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Implementing VMware vSphere 5 Auto Deploy on the Cisco Unified Computing System

What You Will Learn

This document provides an overview and detailed procedure for installing and configuring the VMware vSphere 5 Auto Deploy feature on a Microsoft Windows server. VMware vSphere is an industry-leading virtualization platform, transforming data centers into dramatically simplified cloud infrastructures and enabling the next generation of flexible, reliable IT services. Cisco Unified Computing System[™] (Cisco UCS[™]) and VMware vSphere together enable rapid application and infrastructure deployment with greater security, availability, and performance leading to increased return on investment (ROI) and reduced total cost of ownership (TCO) for computing environments.

Overview

VMware Auto Deploy, a feature available with VMware vSphere 5.0, combines the features of host profiles, VMware Image Builder, and Preboot Execution Environment (PXE)—a network boot using PXE—to simplify the task of managing VMware ESXi hypervisor installation and upgrades for hundreds of machines. VMware ESXi host images are centrally stored in the VMware Auto Deploy library. New hosts are automatically provisioned, based on rules defined by the user. Rebuilding a server to a clean state is as simple as a reboot. To move between VMware ESXi versions, simply update a rule using the VMware Auto Deploy PowerCLI and perform a test compliance and repair operation.

VMware Auto Deploy customizes VMware ESXi systems using host profiles and other information stored on the managing VMware vCenter Server system. You can set up the environment to use different images and different host profiles for different hosts. VMware Auto Deploy can be installed on a standalone Microsoft Windows host virtual machine or on the VMware vCenter Server itself. It also ships with the VMware vCenter Server appliance. In either case, it is registered with a VMware vCenter Server.

VMware Auto Deploy works in tandem with Dynamic Host Control Protocol (DHCP), Trivial File Transfer Protocol (TFTP), and the VMware vCenter Server. The PXE boot image is downloaded, and the preboot environment runs on the host. It contacts the VMware Auto Deploy server, which checks the rule engine based on which image is offered to the host and which host profile is applied (Figure 1).





The following concepts relate to configuration of the VMware Auto Deploy server:

- Software depot: Location where VMware ESXi images, drivers, and other add-ons are stored
- Image profile: VMware ESXi images available in the depot
- Host profile: Optional configuration template created on VMware vCenter Server
- Deploy rule: Pattern-based policy through which the service provider specifies the image profile that hosts that match the pattern should receive
- Deploy rule set: Active set of deploy rules

Integration with Cisco Unified Computing System

As part of Cisco UCS Manager Release 2.0, the Cisco UCS cluster name, service provider name, and service provider template name are stored in the system management BIOS (SMBIOS) of the blade. This information is now available for the VMware Auto Deploy server to check the rules engine for the host profile to be applied. Note that no configuration needs to be performed to implement this capability on Cisco UCS. As part of the BIOS in Cisco UCS Manager Release 2.0, this information is automatically available to create a rule set based on the information exposed.

Deployment Steps

Step 1: Create Service Profile

Create a service profile template for the VMware ESX cluster that will be deployed using VMware Auto Deploy (Figure 2). The first (and preferably only) entry in the boot order should be **LAN** (PXE).

Figure 2. Creating a Service Profile Template for the VMware ESX Cluster

Boot Order						
🛨 😑 💐 Filter 👄 Export 😸 Print						
Name	Order	VNIC/VHBA/ISCSI VNIC	Туре			
E-E LAN	1					
LAN eth0		eth0	Primary			

The Ethernet virtual network interface cards (vNICs) should be created based on requirements for the native VLAN on the PXE vNIC set as the VLAN on which the DHCP server is reachable, either by creating them on the same VLAN or by entering **ip helper-address** on the Layer 3 interface (Figure 3). Create service profiles from the template as required.



abric ID: 💽 Fabric A	C Fabric B 🔲 Enable Failover		
VLANs			
Select	Name	Native VLAN	17
	1k-Packet	0	-
V	VLAN10	0	
V	VLAN180	e	
	VLAN20	0	_
		-	<u>Ľ</u>

Note: The BIOS version on the blades must be from Cisco UCS Release 2.0. Use of a firmware policy as part of the template is highly recommended.

