Cisco UCS Director Baremetal Agent Installation and Configuration Guide, Release 5.5

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Audience

This guide is intended primarily for data center administrators who use Cisco UCS Director and who have responsibilities and expertise in one or more of the following:

- Server administration
- Storage administration
- Network administration
- Network security
- Virtualization and virtual machines

Recommended Knowledge

To deploy and manage Cisco UCS Director Baremetal Agent, you should be familiar with the following:

- DHCP configuration
- PXE boot
- TFTP functionality
- HTTP functionality
- Linux
- Virtualization technologies

Conventions

Text Type	Indication
GUI elements	GUI elements such as tab titles, area names, and field labels appear in **this font**. Main titles such as window, dialog box, and wizard titles appear in **this font**.
Document titles	Document titles appear in *this font*.
TUI elements	In a Text-based User Interface, text the system displays appears in `this font`.
System output	Terminal sessions and information that the system displays appear in `this font`.
CLI commands	CLI command keywords appear in **this font**. Variables in a CLI command appear in *this font*.
[ ]	Elements in square brackets are optional.
{x | y | z}	Required alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

Caution Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Tip   Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

Timesaver   Means *the described action saves time*. You can save time by performing the action described in the paragraph.

Warning   IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS

Related Documentation

Cisco UCS Director Documentation Roadmap

For a complete list of Cisco UCS Director documentation, see the *Cisco UCS Director Documentation Roadmap* available at the following URL: http://www.cisco.com/en/US/docs/unified_computing/ucs/ucs-director/doc-roadmap/b_UCSDirectorDocRoadmap.html.

Cisco UCS Documentation Roadmaps

For a complete list of all B-Series documentation, see the *Cisco UCS B-Series Servers Documentation Roadmap* available at the following URL: http://www.cisco.com/go/unifiedcomputing/b-series-doc.

For a complete list of all C-Series documentation, see the *Cisco UCS C-Series Servers Documentation Roadmap* available at the following URL: http://www.cisco.com/go/unifiedcomputing/c-series-doc.

Note   The *Cisco UCS B-Series Servers Documentation Roadmap* includes links to documentation for Cisco UCS Manager and Cisco UCS Central. The *Cisco UCS C-Series Servers Documentation Roadmap* includes links to documentation for Cisco Integrated Management Controller.

Documentation Feedback

To provide technical feedback on this document, or to report an error or omission, please send your comments to ucs-director-docfeedback@cisco.com. We appreciate your feedback.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see What's New in Cisco Product Documentation.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. RSS feeds are a free service.

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New and Changed Information for this Release

This chapter contains the following sections:

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New and Changed Information

The following table provides an overview of the significant changes to this guide for the current release. The table does not provide an exhaustive list of all changes made to this guide or of all new features in this release.

Feature	Description	Where Documented
The Additional Parameters field in the Setup PXE boot tasks in Baremetal Agent has been re-designed	The Additional Parameters text box has now been changed to specify tabular inputs: A parameter name and its corresponding single-line value. You now have the option to add multiple parameters for a PXE task. You also have the options to edit, modify, or delete the parameters.	Inputs for the Setup PXE Boot Task, on page 34 Inputs for the Setup PXE Boot with BMA Selection Task, on page 35 Inputs for the Setup Windows PXE Boot Task, on page 37
Network Configurations option removed from the Setup PXE Boot task	The Network Configuration field has been removed, as the network configurations can now be added using the Additional Parameters interface when setting up the PXE boot task for Linux-based images.	Inputs for the Setup PXE Boot Task, on page 34
Support for CentOS 7.x and RHEL 7.x	Barmetal Agent now supports 7.x versions of CentOS and RHEL.	-

Overview

This chapter contains the following sections:

Cisco UCS Director Baremetal Agent

Cisco UCS Director Baremetal Agent (Baremetal Agent) automates the process of using a Preboot Execution Environment (PXE) to install operating systems on baremetal servers or virtual machines. Baremetal Agent provides the following services that are required for a functional PXE install environment:

- Dynamic Host Control Protocol (DHCP)

- Hypertext Transfer Protocol (HTTP)

- Trivial File Transfer Protocol (TFTP)

When this environment is operational and Baremetal Agent and Cisco UCS Director are correctly configured, you can build PXE installation tasks into any Cisco UCS Director infrastructure workflow.

You can access Baremetal Agent through Secure Shell (SSH). You can also perform services on Baremetal Agent, such as DHCP configuration and starting and stopping services, through Cisco UCS Director. A single Cisco UCS Director node can support multiple Baremetal Agent applications.

Minimum System Requirements

For proper installation and operation of Baremetal Agent, your environment must meet the minimum system requirements.

Minimum Requirements for VMware vSphere

Name	Requirements
VMware vCenter Server	4.0 and later
Minimum reservation in VMware vCenter	Minimum number of CPUs—2 Memory—3 GB Hard disk—40 GB

Minimum Requirements for Microsoft Hyper-V

Name	Requirements

Hyper-V	Windows Server 2008 R2 or Windows Server 2012 with one of the following:
	
	    • 2.0
	
	    • 3.1

Minimum reservation in Hyper-V	Minimum number of CPUs—2 Memory—3 GB Hard disk—40 GB

Guidelines and Limitations

Before you install Baremetal Agent, take note of the following guidelines and limitations.

Baremetal Agent Connections

Each Baremetal Agent application can connect to only one Cisco UCS Director node.

Network Availability

After installation and configuration, your environment must have the following network availability:

- Baremetal Agent must be able to reach Cisco UCS Director over the network.

- Cisco UCS Director must be able to reach Baremetal Agent over the network.

- The baremetal servers (blade or rack) must be able to reach the DHCP network of the Baremetal Agent during the initial stage of operating system installation over PXE.

DHCP Configuration

If you use DHCP, locate a DHCP server in the same PXE VLAN as Baremetal Agent. Then configure that DHCP server with the IP address range required by your DHCP server.

VLAN Configuration

When setting up the network configuration, the most common configuration uses one PXE VLAN and one Management VLAN (separate VLANs). However, Baremetal Agent supports one VLAN for both, if you prefer. For more information about the network configuration options, see Configuring Cisco UCS Director Baremetal Agent, on page 11.

Configure the VLANs end-to-end between Cisco UCS, Cisco UCS Director, and Baremetal Agent. However, when you configure Baremetal Agent, do not assume that routing occurs between the PXE_VLAN Layer 2 network and the Management VLAN network.

If you configure Baremetal Agent to use DHCP, locate and configure the DHCP server in the PXE VLAN and its subnet. This DHCP server serves the transient IP address required for the PXE process. In an environment with two VLANs, the server is allocated an IP address from the subnet of the Management VLAN. An IP address pool managed by Cisco UCS Director assigns this IP address.

If you configure Baremetal Agent with two VLANs, set up two IP address attributes:

- An IP address for Baremetal Agent in the PXE VLAN

- A second IP address for Baremetal Agent in the Management VLAN

TFTP Server

With Baremetal Agent, use the Cisco UCS Director TFTP server to ensure that configurations such as dynamic variables function properly.

When you add a Baremetal Agent account, Baremetal Agent configures the TFTP server when services are started.

Upgrade of Baremetal Agent

For detailed information on upgrading Baremetal Agent, see the Cisco UCS Director Upgrade Guide.

CHAPTER 3

Installing Cisco UCS Director Baremetal Agent

This chapter contains the following sections:

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Installing Cisco UCS Director Baremetal Agent on VMware vSphere

Before You Begin

- You must have system administrator privileges for VMware vSphere or vCenter.
- If you want to use a static IP address rather than DHCP, you must know the following information:
    - IP address
    - Subnet mask
    - Default gateway

Procedure

Step 1   On the Cisco.com download site for Cisco UCS Director, download Cisco UCS Director Baremetal Agent and unzip the OVF file in to the folder.

Step 2   Log in to VMware vSphere Client.

Step 3   In the **Navigation** pane, click the vSphere host on which you want to deploy Cisco UCS Director Baremetal Agent.

Step 4   Choose **File** > **Deploy OVF Template**.

Step 5   In the **Source** screen of the **Deploy OVF Template** window, do one of the following to choose your OVF source location and then click **Next**:

- If the OVF file is stored on your local computer, browse to the location, choose the file, and click **Open**.

- If the OVF file is stored on a server on your local area network, enter the location of the file including the IP address or fully qualified domain name of the server.

Step 6 In the **OVF Template Details** screen, verify the details and click **Next**.

Step 7 In the **End User License Agreement** screen, review the license agreement and click **Accept**.

Step 8 In the **Name and Location** screen, do the following:

   a) In the **Name** field, enter a unique name for the VM.

   b) In the **Inventory Location** area, choose the location where you want the VM to reside.

   c) Click **Next**.

Step 9 In the **Storage** screen, choose the storage location for the VM and click **Next**.

Step 10 In the **Disk Format** screen, click **Next** to accept the default radio button for **Thick Provision (Lazy Zeroed)** format.

Step 11 In the **Network Mapping** screen, choose the network for the VM and click **Next**.

Step 12 In the **Properties** screen, do the following:

   a) In the **BMA Root User Password** field, enter the password that you want to use as the root password.

   b) Configure the IP addresses for both the NICs (eth0 and eth1) that you want to assign, as follows:

- To use DHCP to assign the IP addresses, leave the default of 0.0.0.0 in the IP address fields.

- To use static IP addresses, enter the desired IP addresses in the IP address fields. If you only want to configure one NIC, only complete one set of IP addresses and leave the second set at the default.

   c) Click **Next**.

Step 13 In the **Ready to Complete** screen, verify the settings and click **Finish**.
A message appears to indicate that Cisco UCS Director Baremetal Agent is being deployed.

Step 14 In the **Navigation** pane, right-click the VM host and choose **Edit Settings**.

Step 15 Make sure that the VM host has sufficient resources to power on.
For more information about the required resources, see Minimum System Requirements, on page 3.

Step 16 Power on the VM.

Installing Cisco UCS Director Baremetal Agent on Microsoft Hyper-V

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Note We recommend that you deploy Cisco UCS Director Baremetal Agent on the Hyper-V Manager host, rather than the Microsoft System Center Virtual Machine Manager (SCVMM) console.

Before You Begin

- You must have system administrator privileges for Microsoft Hyper-V.

- If you want to use a static IP address rather than DHCP, you must know the following information:

- IP address

- Subnet mask

- Default gateway

Procedure

Step 1 On the Cisco.com download site for Cisco UCS Director, download Cisco UCS Director Baremetal Agent and unzip the *.vhd file into a folder.

Step 2 Log into the Hyper-V host.

Step 3 Choose **Start** > **Administrative Tools** to open Hyper-V Manager.

Step 4 In the **Hyper-V Manager** dialog box, choose **Action** > **New Virtual Machine**.

Step 5 In the **Before You Begin** pane, click **Next** to accept the custom configuration option.

Step 6 In the **Specify Name and Location** pane, enter a unique name for the virtual machine (VM) name in the **Name** field.

Step 7 In the **Name and Location** pane, do the following:

   a) Check the **Store the virtual machine in a different location** checkbox.
   b) Enter the alternate location.
   c) Click **Next**.

Step 8 In the **Assign Memory** pane, enter the amount of memory to allocate to this VM (3 GB minimum) and click **Next**.

Step 9 In the **Configure Networking** pane, in the **Connection** field, click **Next** to accept the **Not Connected** default option.

Step 10 In the **Connect Virtual Hard Disk** pane, click **Next** to accept the **Attach a virtual disk later** default option.

