changes made by your hardware vendor, such as IP address settings and license configuration, might also be deleted.

Resetting the configuration does not remove virtual machines on the ESXi host. After you reset the configuration defaults, the virtual machines are not visible, but you make them visible again by reconfiguring storage and reregistering the virtual machines.

Caution  When you reset the configuration defaults, users accessing the host lose connectivity.

Prerequisites

Before resetting the configuration, back up your ESXi configuration in case you want to restore your configuration.

Procedure

1  Back up the configuration using the vSphere CLI vicfg-cfgbackup command.

2  From the direct console, select Reset System Configuration and press Enter.

3  Press F11 to confirm.

The system reboots after all settings are reset to the default values.

After You Install and Set Up ESXi

After ESXi is installed and set up, you can manage the host by using the vSphere Web Client and vCenter Server, license the host, and back up your ESXi configuration.

You can also use the VMware Host Client to connect directly to the ESXi host and to manage it. For information about installing and using the VMware Host Client, see vSphere Single Host Management.

Managing the ESXi Host

The VMware Host Client provides the simplest way to manage your ESXi host and operate its virtual machines.

You can also use the vSphere Web Client to connect to and manage vCenter Server by using a Web browser. The vSphere Web Client is installed together with vCenter Server and the vCenter Server Appliance and you can use it to manage your ESXi hosts.
Licensing ESXi Hosts

After you install ESXi, it has a 60-day evaluation period during which you can explore the full set of vSphere features provided with a vSphere Enterprise Plus license. You must assign the host an appropriate license before the evaluation period expires.

ESXi hosts are licensed with vSphere licenses that have per-CPU capacity. To license hosts correctly, you must assign them a vSphere license that has enough CPU capacity to cover all CPUs in the hosts. The license must support all features that the hosts are using. For example, if the hosts are connected to a vSphere Distributed Switch, you must assign a license that has the vSphere Distributed Switch feature.

You can use one of the following methods to license ESXi hosts:

- License multiple hosts at a time by using the license management function in the vSphere Web Client. The hosts must be connected to a vCenter Server system. For more information, see vCenter Server and Host Management.
- Set up bulk licensing by using PowerCLI commands. Bulk licensing works for all ESXi hosts, but is especially useful for hosts provisioned with Auto Deploy. See Set Up Bulk Licensing.
- License individual ESXi hosts by using a direct connection with the VMware Host Client. For information about assigning a license key to an ESXi host, see vSphere Single Host Management.

About ESXi Evaluation and Licensed Modes

You can use evaluation mode to explore the entire set of features for ESXi hosts. The evaluation mode provides the set of features equal to a vSphere Enterprise Plus license. Before the evaluation mode expires, you must assign to your hosts a license that supports all the features in use.

For example, in evaluation mode, you can use vSphere vMotion technology, the vSphere HA feature, the vSphere DRS feature, and other features. If you want to continue using these features, you must assign a license that supports them.

The installable version of ESXi hosts is always installed in evaluation mode. ESXi Embedded is preinstalled on an internal storage device by your hardware vendor. It might be in evaluation mode or prelicensed.

The evaluation period is 60 days and begins when you turn on the ESXi host. At any time during the 60-day evaluation period, you can convert from licensed mode to evaluation mode. The time available in the evaluation period is decreased by the time already used.

For example, suppose that you use an ESXi host in evaluation mode for 20 days and then assign a vSphere Standard Edition license key to the host. If you set the host back in evaluation mode, you can explore the entire set of features for the host for the remaining evaluation period of 40 days.

For information about managing licensing for ESXi hosts, see the vCenter Server and Host Management documentation.
**Recording the License Key of an ESXi Host**

If a host becomes inaccessible or unbootable, you should have a record of its license key. You can write down the license key and tape it to the server, or put the license key in a secure location. You can access the license key from the direct console user interface or the vSphere Web Client.