Step 2: Configure DHCP Server

Configure a DHCP server with the relevant scope and boot options (Figure 4). In the following example, the Microsoft Windows DHCP server running on VMware vCenter is used. The following URL provides a step-by-step guide to configuring a Microsoft Windows DHCP server:

http://www.windowsreference.com/windows-server-2008/how-to-setup-dhcp-server-in- windows-server-2008-stepby-step-guide/.

The MAC address must be populated from a service profile created in Step 1, which will be used to deploy the first host.

Figure 4. Configuring the DHCP Server

😤 DHCP		_ 🗆 ×
File Action View Help		
(= =) 2 🖬 0 🛛 🖬		
2 DHCP		Actions
e i win-test	Reservations	Reservations
Scope [172.25.180.0] 172.25.x Address Pool Address Leases Scope Options Server Options Pitters Pitters Pitters Pitters	A reservation ensures that a DHCP client is always assigned the same IP address. To add a reservation, on the Action menu, click New Reservation. Note: An exclusion prevents a DHCP client from ever obtaining an address from a specified address range. Exclusion ranges can be defined in Address Pool. For more information about reservations and exclusions, see online Heb. New Reservation Provide information for a reserved client. Reservation name: ESK1 IP address: 002585123458 Description. SPESK1 Supported types © Both © DHCP © BDOTP Add	More Actions

Click Server Options to configure options 66 and 67 (Figure 5). Option 66 will have the TFTP server IP address. The TFTP server could be the same VMware vCenter Server or a different server.

Figure 5. Configuring Server Options

servation Options	?
General Advanced	
Available Options	Description 🔺
🗹 066 Boot Server Host Name	TFTP boot :
🗆 067 Bootfile Name	Bootfile Nan
068 Mobile IP Home Agents	Mobile IP hc
069 Simple Mail Transport Protocol (SMTP) Servers	List of SMTF 🖵
•	
▲ Data entry	
String value:	
172.25.180.64	
The control of	

Option 67 will have the value undionly.kpxe.vmw-hardwired (Figure 6).

Figure 6. Option 67

Available Options	Description 🔺
O66 Boot Server Host Name	TFTP boot :
O67 Bootfile Name	Bootfile Nan
068 Mobile IP Home Agents	Mobile IP hc
069 Simple Mail Transport Protocol (SMTP) Servers	List of SMTF 🖵
d 1	•

For a Linux-based DHCP server, the configuration shown in Figure 7 applies.

Figure 7. Linux-Based DHCP Server Configuration



Note: 10.10.100 is the IP address of the VMware Auto Deploy server.

To rule out DHCP server configuration problems at this time if the service provider is associated, the blade should receive an IP address defined in the reservation operation, but should fail at the TFTP file download because the TFTP server has not been configured (Figure 8).

Figure 8. TFTP File Download Failure

```
Intel(R) Boot Agent XG v2.1.11
Copyright (C) 1997-2008, Intel Corporation
CLIENT MAC ADDR: 00 25 B5 12 34 39 GUID: 621BBF08 B90D 11DE 129C 08002EF7867D
CLIENT IP: 172.25.180.122 MASK: 255.255.255.0 DHCP IP: 172.25.180.116
TFTP.
PXE-T01: File not found
PXE-E3B: TFTP Error - File Not found
PXE-M0F: Exiting Intel Boot Agent.
```

Note: If the blade does not receive an IP address, check the native VLAN configuration in the service provider and the connectivity and configuration of the DHCP server.

Step 3: Set Up VMware Auto Deploy

Run VMware-Auto Deploy, which is an application in the vctools directory of VMware vSphere 5. Keep all settings at the defaults; only the IP and credentials for the VMware vCenter need to be provided.

For a successful installation, the Plug-in Manager should show VMware Auto Deploy as registered, and an icon for it should appear under Administration. VMware Auto Deploy by default runs on TCP port 6501 (Figure 9).

Figure 9. Plug-in Manager and Administration Displays

Plug-ir	n Name	Vendor	Version	Status	Description	Progress	Errors	
Insta	lled Plug-ins							
3	VMware vCenter Storage Mon	VMware Inc.	5.0	Enabled	Storage Monitoring and Reporting			
3	vCenter Service Status	VMware, Inc.	5.0	Enabled	Displays the health status of vCenter services			
3	vCenter Hardware Status	VMware, Inc.	5.0	Enabled	Displays the hardware status of hosts (CIM monitoring)			
3	Auto Deploy	VMware, Inc.	5.0.0	Enabled	Supports network-based deployment of ESX servers.			