Step 11 In the **Completing the New Virtual Machine Wizard** pane, verify the settings and click **Finish**.

Step 12 In the left pane, right-click the VM and choose **Edit Settings**.

Step 13 Delete the existing network adapter and click **Apply**.

Step 14 In the **Navigation** pane, click **Processor**.

Step 15 In the **Number of virtual processors** field, enter **2 vCPU**.

Step 16 In the **Navigation** pane, click **Add Hardware**.

Step 17 In the **Add Hardware** pane, choose the **Legacy Network Adapter** and click **OK**.

Step 18 In the **Legacy Network Adapter** pane, in the **Virtual Switch** drop-down list, choose the virtual network device.

Step 19 In the **Navigation** pane, click **IDE Controller**.

Step 20 In the **IDE Controller** pane, choose **Hard Drive** and click **Add**.

Step 21 Browse to the .vhd file and choose it.

Step 22 Click **Apply**, and then click **OK**.

Step 23 Power on the VM to configure network properties.
Optionally, you can configure network properties from the Shell Admin.

What to Do Next

After Cisco UCS Director Baremetal Agent has started, configure DHCP or a static IP address.

C H A P T E R 4

Configuring Cisco UCS Director Baremetal Agent

This chapter contains the following sections:

About the Network Configuration Options

You can choose between the following network configuration options for Cisco UCS Director Baremetal Agent:

• Single network for management and Preboot Execution Environment (PXE)

• Separate networks for management and PXE

Choose the network configuration option that best meets the requirements of your environment.

Single Network for Management and PXE

We recommend that you choose this network configuration option if your environment permits the following to be hosted on the same network interface and Layer 2 network (see the following figure):

- Services provided by Baremetal Agent, such as DHCP, TFTP, and HTTP
- Management traffic between Baremetal Agent and Cisco UCS Director or other devices and appliances

Figure 1: Sample Topology for a Single Network
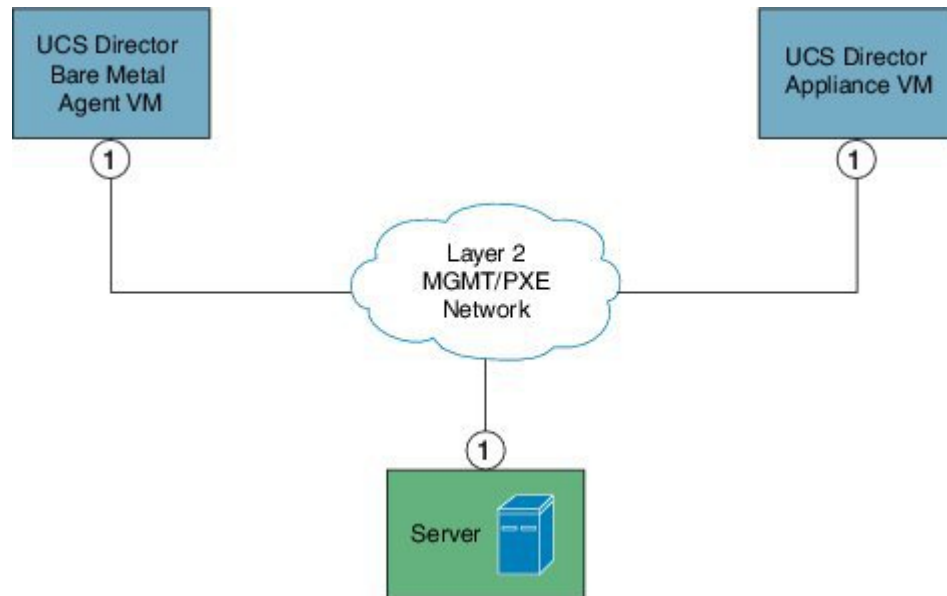
Prerequisites and Assumptions for a Single Network Configuration

If you plan to configure Baremetal Agent with a single network configuration, ensure that your environment meets the following prerequisites:

- Cisco UCS Director has been installed and the network interface configured, as described in the appropriate Cisco UCS Director installation guide.
- Cisco UCS Director is reachable through a web browser and you can log in.
- Baremetal Agent has been installed, as described in the Cisco UCS Director Baremetal Agent Installation and Configuration Guide, and no additional configuration has been performed.
- The required single Management and PXE VLAN is provisioned and available as a virtual port group or port profile that virtual machines (VMs) can be attached to or leverage.

Separate Networks for Management and PXE

We recommend that you choose this network configuration option if your environment does not permit the following to be hosted on the same network interface and Layer 2 network (see the following figure):

- On the PXE network, services provided by Baremetal Agent, such as DHCP, TFTP, and HTTP

- On the Management network, traffic between Baremetal Agent and Cisco UCS Director or other devices and appliances

Figure 2: Sample Topology for Separate PXE and Management Networks
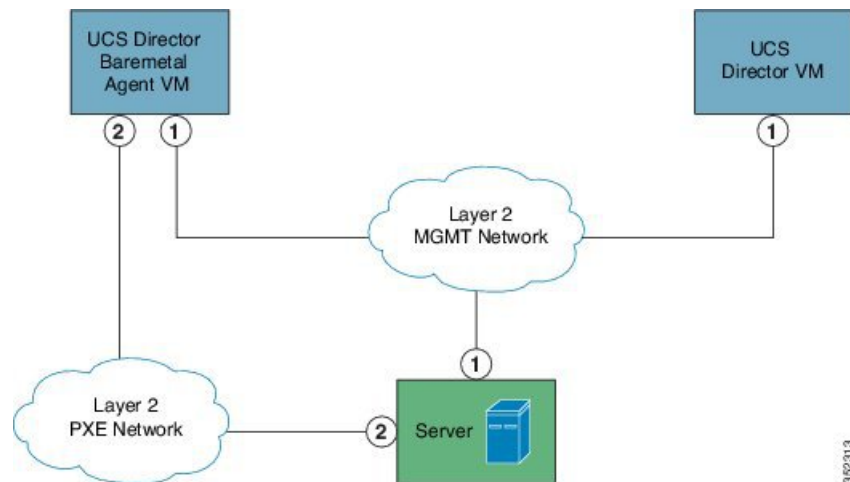
Prerequisites and Assumptions for a Separate Network Configuration

If you plan to configure Baremetal Agent with a separate network configuration, make sure that your environment meets the following prerequisites:

- Cisco UCS Director has been installed and the network interface configured, as described in the appropriate Cisco UCS Director installation guide.

- Cisco UCS Director Baremetal Agent is reachable through a web browser and you can log in.

- Baremetal Agent has been installed, and no additional configuration has been performed.

- The following networks are provisioned and available as a virtual port group or port profile that VMs can be attached to or leverage:

  ◦ Management (MGMT) network—Used for traffic between Baremetal Agent and Cisco UCS Director

  ◦ PXE network—Used for PXE services traffic, such as DHCP, HTTP, and TFTP

Configuring Cisco UCS Director Baremetal Agent

Before You Begin

Before you configure Cisco UCS Director Baremetal Agent, do the following:

- Make sure that the Baremetal Agent is installed.

- Make sure that the Baremetal Agent VM is completely booted up, and that the VM Console is closed. You must have the IP address of the Baremetal Agent VM.

- Set up the environment required to support a single or separate PXE and Management network configuration, with the appropriate VLANs.

- To provide required DHCP services, ensure that at least one DHCP server is located in the same PXE VLAN as Baremetal Agent and configure that DHCP server with an appropriate IP address range.

Procedure

Step 1 On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2 Click the **Bare Metal Agents** tab.

Step 3 In the **Add Baremetal Agent Appliance** dialog box, complete the following fields:

Name	Description
Account Name field	The name you assign to this Baremetal Agent account.
Management/PXE Address field	The IP address assigned to the Management network for Baremetal Agent. If your configuration uses a single network for the Management and PXE networks, this IP address is automatically assigned as the PXE address. **Note** This address must be reachable from Cisco UCS Director.
Login ID field	An account with administrative privileges that you can use to log in to Baremetal Agent.
Password field	The password for the account.
Baremetal Agent uses Different Interfaces for Management and PXE Traffic check box	Check this box if your configuration uses separate networks for the PXE server and the Management network that hosts the traffic manager.
PXE Interface Address field	The IP address for the Baremetal Agent PXE network, if your configuration uses separate networks. **Note** This field appears only if the **Baremetal Agent uses Different Interfaces for Management and PXE Traffic** check box has been checked.
Description field	(Optional) A description of this Baremetal Agent.
Location field	(Optional) The location of this Baremetal Agent, such as a physical location.

Name	Description
Database Address drop-down list	Choose the IP address that is associated with the Cisco UCS Director database that this Baremetal Agent will use.
	Note If you are configuring Baremetal Agent for multi-node deployment, choose the IP address of the Inventory Database node.

Step 4   Click **Submit**.

What to Do Next

Configure the DHCP Server for Baremetal Agent.

Configuring the DHCP Server for a Baremetal Agent Account

Note   For a multi-home DHCP configuration, use this procedure to configure the first subnet for the DHCP server. For the remaining subnets, you must manually edit the DHCP configuration file (`/etc/dhcpd.conf`).

Before You Begin

To provide required DHCP services, ensure that at least one DHCP server is located in the same PXE VLAN as Baremetal Agent. Configure the DHCP server with an appropriate IP address range. The DHCP server, together with the TFTP server, is used to communicate with a PXE server.

Procedure

Step 1   On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2   Click the **Bare Metal Agents** tab.

Step 3   Click the row for the Baremetal Agent account for which you want to configure the DHCP server.

Step 4   Click **Service Status** to verify that services for the Baremetal Agent account are stopped.

Step 5   Click **Configure DHCP**.

Step 6   In the **Configure DHCP** dialog box, complete the following fields and click **Submit**.

  • **DHCP Subnet**

  • **DHCP Netmask**

  • **DHCP Start IP**

  • **DHCP End IP**

  • **Router IP Address**

The DHCP IP address assignments are updated, and the DHCP service is restarted.

Step 7 Click the row for the Baremetal Agent account and click **Start Services**.

Step 8 After the services have started, do the following:

- Verify that the status of the account in the **Status** column is Active.

- Verify that the **Enabled Services** column shows that all services are running. If this status indicates that one or more services are stopped, verify the configuration of your DHCP server and try again.

- Click **Service Status** to verify that the status of all expected services is up:

    ◦ Network Services status in the Baremetal Agent appliance

    ◦ Database connectivity status from the Baremetal Agent appliance

What to Do Next

Set up PXE boot requests.

Viewing the DHCP Configuration for a Baremetal Agent Account

Procedure

Step 1 On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2 Click the **Bare Metal Agents** tab.

Step 3 Click the row for the Baremetal Agent account for which you want to view the DHCP configuration.

Step 4 Click **View DHCP Configuration**.
You might need to click the Down arrow at the end of the button bar to access the **View DHCP Configuration** option.

The **View DHCP Server Configuration** window displays the contents of the DHCP server configuration file for the account.

Starting and Stopping Baremetal Agent Services

Procedure

Step 1 On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2 Click the **Bare Metal Agents** tab.

Step 3 Click the row for the Baremetal Agent account whose services you want to start or stop.

Step 4 Click one of the following:

- **Start Services**

- **Stop Services**

Step 5   Click **Service Status** and check the status displayed in the **Enabled Services** column to ensure that services have started or stopped as desired.
If services do not start, check the status displayed in the **Enabled Services** column. If this status indicates that services are not enabled, verify the configuration of your DHCP server and try again.