**View the License Keys of ESXi Hosts from the vSphere Web Client**

You can view the license keys of the hosts that are connected to a vCenter Server system through the vSphere Web Client.

**Procedure**

1. In the vSphere Web Client, select **Administration**.
2. Under Licensing, select **Licenses**.
3. On the **Assets** tab, select **Hosts**.
4. In the License column, click a license.

You view information about the license, such as its usage and license key.

**Access the ESXi License Key from the Direct Console**

If you have physical access to the host or remote access to the direct console, you can use the direct console to access the ESXi license key.

**Procedure**

1. From the direct console, select **View Support Information**.
   
   The license key appears in the form XXXXX-XXXXX-XXXXX-XXXXX-XXXXX, labeled License Serial Number.

   **Note** The physical machine serial number also appears, labeled Serial Number. Do not confuse the license key with the physical machine serial number.

**View System Logs**

System logs provide detailed information about system operational events.

**Procedure**

1. From the direct console, select **View System Logs**.
2. Press a corresponding number key to view a log.
   
   vCenter Server Agent (vpxa) logs appear if you add the host to vCenter Server.
3. Press Enter or the spacebar to scroll through the messages.
4 Perform a regular expression search.
   a Press the slash key (/).
   b Type the text to find.
   c Press Enter.
      The found text is highlighted on the screen.

5 Press q to return to the direct console.

What to do next

See also Configure Syslog on ESXi Hosts.
Troubleshooting ESXi Booting

The ESXi booting troubleshooting topics provide solutions to problems that you might encounter during the ESXi booting.

This chapter includes the following topics:

- Host Stops Unexpectedly at Bootup When Sharing a Boot Disk with Another Host
- Host Fails to Boot After You Install ESXi in UEFI Mode

Host Stops Unexpectedly at Bootup When Sharing a Boot Disk with Another Host

When more than one host, either physical or virtual, boots from the same shared physical disk or LUN, they cannot use the same scratch partition.

**Problem**

The host stops at bootup when sharing a boot disk with another host.

**Cause**

More than one ESXi host can share the same physical disk or LUN. When two such hosts also have the same scratch partition configured, either of the hosts can fail at bootup.

**Solution**

1. Set the hosts to boot sequentially, and boot the hosts.
   
   This setting lets you start the hosts so that you can change the scratch partition for one of them.

2. From the vSphere Web Client, connect to the vCenter Server.

3. Select the host in the inventory.

4. Click the Manage tab.

5. Click Settings.


7. Select ScratchConfig.
   
   The ScratchConfig.CurrentScratchLocation text box shows the current location of the scratch partition.
In the **ScratchConfig.ConfiguredScratchLocation** text box, enter a directory path that is unique for this host.

For example, `/vmfs/volumes/DatastoreUUID/DatastoreFolder`.

Reboot the host for the changes to take effect.

# Host Fails to Boot After You Install ESXi in UEFI Mode

When you install ESXi on a host machine in UEFI mode, the machine might fail to boot.

## Problem

When you reboot after installing ESXi on a host machine in UEFI mode, the reboot might fail. This problem is accompanied by an error message similar to *Unexpected network error. No boot device available*.

## Cause

The host system fails to recognize the disk that ESXi is installed on as the boot disk.

## Solution

1. While the error message is displayed on screen, press F11 to display boot options.
2. Select an option similar to **Add boot option**.
   The wording of the option might vary, depending on your system.
3. Select the file `\EFI\BOOT\BOOTx64.EFI` on the disk that you installed ESXi on.
4. Change the boot order so that the host boots from the option that you added.
Decommission an ESXi Host

If you do not want your server to be an ESXi host, you can decommission the ESXi host machine.

Procedure

1. Remove VMFS datastores on the internal disks so that the internal disks are no longer set up to store virtual machines.
2. Change the boot setting in the BIOS so that the host no longer boots into ESXi.
3. Install another operating system in its place.