Click the Auto Deploy Icon, download the TFTP Boot Zip file, and extract the contents to the tftproot file of the TFTP server (Figure 10).

Figure 10. Download TFTP Boot Zip and Extract Contents

ile Edit View Inventory Administration	n Plug-ins Help
🖬 🔝 🔥 Home 🕨 🖗 Admini	stration 👂 💐 Auto Deploy 👂 🛃 WIN-TEST
Configuration	
BIOS DHCP File Name:	undionly.kpxe.vmw-hardwired
EFI DHCP File Name:	snponly64.efi.vmw-hardwired
gPXE Boot URL:	https://172.25.180.116:6501/vmw/rbd/tramp
Cache Size:	2.00 GiB
Cache Space In-Use:	<1 MiB
Actions	
Download TFTP Boot Zip	
Download AutoDenloy Log Files	

On the blade, reboot with the configuration shown in Figure 11.

Figure 11. Blade Reboot Configuration

You should see the DHCP requests shown in Figure 12.

Figure 12. DHCP Requests Displayed



Note: If the second DHCP request does not receive an IP address with a Microsoft Windows DHCP server, you could be encountering CSCts86689 (Figure 13).





Note the service provider template name, service provider name, and Cisco UCS name that are populated because of Cisco UCS integration with VMware vSphere Auto Deploy.

Step 4: Install VMware vSphere PowerCLI and Configure VMware Auto Deploy Install VMware vSphere PowerCLI, found in the VMware vSphere 5 distribution.

Note: Install or upgrade the PowerShell feature in Microsoft Windows if required. Two icons are created at the end of the installation. Do not use VMware vSphere Power CLI (32bit) for configuration.

Click the VMware vSphere PowerCLI icon to launch VMware PowerCLI and run the following commands (Figure 14):

Set-ExecutionPolicy unrestricted Connect-viserver <IP of VCenter> Figure 14. Set-ExecutionPolicy and Connect VIServer Commands

PowerCLI C:\> Set-ExecutionPoli	cy unr	restricted				
Execution Policy Change The execution policy helps prot Changing the execution policy m in the about_Execution_Policies	ect yo ight e help	ou from scripts that you do not trust. expose you to the security risks described topic. Do you want to change the execution				
[Y] Yes [N] No [S] Suspend [PowerCLI C:\> Connect-VIServer WARNING: There were one or more	?] Hel 172.25 probl	p (default is "Y"): y 5.180.116 .ems with the server certificate:				
A certification chain processed correctly, but terminated in a root certificate which isn't trusted by the trust provider.						
• The certificate's CN name does not match the passed value.						
Name	Port	User				
172.25.180.116	443	Administrator				

Download the VMware ESX image (.zip) from the vSphere distribution to a local folder and run the **Add-ESXSoftwareDepot** command to add the image to the depot. Run the **Get-EsxImageProfile** command to check the status of the image import operation (Figure 15).

Figure 15. GetEsxImageProfile Command

PowerCLI C:\> Add-EsxSoftwareD	epot C:\depot\VM	ware-ESXi-5.0.0-4	69512-depot.zip				
Depot Url							
zip:C:\depot\VMware-E\$Xi-5.0.0-469512-depot.zip?index.xml							
Name Vendor Last Modified Acceptance Level							
 ESXi-5.0.0-469512-no-tools ESXi-5.0.0-469512-standard	 VMware, Inc. VMware, Inc.	8/19/2011 1: 8/19/2011 1:	PartnerSupported PartnerSupported				

You can now create a deploy rule using the New-DeployRule command. The syntax for this command is:

New-DeployRule -- Name "<name of rule>" -- Item "<Image>" -- Pattern "<pattern>"

A match is performed on the service provider template oemstring '\$SPT:ESXFarm"; the escape character (') must be entered before the \$ sign.

The **Get-DeployRule** command can be entered to query the rule. Enter **Add-DeployRule** -**DeployRule** "<name of rule>" to add the newly created rule to the list of rules (Figure 16).