Configuring the Interface for the PXE Network

You can use this to change or add an IP address for the PXE network used by Baremetal Agent.

Procedure

Step 1   On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2   Click the **Bare Metal Agents** tab.

Step 3   Click the row for the Baremetal Agent account for which you want to configure the interface for the PXE network.

Step 4   Click **Configure Interface**.

Step 5   In the **Configure PXE Interface** dialog box, complete the following fields:

a)   From the **Interface Name** drop-down list, choose the interface that you want to use for the PXE network.
b)   Enter the IP address and subnet mask for the PXE network.
c)   Click **Submit**.

Changing the Default Baremetal Agent Account

The first Baremetal Agent account that you create is designated as the default account. This account is used by default in legacy workflows. To use a different account in the legacy workflows, you must designate that Baremetal Agent account as the default.

Procedure

Step 1   On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2   Click the **Bare Metal Agents** tab.

Step 3   Click the row for the Baremetal Agent account that you want designate as the default.

Step 4   Click **Set Default BMA**.

Changing the Default Samba User Password

A fresh installation of Baremetal Agent comes with a default Samba user. To change the default Samba password, use the changePasswdSmb.sh shell script.

Procedure

Step 1   Log on to the Shell Admin using the root password.

Step 2   Navigate to the `/opt/infra/` directory.

Step 3   Run the shell script, changePasswdSmb.sh.

Step 4   Provide a new password at the **Enter samba password for smbuser:** prompt.

Example:

```
[root@localhost infra]#
[root@localhost infra]#
[root@localhost infra]#
[root@localhost infra]# ./changePasswdSmb.sh

Enter samba password for smbuser:
```

Viewing the Logs for a Baremetal Agent Account

Procedure

Step 1   On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2   Click the **Bare Metal Agents** tab.

Step 3   Click the row for the Baremetal Agent account for which you want to view the logs.

Step 4   Click **View Baremetal Agent Logs**.
You might need to click the Down arrow at the end of the button bar to access the **View Baremetal Agent Logs** option.

The **View Baremetal Agent Log** window displays the logs for the account.

Viewing the DHCP Logs for a Baremetal Agent Account

Procedure

Step 1 On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2 Click the **Bare Metal Agents** tab.

Step 3 Click the row for the Baremetal Agent account for which you want to view the DHCP logs.

Step 4 Click **View DHCP Logs**.
You might need to click the Down arrow at the end of the button bar to access the **View DHCP Logs** option.

The **View Baremetal Agent DHCP Log** window displays the contents of the DHCP server logs for the account.

C H A P T E R **5**

Adding and Configuring PXE Boot Requests

This chapter contains the following sections:

Setup and Configuration for PXE Boot Requests

You can use Cisco UCS Director Baremetal Agent (Baremetal Agent) to create and send a request through the DHCP server for a PXE boot for a specified operating system (OS).

Before you can create and send a PXE boot request, the OS image that you want to use in a given PXE boot request must be configured correctly and be available in Baremetal Agent. If the OS image that you want to PXE boot is not listed as an available OS type, you must first create the OS image template in Baremetal Agent,

Note Although you can perform all the OS image setup procedures manually, we recommend that you use Baremetal Agent to set up your OS images.

You can also automate one or more PXE boot requests with workflow tasks in the Cisco UCS Director Workflow Designer. For more information, see Orchestration Workflow Tasks for PXE Boot, on page 31.

PXE Boot States

The following are the PXE boot states for PXE boot requests in Cisco UCS Director:

- Submitted—The PXE boot request has been submitted to Cisco UCS Director.

- Environment Setup—A Submitted PXE boot request has been transferred to Baremetal Agent and that the environment required to perform a PXE boot is ready in Baremetal Agent.

- In Progress—The baremetal server has communicated with Baremetal Agent and the PXE configuration files and image files are being downloaded.

- Ready—The PXE boot process is complete. The server has booted with the newly installed operating system and Baremetal Agent received a success notification from the server that it is ready.

- Failed—The PXE boot process started, but Baremetal Agent did not receive a success notification from the server after the defined wait period expired.

- Archived—The PXE Request task included a rollback or delete.

Creating a Non-Windows Operating System Image in Baremetal Agent

This procedure creates a Non-Windows OS image template in Baremetal Agent. You must add the OS image template before you can request a PXE boot for the OS image.

Note You cannot use this procedure to create supported Windows operating systems images. For more information about how to set up Windows OS images, see Adding Windows Operating System Images, on page 41.

Before You Begin

You must have all resources and requirements in place for each operating system image that you want to install through a Baremetal Agent PXE boot request.

Procedure

Step 1 Copy the OS image(s) to one of the following locations:

- An appropriate location in the Baremetal Agent directory structure

- An NFS mount point that you have added to Baremetal Agent

Step 2 Navigate to `/opt/infra` and run **isoExtractor.sh**.

Example:
The following sample isoExtractor.sh file shows a scenario for an OS image in the Baremetal Agent directory structure. The image path field contains the location of the VMware image in the `/opt/image/` folder.

If you have added an NFS mount point, the image path field would contain the location of the image in the `/mnt/external` folder. For example, if you want to create a CentOS image that is located in a `CentOS` folder in an NFS mount point, the image path field would contain `/mnt/external/CentOS/image.iso`.

```
root@localhost infra]# pwd
/opt/infra
root@localhost infra]# ./isoExtractor.sh
     Please select the OS Type

        1)   ESXi 4.1
        2)   ESXi 5.0
        3)   ESXi 5.1
        4)   ESXi 5.5
        5)   ESXi 6.0
        6)   ESXi 5.5 VSAN
        7)   ESXi 6.0 VSAN
        8)   CentOS or RHEL [Pre 7.0]
        9)   CentOS 7.x or RHEL 7.x
        10)   SUSE Linux
        11)   Other


        SELECT> 4
     Image path : /opt/image/VMWare-VMvisor-Installer-5.5.0-1111111.x86_64.iso

     OS catalog name : BMA-184-ESXi5.5
Input file being used: /opt/images/VMware-VMvisor-Installer-5.5.0-1111111.x86_64.iso
OS catalog name being used: BMA-184-ESXi5.5
Mounting the image....
Preparing the image....
Creating catalog directory /opt/cnsaroot/templates/BMA-184-ESXi5.5
Creating configuration files for ESXi 5.5 ...
Copied the image and created the configuration files...
is /opt/cnsaroot/images/
BMA-184-ESXi5.5 centos60-small
is /opt/cnsaroot/templates/
BMA-184-ESXi5.5 CentOS60 Win2k12R2x64 Win2k12x64 Win2k8R2x64
is /opt/cnsaroot/templates/BMA-184-ESXi5.5
boot.cfg ks.cfg pxe.cfg
[root@localhost infra]#
```

Step 3   When prompted, choose the image category and provide the image location and catalog name.

Step 4   After the script execution is completed, navigate to `/opt/cnsaroot/images/`*`catalogname`* and confirm that the image is available in that location.

Step 5   Navigate to `/opt/cnsaroot/templates/`*`catalogname`* and confirm that the PXE configuration templates are available in that location.

Step 6   To verify that the OS image is created, do the following:

a) In Cisco UCS Director, choose **Physical** > **Compute**.

b) In the left pane, navigate to the pod that contains the Baremetal Agent.

c) In the right pane, click the **PXE Boot Requests** tab.

d) Click **Add PXE Boot Request** and verify that the OS image is included in the **OS Type** drop-down list.

Injecting Drivers When Installing RHEL 7 or CentOS 7 on UCS Modular Servers

When you install RHEL 7 or CentOS 7 on the UCS servers, manually inject drivers through the PXE.cfg file. The PXE.cfg file is available in the following location: `/opt/cnsaroot/templates/(RHEL 7/CentOS 7 OS Catalog name)`.

The default PXE.cfg file contains the following line:
```
append initrd=images/(RHEL 7/CentOS 7 OS Catalog name)/isolinux/initrd.img ramdisk_size=9216
 noapic acpi=off ip=dhcp ks=$PXE_KS_URL
ksdevice= inst.repo=http://$PXE_NATIVE_WEBSERVER/(RHEL 7/CentOS 7 OS Catalog name)
net.ifnames=0 biosdevname=0
```

Note Here RHEL 7/CentOS 7 OS Catalog name is the name of the OS image provided in the ISO extractor script while creating the RHEL 7 or CentOS 7 OS image template in Baremetal Agent.

To inject the drivers, update the location of the drivers in the PXE.cfg file by updating the line as shown below:
```
append initrd=images/(RHEL 7/CentOS 7 OS Catalog name)/isolinux/initrd.img ramdisk_size=9216
 noapic acpi=off ip=dhcp ks=$PXE_KS_URL
ksdevice= inst.repo=http://$PXE_NATIVE_WEBSERVER/(RHEL 7/CentOS 7 OS Catalog name)
inst.dd=http://$PXE_NATIVE_WEBSERVER/
(RHEL 7/CentOS 7 OS Catalog name )/(name of the driver disk) net.ifnames=0 biosdevname=0
```

The driver disk should be in the ISO image format and placed in the following location: `/opt/cnsa/images/(RHEL 7/CentOS 7 OS Catalog name)/`

Note
- Download the driver ISO image from the UCS Servers download page on the Cisco website.
- The parameter inst.dd helps load the driver images during PXE install.

Creating a PXE Boot Request in Cisco UCS Director

Before You Begin

Create the OS image template that you want to use for the PXE boot in Baremetal Agent.

Procedure

Step 1 On the menu bar, choose **Physical** > **Compute**.

Step 2 In the left pane, navigate to the pod for which you want to set up the PXE boot request.

Step 3 In the right pane, click the **PXE Boot Requests** tab.

Step 4 Click **Add PXE Request**.

Step 5 In the **Add PXE Boot Request** dialog box, complete the following fields:

Name	Description
Server MAC Address field	The MAC address of the server that requires the PXE installation.
Host Name field	The hostname to be assigned to the server after the PXE installation process is complete.
Root Password field	The password that you want to assign to the root user on the server. You need to re-enter this password in the next field to confirm it. **Note** Apply your organization's guidelines for maintaining the security of this password.
PXE Request for Windows check box	Check this check box if the PXE boot request is for a Windows OS. After you check this check box, a set of Windows-specific fields appears in this dialog box.
OS Type drop-down list	Choose the OS image that you want this PXE boot request to install on the server. The drop-down list includes all OS image templates that have been created and are available for PXE installation. This drop-down list displays in a different location in the dialog box, depending upon whether you check the **PXE Request for Windows** check box.
Management VLAN field	(Optional) The VLAN ID that you want to assign to the management interface on the server after the PXE installation process is complete. This setting is used in ESX/ESXi deployments where VLAN tagging is implemented on the virtual switch. It sets the VLAN ID for tagging on the management vmkernel port.
OS Flavor Name field	(Required for a Windows OS only) The flavor name is required for successful PXE boot of a Windows Server image. You must enter the exact character string used by Windows PE (WinPE). This string is case sensitive. For example, enter SERVERSTANDARD or SERVERENTERPRISE. For more information, see Determining the Windows OS Flavor Name, on page 27. This value is used in the Windows answer file, which requires the correct name of the edition for the image installation process. The OS flavor name might be different for each type of Windows OS image.
Organization Name field	(Required for a Windows OS only) The name of the organization that is associated with the OS product key. This value is used by the Windows answer file. It could be a division within your company or the company name.
Product Key field	(Required for a Windows OS only) The product key (sometimes called the license key or software key) for the OS.
Timezone drop-down list	Choose the time zone in which you want to configure the server.

Name	Description
Disk Partition Size (GB) field	(Required for a Windows OS only) The size, in GB, of the partition designated for the OS.
Additional Parameters interface	Interface to add, edit, or delete single-line parameters that are used additionally for the PXE boot request. You can add multiple parameters using this interface.
	To add a parameter, click (+). In the **Add Additional Parameter** box that appears, enter the parameter name and the value for the parameter. Use the **Edit** button to modify the parameter name or its value. Use the **Delete** button to delete a parameter.
	For example, for a Windows OS, you can use parameters to provide the minimum requirements for the Windows answer file. You can define parameters and their values to enhance the answer file to meet the requirements of your environment. These parameters are updated with the appropriate values in the Answer file template.
	The answer file templates used by Baremetal Agent are available in the following locations:
	• Windows 2012 R2 x64—`/opt/cnsaroot/templates/Win2k12R2x64/autounattend.xml`
	• Windows 2012 x64—`/opt/cnsaroot/templates/Win2k12x64/autounattend.xml`
	• Windows 2008 R2 x64—`/opt/cnsaroot/templates/Win2k8R2x64/autounattend.xml`
Server IP Address field	The static IP address that you want to assign to the server. This IP address is given to the server after the PXE installation process is complete, and is the final IP address for the server.
	This IP address can be on a different network or subnet than the PXE network or Management network that you configured for Baremetal Agent.
Network Mask field	The subnet mask that you want to assign to the server after the PXE installation process is complete.
Gateway field	The default gateway IP address that you want to assign to the server after the PXE installation process is complete.
Server Name Server field	The DNS server that you want the server to use.
	If no DNS server is required, leave this field blank.
Target BMA drop-down list	Choose the Baremetal Agent that you want to use for this PXE boot request. The Baremetal Agent that you choose determines which OS images are available for the PXE boot request.

Step 6 Click **Submit**.

Information about the new PXE Boot Request will appear as a new row in the **PXE Boot Request** tab, displaying the *ID* assigned to this request. The information includes the current *Status* of this request.

What to Do Next

After the PXE boot request is in the Submitted state, you must set up the PXE environment to create the Cisco UCS Director configuration files. You can activate a PXE boot request that has a status of Submitted by selecting it and clicking **Setup PXE Environment**.

Adding an NFS Mount Point

Procedure

Step 1 On the menu bar, choose **Administration** > **Physical Accounts**.

Step 2 Click the **Bare Metal Agents** tab.

Step 3 Click the row for the Baremetal Agent account for which you want to view PXE service requests.

Step 4 Click **View Details**.

Step 5 Click the **NFS Mount Point** tab.

Step 6 Click **Add**.

Step 7 In the **Add NFS Mount Point** dialog box, do the following:

a) In the **NFS Server IP Address** field, enter the IP address of the NFS server where you plan to store the OS images for Baremetal Agent to use.

b) In the **NFS Server Path** field, enter the location on the NFS server where the OS images are stored.

c) Click **Submit**.

After you add the NFS mount point, all content in the `imageRepository` folder in the NFS server is available under the `/mnt/external` folder. You include this path in the `isoExtractor.sh` file when you create a non-Windows image template.

Determining the Windows OS Flavor Name

The flavor name is required for successful PXE boot of a Windows Server image. You must enter the exact character string used by Windows PE (WinPE). This string is case sensitive. The OS flavor name follows a consistent naming convention. Some examples of OS flavor names are as follows:

```
Windows Server 2008 R2 SERVERSTANDARD
Windows Server 2008 R2 SERVERSTANDARDCORE
Windows Server 2008 R2 SERVERENTERPRISE
Windows Server 2008 R2 SERVERENTERPRISECORE
Windows Server 2008 R2 SERVERDATACENTER
Windows Server 2008 R2 SERVERDATACENTERCORE
Windows Server 2008 R2 SERVERWEB
Windows Server 2008 R2 SERVERWEBCORE
Windows Server 2012 SERVERSTANDARD
```

```
Windows Server 2012 SERVERSTANDARDCORE
Windows Server 2012 R2 SERVERSTANDARD
Windows Server 2012 R2 SERVERSTANDARDCORE
Windows Server 2012 R2 SERVERDATACENTER
Windows Server 2012 R2 SERVERDATACENTERCORE
```

Procedure

Step 1 Navigate to the extracted ISO files for the Windows OS image.

Step 2 For a Windows 2012 R2 image, navigate to `C:\win2k12r2\sources\install.wim` and use a PowerShell cmdlet to find the flavor name.
An example of the use of this cmdlet is as follows:

```
PS C:\Windows\system32> Get-WindowsImage -ImagePath
C:\win2k12r2\sources\install.wim
Index       : 1
Name        : Windows Server 2012 R2 SERVERSTANDARDCORE
Description : Windows Server 2012 R2 SERVERSTANDARDCORE
Size        : 6,653,342,051 bytes
Index       : 2
Name        : Windows Server 2012 R2 SERVERSTANDARD
Description : Windows Server 2012 R2 SERVERSTANDARD
Size        : 11,807,528,410 bytes
Index       : 3
Name        : Windows Server 2012 R2 SERVERDATACENTERCORE
Description : Windows Server 2012 R2 SERVERDATACENTERCORE
Size        : 6,653,031,430 bytes
<etcetera>
```

Step 3 For a Windows 2008 image, use the DISM.EXE syntax from the machine on which you installed the WAIK tools.
An example of the use of this syntax is as follows:

```
C:\Program Files\Windows AIK\Tools\>dism
/get-wiminfo /wimfile:e:\\Win2k8r2x64\sources\install.wim
Deployment Image Servicing and Management tool
Version: 6.1.7600.16385
Details for image : e:\Username_Windowsbits\Win2k8r2x64\sources\install.wim
Index : 1
Name : Windows Server 2008 R2 SERVERSTANDARD
Description : Windows Server 2008 R2 SERVERSTANDARD
Size : 10,510,503,883 bytes
Index : 2
Name : Windows Server 2008 R2 SERVERSTANDARDCORE
Description : Windows Server 2008 R2 SERVERSTANDARDCORE
Size : 3,563,695,852 bytes
<etcetera>
```

Viewing PXE Service Requests

You can view information about PXE requests made through a workflow that have an associated service request. You cannot view details of PXE requests that are not made through a workflow, as those requests are not associated with a service request.

The information provided about each PXE request includes the following:

- Service request ID
- Request type
- User who initiated the request
- Name of the catalog or workflow that was used to create the request
- Any comments provided by the user who initiated the request
- Time of the request
- Status of the request
- Rollback type, if applicable

Procedure

Step 1	On the menu bar, choose **Administration** > **Physical Accounts**.
Step 2	Click the **Bare Metal Agents** tab.
Step 3	Click the row for the Baremetal Agent account for which you want to view PXE service requests.
Step 4	Click **View Details**.
Step 5	Click the **PXE Service Requests** tab.

Viewing Operating System Images

You can view a list of the operating system (OS) images that have been created and are available for a Baremetal Agent account.

Procedure

Step 1	On the menu bar, choose **Administration** > **Physical Accounts**.
Step 2	Click the **Bare Metal Agents** tab.
Step 3	Click the row for the Baremetal Agent account for which you want to view OS images.
Step 4	Click **View Details**.
Step 5	Click the **BMA OS List** tab.

CHAPTER 6

Orchestration Workflow Tasks for PXE Boot

This chapter contains the following sections:

About the Orchestration Workflow Tasks for PXE Boot

The orchestration workflow tasks for PXE boot enable you to create workflows within Cisco UCS Director that use the functionality of Cisco UCS Director Baremetal Agent (Baremetal Agent).

The following orchestration workflow tasks are available:

- Setup PXE Boot task
- Setup PXE Boot with BMA Selection task
- Setup Windows PXE Boot task
- Monitor PXE Boot task
- Remove PXE Boot Setup task

Note To set up a PXE boot for a Windows Server operating system, you must use the PXE boot setup task that is defined specifically for Windows. To set up a PXE boot for all other supported operating systems, use the Setup PXE Boot task or the Setup PXE Boot with BMA Selection task.

You can access these workflow tasks in the **Network Services** area of the Cisco UCS Director Workflow Designer Task Library.

Prerequisites for Workflows with PXE Boot Tasks

If you plan to create orchestration workflows that include one or more of the PXE boot tasks, your Cisco UCS Director and Cisco UCS Director Baremetal Agent environment must meet the following prerequisites:

- Cisco UCS Director has been installed and the network interface configured as described in the appropriate Cisco UCS Director installation guide.

- Cisco UCS Director is reachable through a web browser and you can log in.

- Cisco UCS Director Baremetal Agent has been installed as described in Installing Cisco UCS Director Baremetal Agent, on page 7 and the network configuration completed as described in Configuring Cisco UCS Director Baremetal Agent, on page 11.

- The required network/VLAN has been configured as the native, or default, VLAN on the server. For example, for a Cisco UCS server, edit the vNIC template associated with the server and choose the PXE network/VLAN as the native VLAN. You can perform this configuration through an orchestration workflow.

- Each Baremetal Agent account that you want to use in a workflow has been set up, is active, has a tested connection, and has services that have been enabled and started.

Setup PXE Boot, Setup PXE Boot with BMA Selection, and Setup Windows PXE Boot Tasks

When you include any of the PXE boot tasks in an orchestration workflow, the task prepares the Baremetal Agent environment to receive a PXE install request for a physical or virtual machine.

The values for each input required within the task can be supplied in one of the following ways:

- As user inputs by the user who executes the workflow

- Through outputs from a previous task in the workflow

- Through admin inputs that are assigned by the Cisco UCS Director user who creates the workflow

Most inputs and outputs are the same for the Setup PXE Boot task, the Setup PXE Boot with BMA Selection task, and the Setup Windows PXE Boot task, with the following notable exceptions:

- The Setup PXE Boot with BMA Selection task has an input field for selecting the target Baremetal Agent.

- The Setup PXE Boot task does not have an option to select the target Baremetal Agent. This legacy workflow task uses the default Baremetal Agent as the target Baremetal Agent.

- The Setup Windows PXE boot task has an input field for selecting the target Baremetal Agent.

Tip For the legacy Setup PXE Boot task, the default Baremetal Agent is the first Baremetal Agent added. However, you can change the default Baremetal Agent. See Changing the Default Baremetal Agent Account, on page 17.

Execution of the Setup PXE Boot Tasks

The following Setup PXE Boot tasks are available for use in workflows:

- Setup PXE Boot task

- Setup PXE Boot with BMA Selection task

- Setup Windows PXE Boot task

Each time that one of these tasks is executed within a workflow, Cisco UCS Director uses the following values for the inputs to complete a set of configuration files for that particular PXE request:

- Dynamic values received from previous tasks in the workflow or from the user at run-time.

- Static values that you enter when you create the workflow.

- Template configuration files—the ks.cfg Kickstart files—that were created when the chosen operating system was added to Baremetal Agent. For more information about these files, see Sample Operating System Configuration Template Files, on page 69.