Figure 16. Add-Deploy Rule

PowerCLI C:\≻	New-DeployRule -Name "Stage" -Item "ESXi-5.0.0-469512-standard" -P
attern "oemstr	•ing=`\$SPT:ESXFarm"
Name :	Stage
PatternList :	{oemstring=\$SPT:ESXFarm}
ItemList :	{ESXi-5.0.0-469512-standard}
PowerCLI C:\>	Get-DeployRule
Name :	Stage
PatternList :	{oemstring=\$SPT:ESXFarm}
ItemList :	{ESXi-5.0.0-469512-standard}
PowerCLI C:\>	Add-DeployRule -DeployRule "Stage"
Name :	Stage
PatternList :	{oemstring=\$SPT:ESXFarm}
ItemList :	{ESXi-5.0.0-469512-standard}

When the blade is rebooted, VMware Auto Deploy should have a match for the oemstring, and the PXE boot of VMware ESXi with the image service provider specified should begin (Figure 17).



1 Virtual Media	
	Loading VMware ESXi
Loading /vmw/cache/11/40111	158415a78fb587526b327814e6/tboot.2cbadfb6e2567af9f09150a898840cc0
Loading /vmw/cache/bb/fb1b1	47396a03446d3a1dd31343e3f/b.ed61b24c399ff9d9d4682ef44ced5bca
Loading /vmw/cache/bb/fb1b1	147396a03446d3a1dd31343e3f/useropts.ed61b24c399ff9d9d4682ef44ced5bca
Loading /vmu/cache/bb/fb1b1	147396a03446d3a1dd31343e3f/k.ed61b24c399ff9d9d4682ef44ced5bca
Loading /vmw/cache/11/40111	158415a78fb587526b327814e6/a.2cbadfb6e2567af9f09150a898840cc0
Loading /vmw/cache/e8/7bc42	287fa2340141bce545aa8e1fc1/ata-pata.de670812b0d8072121a4fae955f48cb1
Loading /vmw/cache/20/4906h	68947aee8373423615dac8186/ata-pata.086eb2d336e38516c245bd08e6cf3548
Loading /vmw/cache/d4/a07b5	83e498808e7f50558a68a2f50/ata-pata.d8cae6a404417a6f0847545ec8d68b6d
Loading /vmw/cache/16/61c69	ea2920211ec90a3487aff88a6/ata-pata.f2ba296ac3e713f54f1a48c6d1ac2e59
Loading /vmw/cache/d2/a8fa7	226b79d98980276b5a7d8c0b2f/ata-pata.0657f310ebed9ba1a06e396d15282e34
Loading /vmw/cache/0f/d5741	9685ee26ad37467f3add50b42/ata-pata.37e8fea17cf42b20256c23106f412eed
Loading /vmu/cache/8d/82755	id350403fa31af871a8939bb78/ata-pata.8767c9ea8b2e2e7b08529ee0efae4252
Loading /umu/cache/57/92h0h	a8198581de5268c3a93d5ae5/ata_pata_7d8d7d628e62493242e18ddf90673eeb
Loading /umu/cache/df/7f376	222295a07b84ca7ab925b2953/block_cc 504dc728ef63b74c46a02d0558d32207
Loading /vmu/cache/01/0220	
Loading /VMW/cache/01/323fd	1021111100005153501013011000170101-010.0416352000430002001103140
Loading /vmu/cache/bb/fb1b1	47396a03446d3a1dd31343e3f75.ed61024c399ff9d9d4682ef44ced5bca

After loading is completed, it will show up in VMware vCenter as a standalone host (Figure 18).

Figure 18. Add Standalone Host in VMware vCenter



Name	Target	Status	Details	Initiated by	vCenter Server
Add standalone host	TME-Lab	🥝 Completed		com.vmware	🚱 WIN-TEST

The host can be configured according to the properties desired (vSwitch configuration, data stores, security settings, etc.).

Note: To set up bulk licensing, see <u>http://pubs.vmware.com/vSphere-</u> 50/topic/com.vmware.ICbase/PDF/vSphere-esxi-vcenter-server-50-installation-setup- guide.pdf (page 73).