When the workflow is executed, Baremetal Agent and Cisco UCS Director use the values gathered through the task and perform the following steps to prepare for a PXE installation request on the specified server:

Step	Action	Notes
1	Creates a new directory in the Cisco UCS Director Baremetal Agent VM that corresponds to the PXE ID request in the `/opt/cnsaroot/web/ks-repository/` directory.	You can view these PXE requests and PXE IDs on the **PXE Boot Requests** tab for a pod in Cisco UCS Director.
2	Adds the required unique configuration files to the `/opt/cnsaroot/web/ks-repository/`*PXE_ID* directory for the PXE installation specific to this request, including the `ks.cfg`, or Kickstart Configuration, file. Depending upon the operating system, other configuration files might be added to this directory, such as the `boot.cfg` file required for an ESXi installation.	For example, to create the customized `ks.cfg` file for the PXE installation, Cisco UCS Director takes the template `ks.cfg` file from the `/opt/cnsaroot/templates/`*Operating_System*`/` directory and fills in the variables provided in the Setup PXE Boot task. This customized `ks.cfg` file is saved in a directory that corresponds to the PXE ID, such as `/opt/cnsaroot/web/ks-repository/`*PXE_ID*.
3	Creates a file corresponding to the MAC address of the server in the `/opt/cnsaroot/pxelinux.cfg/` directory in the Baremetal Agent VM.	The workflow appends "01-" to the MAC address of the server to create the filename. This file includes information about where the image files are located and is generated through the `pxe.cfg` file in the `/opt/cnsaroot/templates/`*Operating_System*`/` directory.

Note   Baremetal Agent automatically creates Windows answer files for the supported operating systems. The same answer file is used for local boot and SAN boot. The Windows installation does not support multi-path SAN boot, but you can use a single path workflow to achieve SAN boot.

Inputs for the Setup PXE Boot Task

The following table describes the inputs for the Setup PXE Boot task. Because the information for one or more of these inputs can be obtained from a previous task or from a user at run-time, the values for these inputs can be dynamic and change with each execution of the workflow.

Note   For legacy Setup PXE Boot tasks, the default Baremetal Agent is the first Baremetal Agent added. However, you can change the default Baremetal Agent. See Changing the Default Baremetal Agent Account, on page 17.

Table 1: Setup PXE Boot Task Inputs

Input	Description
OS Type drop-down list	The OS image that you want this PXE boot request to install on the server. The drop-down list includes all OS images that have been created and are available for PXE installation.
Server MAC Address	The MAC address of the server that requires the PXE installation. This input is typically mapped to the MAC address output from the Create UCS Service Profile task.
Server IP Address field	The IP Address that you want to assign to the server. This IP address is given to the server after the PXE installation process is complete, and is the final IP address for the server. This IP address can be on a different network or subnet than the PXE network or Management network that you configured for Baremetal Agent.
Server Net Mask field	The subnet mask that you want to assign to the server after the PXE installation process is complete.
Server Host Name field	The hostname that you want to assign to the server after the PXE installation process is complete.
Server Gateway field	The default gateway IP address that you want to assign to the server after the PXE installation process is complete.
Server Name Server field	(Optional) The DNS server that you want the server to use. If no DNS server is required, leave this input blank.

Input	Description
Management VLAN field	(Optional) The VLAN ID that you want to assign to the management interface on the server after the PXE installation process is complete.
	This setting is typically used in ESX/ESXi deployments where VLAN tagging is prevalent on the virtual switch. It sets the VLAN ID for tagging on the management vmkernel port.
Root Password field	The password that you want to assign to the root user on the server.
Timezone field	The time zone in which you want to configure the server.
Additional Parameters interface	Interface to add, edit, or delete single-line parameters that are used additionally for the PXE boot request. You can add multiple parameters using this interface.
	To add an additional parameter, click (+). In the **Add Additional Parameter** box that appears, enter the parameter name and the value for the parameter. Use the **Edit** button to modify the parameter name or its value. Use the **Delete** button to delete a parameter.
	For example, you can use an additional parameter to customize the ks.cfg file template and provide a value for the parameter here. The parameter is then updated with the appropriate value in the ks.cfg file template.

	Suppose the existing firewall configuration in ks.cfg is as follows:
	
	`# Firewall configuration`
	`firewall --disabled`
	You can customize the configuration as following:
	
	`# Firewall configuration`
	`firewall —$FIREWALL_CONFIG`
	In the Additional Parameter interface here, you can include `FIREWALL_CONFIG` as the parameter name and provide the value as `disabled`. The value of the parameter can also be mapped to a user input `${variable}`. This parameter is updated with the appropriate value in the ks.cfg file template.

	The ks.cfg file templates used by Baremetal Agent are available in `/opt/cnsaroot/templates/`*IMAGE_CATALOG_NAME*`/ks.cfg`. For example, the ks.cfg file for CentOS 6.0 is available in `/opt/cnsaroot/templates/CentOS60/ks.cfg`

Inputs for the Setup PXE Boot with BMA Selection Task

The following table describes the inputs for the Setup PXE Boot with BMA Selection task. Because the information for one or more of these inputs can be obtained from a previous task or from a user at run-time, the values for these inputs can be dynamic and change with each execution of the workflow.

Note   The Setup PXE Boot with BMA Selection task does not support the Windows OS and does not accept inputs for that OS.

Table 2: Setup PXE Boot with BMA Selection Task Inputs

Input	Description
Target BMA field	The Baremetal Agent accounts that have been added to Cisco UCS Director and are available for use.
OS Type drop-down list	The OS image that you want this PXE boot request to install on the server. The drop-down list includes all OS images that have been created and are available for PXE installation.
Server MAC Address	The MAC address of the server that requires the PXE installation. This input is typically mapped to the MAC address output from the Create UCS Service Profile task.
Server Address field	The IP Address that you want to assign to the server. This IP address is given to the server after the PXE installation process is complete and is the final IP address for the server. This IP address can be on a different network or subnet than the PXE network or Management network that you configured for Baremetal Agent.
Server Net Mask field	The subnet mask that you want to assign to the server after the PXE installation process is complete.
Server Host Name field	The hostname that you want to assign to the server after the PXE installation process is complete.
Server Gateway field	The default gateway IP address that you want to assign to the server after the PXE installation process is complete.
Server Name Server field	(Optional) The DNS server that you want the server to use. If no DNS server is required, leave this input blank.
Management VLAN field	(Optional) The VLAN ID that you want to assign to the management interface on the server after the PXE installation process is complete. This setting is typically used in ESX/ESXi deployments where VLAN tagging is prevalent on the virtual switch. It sets the VLAN ID for tagging on the management vmkernel port.
Root Password field	The password that you want to assign to the root user on the server.
Timezone field	The time zone in which you want to configure the server.

Input	Description
Additional Parameters interface	Interface to add, edit, or delete single-line parameters that are used additionally for the PXE boot request. You can add multiple parameters using this interface.
	To add an additional parameter, click (+). In the **Add Additional Parameter** box that appears, enter the parameter name and the value for the parameter. Use the **Edit** button to modify the parameter name or its value. Use the **Delete** button to delete a parameter.
	For example, you can use an additional parameter to customize the ks.cfg file template and provide a value for the parameter here. The parameter is then updated with the appropriate value in the ks.cfg file template.

	Suppose the existing firewall configuration in ks.cfg is as follows:
	
	`# Firewall configuration`
	`firewall --disabled`
	You can customize the configuration as following:
	
	`# Firewall configuration`
	`firewall —$FIREWALL_CONFIG`
	In the Additional Parameter interface here, you can include `FIREWALL_CONFIG` as the parameter name and provide the value as `disabled`. The value of the parameter can also be mapped to a user input `${variable}`. This parameter is updated with the appropriate value in the ks.cfg file template.

	The ks.cfg file templates used by Baremetal Agent are available in `/opt/cnsaroot/templates/`*IMAGE_CATALOG_NAME*`/ks.cfg`. For example, the ks.cfg file for CentOS 6.0 is available in `/opt/cnsaroot/templates/CentOS60/ks.cfg`

Inputs for the Setup Windows PXE Boot Task

The following table describes the inputs for the Setup Windows PXE Boot task. Because the information for one or more of these inputs can be obtained from a previous task or from a user at run-time, the values for these inputs can be dynamic and change with each execution of the workflow.

Note   Baremetal Agent automatically creates Windows answer files for supported Windows operating systems. You can use the same answer file for local boot and SAN boot. The Windows installation does not support multi-path SAN boot, but you can use a single path workflow to achieve SAN boot.

Table 3: Setup Windows PXE Boot Task Inputs

Input	Description
Target BMA field	The Baremetal Agent accounts that have been added to Cisco UCS Director and are available for use.
OS Type drop-down list	The OS image that you want this PXE boot request to install on the server. The drop-down list includes all OS images that have been created in Baremetal Agent and are available for PXE installation.
Server MAC Address	The MAC address of the server that requires the PXE installation. This input is typically mapped to the MAC address output from the Create UCS Service Profile task.
OS Flavor Name field	The flavor name is required for successful PXE boot of a Windows Server image. You must enter the exact character string used by Windows PE (WinPE). This string is case sensitive. For example, enter SERVERSTANDARD or SERVERENTERPRISE. For more information, see Determining the Windows OS Flavor Name, on page 27. This value is used in the Windows answer file, which requires the correct name of the edition for the image installation process. The OS flavor name might be different for each type of Windows OS image.
Organization Name field	The name of the organization that is associated with the OS product key. This value is used by the Windows answer file. It could be a division within your company or the company name.
Product Key field	The product key (sometimes called the license key or software key) for the OS.
Host Name field	The hostname that you want to assign to the server after the PXE installation process is complete. Make sure the name complies with NetBIOS name restrictions.
Administrator Password field	The password that you want to assign to the administrative user on the server.
Timezone field	The time zone in which you want to configure the server.
Server Address field	The IP Address that you want to assign to the server. This IP address is given to the server after the PXE installation process is complete, and is the final IP address for the server. This IP address can be on a different network or subnet than the PXE network or Management network that you configured for Baremetal Agent.

Input	Description
Disk Partition Size (GB) field	The size, in GB, of the partition designated for the OS.
Additional Parameters field	Interface to add, edit, or delete single-line parameters that are used additionally for the PXE boot request. You can add multiple parameters using this interface.
	To add a parameter, click (+). In the **Add Additional Parameter** box that appears, enter the parameter name and the value for the parameter. Use the **Edit** button to modify the parameter name or its value. Use the **Delete** button to delete a parameter.
	For example, you can use parameters to provide the minimum requirements for the Windows answer file. You can define parameters and their values to enhance the answer file to meet the requirements of your environment. These parameters are updated with the appropriate values in the Answer file template.
	The answer file templates used by Baremetal Agent are available in the following locations:
	• Windows 2012 R2 x64—`/opt/cnsaroot/templates/Win2k12R2x64/autounattend.xml`
	• Windows 2012 x64—`/opt/cnsaroot/templates/Win2k12x64/autounattend.xml`
	• Windows 2008 R2 x64—`/opt/cnsaroot/templates/Win2k8R2x64/autounattend.xml`

Outputs from the Setup PXE Boot Task and Setup Windows PXE Boot Task

The following table describes the outputs from both the Setup PXE Boot task and the Setup Windows PXE Boot task.

Table 4: Setup PXE Boot and Windows PXE Boot Task Outputs

Input	Description
OUTPUT_PXE_BOOT_ID	The ID of the PXE boot request that was set up through the workflow task.

Monitor PXE Boot Setup Task

When included in an orchestration workflow, the Monitor PXE Boot task monitors a particular PXE ID request until

• The PXE boot is ready.

• The maximum number of hours specified is reached before the PXE boot is ready.

Inputs for the Monitor PXE Boot Task

The following table describes the inputs for the Monitor PXE Boot Task:

Table 5: Monitor PXE Boot Task Inputs

Input	Description
PXE Boot Id	The ID of the PXE boot request that you want to monitor through the workflow.
Max Wait time (Hours)	The maximum length of time, in hours, that you want the task to wait for the PXE boot request to be ready.

Outputs from the Monitor PXE Boot Task

The Monitor PXE Boot task has no outputs.

Remove PXE Boot Setup Task

When included in an orchestration workflow, the Remove PXE Boot Setup task removes the directory and files that are created by the Setup PXE Boot task for a particular PXE ID request.

Inputs for the Remove PXE Boot Setup Task

The following table describes the inputs for the Remove PXE Boot Setup Task.

Table 6: Remove PXE Boot Setup Task Inputs

Input	Description
PXE Boot Id	The ID of the PXE boot request for which you want to remove the setup directory and files.

Outputs from the Remove PXE Boot Setup Task

The Remove PXE Boot Setup task has no outputs.

Adding Windows Operating System Images

This chapter contains the following sections:

Windows Operating Systems Images for Cisco UCS Director Baremetal Agent

After installing and adding Baremetal Agent to UCS Director, and running inventory, UCS Director shows as if Windows images are added by default. But no Windows images are added. Install Windows images manually, as discussed in the "Adding Windows Operating System Images" appendix.

Cisco UCS Director Baremetal Agent (Baremetal Agent) supports the following Windows operating system (OS) images and the automated creation of their required answer files:

• Windows Server 2008 R2 x64

• Windows Server 2012 x64

• Windows Server 2012 R2 x64

You can set up all three OS images in Baremetal Agent. However, a single Baremetal Agent cannot simultaneously provision more than one version of the Windows OS. For example, you can use a single Baremetal Agent to simultaneously provision several servers with Windows Server 2012 R2, but you cannot use the same Baremetal Agent to simultaneously provision both Windows Server 2008 R2 and Windows Server 2012 R2.

You can use the same answer file for local boot and SAN boot.

The steps for setting up a Windows OS image depend upon the operating system. Make sure you use the appropriate procedure for the OS image that you are setting up.

Guidelines and Limitations for Windows Operating System Images

Consider the following guidelines and limitations when you set up Windows Server OS images for provisioning:

Follow a Strict Naming Convention

You must follow a strict naming convention when you configure the files for Windows OS images. The paths and file names are case sensitive.

> **Note**   Mistakes in naming will require you to modify the names throughout the Baremetal Agent data infrastructure.

Ensure That File Names, Drive Letters, and Other Information Match in All Files

If you use the automatically generated answer file, Baremetal Agent ensures that the file names, drive letters and other information match.

However, if you manually edit the answer file, you must ensure that the drive letter in the `WinPE.wim` matches the drive letter provided in the answer file. With this configuration you are defining `WinPE.wim` such that it installs Windows from a particular location by using an answer file setup option. The static names, paths, IP addresses, drive letters, answer file name, and user name credentials must be correct.

File and folder names are case sensitive: `WinPE.wim` names must exactly match entries in the Boot Configuration Data (BCD) store.

Use Single Path Workflow for SAN Boot

> Because the Windows installation does not support multi-path SAN boot, you must use the single path workflow to achieve SAN boot.

Determining the Windows OS Flavor Name

The flavor name is required for successful PXE boot of a Windows Server image. You must enter the exact character string used by Windows PE (WinPE). This string is case sensitive. The OS flavor name follows a consistent naming convention. Some examples of OS flavor names are as follows:

```
Windows Server 2008 R2 SERVERSTANDARD
Windows Server 2008 R2 SERVERSTANDARDCORE
Windows Server 2008 R2 SERVERENTERPRISE
Windows Server 2008 R2 SERVERENTERPRISECORE
Windows Server 2008 R2 SERVERDATACENTER
Windows Server 2008 R2 SERVERDATACENTERCORE
Windows Server 2008 R2 SERVERWEB
```

```
Windows Server 2008 R2 SERVERWEBCORE
Windows Server 2012 SERVERSTANDARD
Windows Server 2012 SERVERSTANDARDCORE
Windows Server 2012 R2 SERVERSTANDARD
Windows Server 2012 R2 SERVERSTANDARDCORE
Windows Server 2012 R2 SERVERDATACENTER
Windows Server 2012 R2 SERVERDATACENTERCORE
```

Procedure

Step 1   Navigate to the extracted ISO files for the Windows OS image.

Step 2   For a Windows 2012 R2 image, navigate to `C:\win2k12r2\sources\install.wim` and use a PowerShell cmdlet to find the flavor name.
An example of the use of this cmdlet is as follows:

```
PS C:\Windows\system32> Get-WindowsImage -ImagePath
C:\win2k12r2\sources\install.wim
Index       : 1
Name        : Windows Server 2012 R2 SERVERSTANDARDCORE
Description : Windows Server 2012 R2 SERVERSTANDARDCORE
Size        : 6,653,342,051 bytes
Index       : 2
Name        : Windows Server 2012 R2 SERVERSTANDARD
Description : Windows Server 2012 R2 SERVERSTANDARD
Size        : 11,807,528,410 bytes
Index       : 3
Name        : Windows Server 2012 R2 SERVERDATACENTERCORE
Description : Windows Server 2012 R2 SERVERDATACENTERCORE
Size        : 6,653,031,430 bytes
<etcetera>
```

Step 3   For a Windows 2008 image, use the DISM.EXE syntax from the machine on which you installed the WAIK tools.
An example of the use of this syntax is as follows:

```
C:\Program Files\Windows AIK\Tools\>dism
/get-wiminfo /wimfile:e:\\Win2k8r2x64\sources\install.wim
Deployment Image Servicing and Management tool
Version: 6.1.7600.16385
Details for image : e:\Username_Windowsbits\Win2k8r2x64\sources\install.wim
Index : 1
Name : Windows Server 2008 R2 SERVERSTANDARD
Description : Windows Server 2008 R2 SERVERSTANDARD
Size : 10,510,503,883 bytes
Index : 2
Name : Windows Server 2008 R2 SERVERSTANDARDCORE
Description : Windows Server 2008 R2 SERVERSTANDARDCORE
Size : 3,563,695,852 bytes
<etcetera>
```

Windows Server 2008 R2 x64 Operating System Images

The Windows Server 2008 R2 x64 OS (Windows 2008 OS) supports PXE boot and installation operations. You can use this OS image in baremetal provisioning workflows.

Prerequisites for Setting Up Windows Server 2008 R2 x64 Operating System Images

To install and set up the environment and files that are required for the setup of Windows Server 2008 R2 x64 OS images, you must first download the following:

- Windows Automated Installation Kit (AIK, sometimes called WAIK). See http://www.microsoft.com/en-us/download/details.aspx?id=5188. This website enables you to generate a customized WinPE. It also supplies an answer file template in its most fundamental form.

- Windows Server 2008 R2 x64 ISO version.

Note You do not need to manually create a Windows answer file when setting up Windows OS images. Baremetal Agent builds the Windows answer file necessary to support your PXE Boot request, based on the information you provide when you create the PXE boot request.

Before you can install the Windows 2008 operating system image in the `/opt/cnsaroot/Boot` directory of the Baremetal Agent VM, you must install and set up the following prerequisites:

- A customized Windows Preinstallation Environment (WinPE)

- Boot Configuration Data (BCD) file

- Windows installation files (the files extracted from the ISO)

Tip We recommend that you use the ISO download file, which contains all editions, including Standard, Enterprise, Datacenter, and Web. You can typically remove all editions except for Standard and Datacenter.

After the system image is in place, you must do the following:

- Set up WinPE and copy the supporting files to the Network Service Agent server for the PXE boot.

- Copy the Windows installation files to the server path.

Creating a Customized WinPE

You need to create and customize the Windows Preinstallation Environment (WinPE) for Windows 2008 R2 x64. The initial WinPE includes the minimum boot image necessary to load kernel and default device drivers supported by the Windows OS. Most servers require additional drivers, such as storage controller drivers that enable Windows to detect disks during installation. You must add these drivers into WinPE.wim.

You use Deployment Image Servicing and Management (`DISM.exe`), which is installed with WAIK tools, to add the drivers to WinPE. Make sure that you download the required drivers before you execute the associated DISM commands.

☞

Important   The following procedure includes sample data that is for reference only. The sample data might not work in your applications. For information about adding drivers to WinPE through `DISM.exe`, see the documentation provided by Microsoft.

Before You Begin

Complete the prerequisites listed in Prerequisites for Setting Up Windows Server 2008 R2 x64 Operating System Images, on page 44.

Download the following:

- Windows Automated Installation Kit (WAIK) specifically for Windows 2008 R2 x64.

- Required drivers, to be added to `WinPE.wim`.

Procedure

Step 1   Add the drivers from their folder locations to the WinPE image.
Use the following `DISM.exe` command when you know the paths to the drivers that you want to add.

```
DISM.exe /mount-wim /wimfile:c:\win2k8r2x64\WinPE.wim /index:1/mountdir:c:\win2k8r2x64\mount
DISM.exe /image:c:\win2k8r2x64\mount /Add-Driver /driver:C:\test\drivers\1.inf
/driver:C:\test\drivers\2.inf /driver:C:\test\drivers\3.inf
```

Use the following `DISM.exe` command when you do not know the paths to the drivers that you want to add and need to query all subfolders.

```
DISM.exe /image:c:\win2k8r2x64\mount /Add-Driver /driver:C:\test\drivers
/Recurse
```

Step 2   Unmount the image and commit the changes.

```
DISM.exe /unmount-wim /mountdir:c:\win2k8r2x64\mount /commit
```

When all of the drivers have been added, the image is ready.

What to Do Next

Create a Boot Configuration Data (BCD) store to hold the boot configuration parameters.

Creating a Boot Configuration Data File

The Boot Configuration Data (BCD) file contains the boot configuration parameters. It controls how the operating system is started in Windows and is used to load the base kernel (WinPE.wim) from the PXE server. You do not need to create a BCD file. Baremetal Agent provides a BCD file with default paths that you can use. The BCD file can be used by any Windows OS version, if you have not changed the basic settings.

By default, the BCD file points to the `/Boot/WinPE.wim` and `boot.sdi` files. These filenames are case sensitive.

Note   We recommend that you use a set of standard names for Baremetal Agent configuration purposes. The folder name should be Boot. The winpe file name should be WinPE.wim. Use corresponding filenames such as boot.sdi. The created BCD file should be in uppercase, and this file will not have any file extension. Baremetal Agent delivers the BCD file to `/opt/cnsaroot/Boot`, which contains a default path pointing to `/opt/cnsaroot/Boot/WinPE.wim`.

Procedure

Step 1   Navigate to the directory that contains the **bcdedit.exe** command and run the following sequence of commands to create the BCD file.
The **bcdedit.exe** command is commonly available in the Windows operating systems root directory: `c:\windows\system32`.

Step 2   **bcdedit.exe /createstore BCD**

Step 3   **bcdedit.exe /store BCD /create {ramdiskoptions} /d "Ramdisk options"**

Step 4   **bcdedit.exe /store BCD /set {ramdiskoptions} ramdisksdidevice boot**

Step 5   **bcdedit.exe /store BCD /set {ramdiskoptions} ramdisksdipath \Boot\boot.sdi**

Step 6   **bcdedit.exe /store BCD /create /d** *"My WinPE Boot Image"* **/application osloader**
At this point, the GUID is displayed. Replace *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* in the following steps with the GUID from your system.