Step 5: Create Host Profile

At this time, if the host is rebooted all the changes made to it will be lost. To save the settings and use them for other servers to be deployed as part of this cluster, the host profile must be created. Choose Management > Host Profiles and click Create Host Profile to create a host profile from an existing host (Figure 19). Select the host and provide a name for the profile.

Figure 19. Create Host Profile



At this time, you can delete this host from VMware vCenter (Figure 20).

Figure 20. Delete Host from VMware vCenter

ESX-Cluster01	ESX-Cluster01 Getting Started Summary Hosts and Clusters		
	What is a host profile?		
	A host profile captures the configuration of a specific host and allows you to duplicate the configuration to other hosts or clusters or to validate that a host's configuration meets datacenter needs. Host profiles help reduce manual steps in cluster host configuration.		

Step 6: Configure VMware Auto Deploy for Service Providers to Use Host Profile Delete the existing deploy rule using the **Remove-DeployRule** command (Figure 21).

Figure 21. Delete Deploy Rule



You must create a new deploy rule that specifies states the cluster for this host to join and the host profile to be used along with the image and the pattern match (Figure 22):

New-DeployRule –Name "<name>" –Item "<image>", "<Cluster to join>", "<Host profile to use>" –Pattern "<pattern>"

Add-DeployRule -DeployRule "<name>"

Figure 22. Create Deploy Rule for Cluster to Be Joined by Host

PowerCLI C:\> New-DeployRule -Name "Production" -Item "ESXi-5.0.0-469512-standar d", "Cluster1", "ESX-Cluster01" -Pattern "oemstring='\$SPT:ESXFarm" Name : Production PatternList : {oemstring=\$SPT:ESXFarm} ItemList : {ESXi-5.0.0-469512-standard, Cluster1, ESX-Cluster01} PowerCLI C:\> Add-DeployRule -DeployRule "Production" Name : Production PatternList : {oemstring=\$SPT:ESXFarm} ItemList : {emstring=\$SPT:ESXFarm} ItemList : {emstring=\$SPT:ESXFarm}

You can use the Get-DeployRuleset command to query the rule created (Figure 23).

Figure 23. Query Rule Created

PowerCLI C:\> PowerCLI C:\> Get-DeployRuleset Name : Production PatternList : {oemstring=\$SPT:ESXFarm} ItemList : {ESXi-5.0.0-469512-standard, Cluster1, ESX-Cluster01}

When the blade is rebooted, the system is booted using PXE and joins the cluster with the settings as specified in the host profile (Figure 24).

Figure 24. Query Rule Created

Name	Target	Status	Details	Initiated by	vCenter Server
Attach host profile		Completed		com.vmware	🚱 WIN-TEST
Add host	Cluster1	📀 Completed		com.vmware	🚱 WIN-TEST

Step 7: Deploy Additional Servers to the Cluster

Follow Step 2 (Configure DHCP Server) to add configurations for other service providers created in Step 1. When those service providers are associated, they will be deployed using the common host profile because the match is implemented on the service provider template name.

Conclusion

VMware Auto Deploy is a new stateless function that ships with VMware vSphere 5.0. It enables PXE boot of baremetal hosts and assigns specific configurations to them. In a Cisco UCS operating environment, multiple VMware vSphere servers can be deployed with a single click, using service profiles. By providing a link to the VMware vCenter boot image in the service profile template, the process of deploying multiple VMware vSphere servers can be automated, preventing human errors and deploying servers in a policy-complaint manner. The result is a dramatic savings in time and reduced potential for manual errors.

In the case of incumbent server vendors, the process of deploying multiple VMware vSphere servers is manual and needs to be repeated multiple times, each iteration requiring a server selection, locating a VMware Auto Deploy image, and booting the server. The process is time consuming and error prone. Using VMware Auto Deploy in a Cisco UCS environment, you can easily and quickly deploy VMware vSphere servers using service profile templates—another example of the ease, speed, and agility of Cisco UCS.

To find out more about UCS Service Profiles, please visit:

Create a Service Profile for Cisco UCS Blade

http://www.cisco.com/en/US/products/ps10281/products_configuration_example09186a0080af7515.shtml

For a basic overview of UCS, please visit:

UCS Overview

http://www.cisco.com/en/US/services/ps2961/ps10312/Unified_Computing_Services_Overview.pdf



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