Step 7   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **systemroot \Windows**

Step 8   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **detecthal Yes**

Step 9   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **winpe Yes**

Step 10 **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **osdevice ramdisk=[boot]\Boot\WinPE.wim,{ramdiskoptions}**

Step 11 **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **device ramdisk=[boot]\Boot\WinPE.wim,{ramdiskoptions}**

Step 12 **bcdedit.exe /store BCD /create {bootmgr} /d "Windows 2008r2 BootManager"**

Step 13 **bcdedit.exe /store BCD /set {bootmgr} timeout 30**

Step 14 **bcdedit.exe /store BCD /displayorder** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}*

Step 15 Use the following command to verify that the configuration names are correct: **bcdedit.exe /store BCD /enum all**

What to Do Next

Verify that you have the correct download version of the Windows installation files extracted from the ISO version.

Verifying the Version of the Windows Installation Files

You use the Windows 2008 ISO version of the Windows installation files to set up the answer file template. This version of the Windows installation files supports all editions of Windows 2008 OS. Otherwise, you have to use the Windows AIK tools to create the entire answer file, which is a more complicated and labor-intensive task.

Before You Begin

Install the ISO version of Windows 2008 R2 OS.

Procedure

Verify that you have the correct (ISO) version of Windows installation files by making sure the following `.CLG` files are present in the `SOURCE` folder after you have extracted the ISO version:

- install_Windows Server 2008 R2 SERVERDATACENTER.clg
- install_Windows Server 2008 R2 SERVERDATACENTERCORE.clg
- install_Windows Server 2008 R2 SERVERENTERPRISE.clg
- install_Windows Server 2008 R2 SERVERENTERPRISECORE.clg
- install_Windows Server 2008 R2 SERVERSTANDARD.clg
- install_Windows Server 2008 R2 SERVERSTANDARDCORE.clg
- install_Windows Server 2008 R2 SERVERDATAWEB.clg
- install_Windows Server 2008 R2 SERVERDATAWEBCORE.clg

What to Do Next

If the `WinPE.wim` file does not point to the Baremetal Agent IP address in the `startnet.cmd` file, then you must edit the `WinPE.wim` file as described in Customizing and Copying the WinPE.wim and PXE Boot Files, on page 47.

Customizing and Copying the WinPE.wim and PXE Boot Files

Procedure

Step 1 Mount `WinPE.wim` to a folder.

Step 2 Edit `WinPE.wim` so that it includes the correct Baremetal Agent IP address.

See the following example. Your filenames may differ.

```
DISM.exe /mount-wim /wimfile:c:\win2k8r2x64\WinPE.wim /index:1
/mountdir:c:\win2k8r2x64\mount
```

Step 3   In `WinPE.wim`, add the required PowerShell packages and edit the paths in each command with the correct mount point and ADK installation path for your environment.

Note   The Powershell package files shown below are provided for your reference only. The PowerShell packages and file names that you need to add to `WinPE.wim` are dependent upon the version of Windows and `WinPE.wim`.To determine which PowerShell packages you need to add, see the compliance report on the Microsoft website. For information about the commands to add the necessary packages for PowerShell, see the WinPE: Adding PowerShell support to Windows PE Technet Page.

```
Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-WMI.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-WMI_en-us.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-NetFX.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-NetFX_en-us.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-Scripting.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-Scripting_en-us.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-PowerShell.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-PowerShell_en-us.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-StorageWMI.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-StorageWMI_en-us.cab"
```

```
Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-DismCmdlets.cab"

Dism /Add-Package /Image:"C:\win2k8r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-DismCmdlets_en-us.cab"
```

Step 4   Navigate to the mount folder (`c:\win2k8r2x64\mount` in the code example above) and verify that you can see the data inside the mount folder.

Step 5   Navigate to `\windows\system32` in the mount folder and do the following:

a) Edit `startnet.cmd`.

b) Paste the following entries into the file in the order shown, to update the IP address and other details as required for your environment:

```
wpeinit
wpeutil.exe InitializeNetwork
wpeutil.exe disablefirewall
ECHO OFF
net use R: \\Baremetal_Agent_PXE_IP_Address\bits /user:user_id password
ECHO ON
R:
@echo
Powershell.exe -NonInteractive -NoLogo -ExecutionPolicy bypass -command R:\enroute.ps1
```

Note   • Use the drvload command when a driver has failed to be installed. For example, include the following line in the `startnet.cmd` file to install a fnic driver:

```
drvload <ipaddress of share>:\\<the_fnic.inf>
```
Use the drvload command only when you face issues in installing drivers. Otherwise, follow the standard process to inject a driver to WinPE.

• Make sure that you modify the IP address in all the entries so that they point to the Baremetal Agent IP address.

• All drive letter references (such as the reference to an R: drive) must match in both the `startnet.cmd` file and the Windows answer file. By default, Baremetal Agent comes with an R: drive letter assignment.

Step 6   Save the `startnet.cmd` file.

Step 7   Copy all files that support the PXE boot from the mount folder to the Baremetal Agent VM, as follows:

a) Copy all files from `Windows\Boot\PXE` to the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM and rename `pxeboot.n12` to `startrom.0`.

b) Copy the BCD file that you created earlier to the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

c) Copy only the folders from `Windows\Boot\EFI` to the `opt/cnsaroot/Boot` directory in the Baremetal Agent VM .

d) Copy `wgl4_boot.ttf` from `Windows\Boot\Fonts` to the `/Boot/Fonts/` directory in the Baremetal Agent VM.

e) Copy `boot.sdi` to the `/Boot` directory in the Baremetal Agent VM.

    f) Copy the renamed `startrom.0` and `bootmgr.exe` to the `opt/cnsaroot` directory in the Baremetal Agent VM.

Step 8 After you have confirmed that the `startnet.cmd` is updated correctly, unmount `WinPE.wim` with the DISM Unmount command and use the /**commit** option to save the modified `startnet.cmd` file.

```
DISM.exe /Unmount-Wim /Mountdir:c:\win2k8r2x64\mount /commit
```

Caution Do not leave any files open that are located in the mounted directory when you unmount `WinPE.wim`. If you have any files open, the unmount process might fail.

Step 9 Copy `WinPE.wim` to the `opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

What to Do Next

Copy the Windows installation files to the server folder path.

Copying the Windows Installation Files to the Server Folder Path

Before You Begin

You must have the following in place:

- Customized `WinPE.wim` and PXE boot files in the `opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

- Configured BCD file in the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

- Windows installation files (ISO version)

- The `setup.exe` file from the extracted ISO in the `/samba/Win2k8R2x64` folder.

- Baremetal Agent directories, completed `.cfg` files and a `.remap` file.

Procedure

Step 1 Extract the downloaded ISO that you obtained and validated.

Step 2 Copy the folders and files from the downloaded ISO to the `/samba/Win2k8R2x64` directory in the Baremetal Agent VM.

Note Do not change the folder paths, filenames, or folder names.

Step 3 Open the `/samba/notifications/notify.ps1` file and verify that the IP address in that file matches the PXE IP address of Baremetal Agent.

Windows Server 2012 x64 and 2012 R2 x64 Operating System Images

Cisco UCS Director Baremetal Agent (Baremetal Agent) supports PXE boot and installation operations for Windows 2012 x64 OS or 2012 R2 x64 OS images and PXE boot tasks used in baremetal provisioning workflows.

Note
If you need to support both Windows 2012 and 2012 R2, you must perform the image setup process twice, once for each OS. Although it is possible to set up a single WinPE file that supports multiple Windows OS versions, we recommend that you set up a separate `WinPE` file for each OS.

Prerequisites for Setting Up Windows Server 2012 x64 and 2012 R2 x64 Operating System Images

Before you can install a Windows 2012 or 2012 R2 OS image in the `/opt/cnsaroot/Boot` directory of the Baremetal Agent VM, you must install and set up the following prerequisites:

- Windows Assessment and Deployment Kit (Windows ADK, version 8.0 or later recommended, depending on the Windows version compatibilities with respect to the `WinPE.wim` file)

- A customized Windows Preinstallation Environment (`WinPE.wim`) and PXE supporting files

- Boot Configuration Data (BCD) file

- Windows installation files (the files extracted from the ISO)

Note
You do not need to manually create a Windows answer file when setting up Windows OS images. Baremetal Agent builds the Windows answer file necessary to support your PXE Boot request, based on the information you provide when you create the PXE boot request.

To install and set up the images, you will first need to download the following:

- Windows Assessment and Deployment Kit that supports Windows Server 2012 and Windows Server 2012 R2. For more information, see http://technet.microsoft.com/en-us/library/dn613859.aspx.

- Windows Server 2012 x64 and/or 2012 R2 x64 (Standard and Datacenter editions are required).

Tip
We recommend that you use the ISO download file, which contains all editions, including Standard, Enterprise, Datacenter, and Web. You can typically remove all editions except for Standard and Datacenter.

After the system image is in place, you must perform additional procedures:

- Set up WinPE and copy the supporting files to the Network Service Agent server for the PXE boot.

- Copy the Windows installation files to the server path.

Creating a Custom WinPE and Copying the PXE Supported Files for Windows 2012

> **Note** The `/opt/cnsaroot/Boot` folder is static, and each Baremetal Agent can have only one boot folder.

Before You Begin

Complete the prerequisites listed in Prerequisites for Setting Up Windows Server 2012 x64 and 2012 R2 x64 Operating System Images, on page 51.

Procedure

Step 1   Download an ADK version that supports Windows 2012 and install it on a Windows 2012 machine.
> **Note**   When you specify the features to include in the download, you must include the Windows PE and Deployment Tools.

Step 2   Navigate to the Windows Pre-installation Environment folder in the ADK tools and execute **copype.cmd** to create the files that WinPE requires.

```
Copype.cmd amd64 C:\WinPE_amd64
```

The target directory contains the `WinPE.wim` file. The latest ADK versions create a `boot.vim` file, which needs to be renamed to `WinPE.wim`.

Step 3   In the Windows machine that has the ADK tools installed, create a directory. Copy the `WinPE.wim` file from `/opt/cnsaroot/Boot` to the directory you have created.

Step 4   At the command line, navigate to the ADK installed folder.

Step 5   Add the drivers from their folder locations to the WinPE image.
Use the following `DISM.exe` command when you know the paths to the drivers that you want to add.

```
// The DISM.exe command mounts the WinPE to a folder.
// In this example, the c:\win2k12x64 directory and the \mount subdirectory have been created
 before running the command.
DISM.exe /mount-wim /wimfile:c:\win2k12x64\WinPE.wim /index:1 /mountdir:c:\win2k12x64\mount

// To add individual driver files to WinPE image, use the following format.
DISM.exe /image:c:\win2k12x64\mount /Add-Driver /driver:C:\test\drivers\1.inf
/driver:C:\test\drivers\2.inf /driver:C:\test\drivers\3.inf
```

Use the following `DISM.exe` command when you do not know the paths to the drivers that you want to add and need to query all subfolders.

```
 // The DISM.exe command mounts the WinPE to a folder.
// In this example, the c:\win2k12x64 directory and the \mount subdirectory have been created
 before running the command.
DISM.exe /mount-wim /wimfile:c:\win2k12x64\WinPE.wim /index:1 /mountdir:c:\win2k12x64\mount
```

```
// To add individual driver files to WinPE image, use the following format.
DISM.exe /image:c:\win2k12x64\mount /Add-Driver /driver:c:\test\drivers /Recurse
```

Step 6 Mount `WinPE.wim` to a folder.

Step 7 In `WinPE.wim`, add the required PowerShell packages and edit the paths in each command with the correct mount point and ADK installation path for your environment.

> **Note** The PowerShell packages and file names that you need to add to `WinPE.wim` are dependent upon the version of Windows and `WinPE.wim`.To determine which PowerShell packages you need to add, see the compliance report on the Microsoft website. For information about the commands to add the necessary packages for PowerShell, see the WinPE: Adding PowerShell support to Windows PE Technet Page. The PowerShell package files shown below are provided for reference and will vary depending on the version of Windows and WinPE.wim.

```
\\ Sample PowerShell package files.
\\ The PowerShell packages and file names that you need to add to WinPE.wim vary depending
 on the version of Windows and WinPE.wim.

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-WMI.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-WMI_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-NetFX.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-NetFX_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-Scripting.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-Scripting_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-PowerShell.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-PowerShell_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-StorageWMI.cab"
```

```
Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-StorageWMI_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-DismCmdlets.cab"

Dism /Add-Package /Image:"C:\win2k12x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-DismCmdlets_en-us.cab"
```

Step 8   Navigate to `\windows\system32` in the mount folder. In the `startnet.cmd`, update the IP address for Baremetal Agent.

> **Note**
> - Do not change any information in the `startnet.cmd` file, except for the Baremetal Agent IP address.
> - Make sure that you modify the IP addresses in all the entries so that they point to the Baremetal Agent IP address.
> - All drive letter references (such as the reference to an R: drive) must match in both the `startnet.cmd` file and the Windows answer file. By default, Baremetal Agent comes with an R: drive letter assignment.

Step 9   Unmount the WinPE, commit the changes, and copy the file to the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

```
DISM.exe /Unmount-Wim /Mountdir:c:\win2k12x64\mount /commit
```

What to Do Next

Install and set up (as necessary) the Boot Configuration Data (BCD) file.

Creating a Custom WinPE and Copying the PXE Supported Files for Windows 2012 R2

For Windows Server 2012 R2 x64, Baremetal Agent provides the WinPE and supported PXE files. You need only add any required drivers to the `WinPE.wim` file, and then edit the `WinPE.wim` file to change the IP address in the `startnet.cmd` file to the PXE IP address for your Baremetal Agent.

> **Note**   The `/opt/cnsaroot/Boot` folder is static, and each Baremetal Agent can have only one boot folder.

Before You Begin

Complete the prerequisites listed in Prerequisites for Setting Up Windows Server 2012 x64 and 2012 R2 x64 Operating System Images, on page 51.

Procedure

Step 1   Download an ADK version that supports Windows 2012 R2 and install it on a Windows 2012 R2 machine.

Note   When you specify the features to include in the download, you must include the Windows PE and Deployment Tools.

Step 2   In the Windows machine that has the ADK tools installed, create a directory. Copy the `WinPE.wim` file from `/opt/cnsaroot/Boot` to the directory you created.

Step 3   At the command line, navigate to the ADK installed folder.

Step 4   Add the drivers from their folder locations to the WinPE image.
Use the following `DISM.exe` command when you know the paths to the drivers that you want to add.

```
// The DISM.exe command mounts the WinPE to a folder.
// In this example, the c:\win2k12r2x64 directory and the \mount subdirectory have been
created before running the command.
DISM.exe /mount-wim /wimfile:c:\win2k12r2x64\WinPE.wim /index:1
/mountdir:c:\win2k12r2x64\mount

// To add individual driver files to WinPE image, use the following format.
DISM.exe /image:c:\win2k12r2x64\mount /Add-Driver /driver:C:\test\drivers\1.inf
/driver:C:\test\drivers\2.inf /driver:C:\test\drivers\3.inf
```

Use the following `DISM.exe` command when you do not know the paths to the drivers that you want to add and need to query all subfolders.

```
 // The DISM.exe command mounts the WinPE to a folder.
// In this example, the c:\win2k12r2x64 directory and the \mount subdirectory have been
created before running the command.
DISM.exe /mount-wim /wimfile:c:\win2k12r2x64\WinPE.wim /index:1
/mountdir:c:\win2k12r2x64\mount

// To add individual driver files to WinPE image, use the following format.
DISM.exe /image:c:\win2k12r2x64\mount /Add-Driver /driver:c:\test\drivers /Recurse
```

Step 5   Mount `winPE.wim` to a folder.

Step 6   In `WinPE.wim`, add the required PowerShell packages and edit the paths in each command with the correct mount point and ADK installation path for your environment.

Note   The PowerShell packages and file names that you need to add to `WinPE.wim` are dependent on the version of Windows and `WinPE.wim`. To determine which PowerShell packages you need to add, see the compliance report on the Microsoft website. For information about the commands to add the necessary packages for PowerShell, see the WinPE: Adding PowerShell support to Windows PE Technet Page. The PowerShell package files shown below are provided for reference and will vary depending on the version of Windows and WinPE.wim.

```
\\ Sample PowerShell package files.
\\ The PowerShell packages and file names that you need to add to WinPE.wim vary depending
 on the version of Windows and WinPE.wim.

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-WMI.cab"
```

```
Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-WMI_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-NetFX.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-NetFX_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-Scripting.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-Scripting_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-PowerShell.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-PowerShell_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-StorageWMI.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-StorageWMI_en-us.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\WinPE-DismCmdlets.cab"

Dism /Add-Package /Image:"C:\win2k12r2x64\mount" /PackagePath:"C:\Program Files\Windows
Kits\8.1\Assessment and Deployment Kit\Windows Preinstallation
Environment\amd64\WinPE_OCs\en-us\WinPE-DismCmdlets_en-us.cab"
```

Step 7   Navigate to `\windows\system32` in the mount folder. In the `startnet.cmd`, update the IP address for Baremetal Agent.

> **Note**
> - Do not change any information in the `startnet.cmd` file, except the IP address for Baremetal Agent.
>
> - Make sure that you modify the IP address in all the entries so that they point to the Baremetal Agent IP address.
>
> - All drive letter references (such as the reference to an R: drive) must match in both the `startnet.cmd` file and the Windows answer file. By default, Baremetal Agent comes with an R: drive letter assignment.

Step 8   Unmount the WinPE, commit the changes, and copy the file to the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

```
DISM.exe /Unmount-Wim /Mountdir:c:\win2k12r2x64\mount /commit
```

What to Do Next

Install and set up (as necessary) the Boot Configuration Data (BCD) file.

Installing and Setting Up the Boot Configuration Data File

The Boot Configuration Data (BCD) file contains the boot configuration parameters. It controls how the operating system is started in Windows and is used to load the base kernel (WinPE.wim) from the PXE server. You do not need to create a BCD file. Baremetal Agent provides a BCD file with default paths that you can use.

By default, the BCD file points to the `/Boot/WinPE.wim` and `boot.sdi` files. These filenames are case sensitive.

Note   We recommend that you use a set of standard names for Baremetal Agent configuration purposes. The folder name should be Boot. The winpe file name should be WinPE.wim. Use corresponding filenames such as boot.sdi. The created BCD file should be in uppercase, and this file will not have any file extension. Baremetal Agent delivers the BCD file to `/opt/cnsaroot/Boot`, which contains a default path pointing to `/opt/cnsaroot/Boot/WinPE.wim`. This file can be used by any Windows OS version, unless you change the path names.

The command **bcdedit.exe** used to create BCD files is commonly available in the Windows operating systems root directory: `c:\windows\system32`.

Before You Begin

Create a custom WinPE and copy the PXE supported files

Procedure

Step 1   Navigate to the directory that contains the **bcdedit.exe** command and run the following sequence of commands to create the BCD file.
The **bcdedit.exe** command is commonly available in the Windows operating systems root directory: `c:\windows\system32`.

Step 2   **bcdedit.exe /createstore BCD**

Step 3   **bcdedit.exe /store BCD /create {ramdiskoptions} /d "Ramdisk options"**

Step 4   **bcdedit.exe /store BCD /set {ramdiskoptions} ramdisksdidevice boot**

Step 5   **bcdedit.exe /store BCD /set {ramdiskoptions} ramdisksdipath \Boot\boot.sdi**

Step 6   **bcdedit.exe /store BCD /create /d** *"My WinPE Boot Image"* **/application osloader**
At this point, the GUID is displayed. Replace *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* in the following steps with the GUID from your system.

Step 7   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **systemroot \Windows**

Step 8   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **detecthal Yes**

Step 9   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **winpe Yes**

Step 10   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **osdevice ramdisk=[boot]\Boot\WinPE.wim,{ramdiskoptions}**

Step 11   **bcdedit.exe /store BCD /set** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}* **device ramdisk=[boot]\Boot\WinPE.wim,{ramdiskoptions}**

Step 12   One of the following:

  • **bcdedit.exe /store BCD /create {bootmgr} /d "Windows 2012r2 BootManager"**

  • **bcdedit.exe /store BCD /create {bootmgr} /d "Windows 2012 BootManager"**

Step 13   **bcdedit.exe /store BCD /set {bootmgr} timeout 30**

Step 14   **bcdedit.exe /store BCD /displayorder** *{a20f8db8-7459-11e2-8ec3-00155d37efa7}*

Step 15   Use the following command to verify that the configuration names are correct: **bcdedit.exe /store BCD /enum all**

What to Do Next

Copy the Windows installation ISO image to the server folder.

Copying the Windows Installation Files to the Server Folder

Before You Begin

You must have the following in place:

  • Customized `winPE.wim` and PXE boot files in the `opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

  • Configured BCD file in the `/opt/cnsaroot/Boot` directory in the Baremetal Agent VM.

  • Windows installation files (ISO version).

Procedure

Step 1   Extract the downloaded ISO that you obtained and validated.

Step 2   Copy the folders and files from the downloaded ISO to the appropriate directory in the Baremetal Agent VM.

Windows OS Version	Server Path
Windows 2012 R2	`/samba/Win2k12R2x64`
Windows 2012	`/samba/Win2k12x64`

Note   Do not change the folder paths, filenames, or folder names.

The following is a sample of the contents of a `Win2k12R2x64` folder after the Window installation files have been copied to it:

```
boot
efi
sources
support
autorun.inf
bootmgr.efi
setup.exe
```

Step 3 Open the `/samba/notifications/notify.ps1` file and verify that the IP address matches the PXE IP address of Baremetal Agent.

Simultaneous Deployment of Windows Server Operating Systems

You can use Baremetal Agent to run parallel workflows and simultaneously deploy Windows server images on multiple baremetal servers.

Prerequisites for Simultaneous Deployment

To ensure that you can perform simultaneous deployment of Windows Server operating system images, you must perform the appropriate configuration required for the versions of the operating system that are described in the following topics, including:

- Adding the PowerShell packages to the `WinPE.wim` file

- Updating `startnet.cmd` with the IP addresses and other information required for your environment

Baremetal Workflows

You do not need to make any changes to your existing baremetal provisioning workflows to support simultaneous deployment of Windows server operating systems.

A PXE boot task in a workflow can only provision one server with a Windows operating system. You cannot use a single PXE boot task to provision multiple servers, but you can execute PXE boot tasks simultaneously multiple times.

Maximum Number of Simultaneous Deployments

The maximum number of simultaneous deployments is dependent upon the bandwidth of your TFTP and PXE networks.

One Windows Version for Each Baremetal Agent

Due to a limitation in the process of the Windows unattended installation, you can only deploy one version of Windows with each Baremetal Agent added to Cisco UCS Director. If you want to deploy a different version of Windows, you must add another Baremetal Agent to Cisco UCS Director.

Minimum Supported Level of Baremetal Agent

Simultaneous deployment of Windows server operating systems requires a minium of Baremetal Agent, Release 5.4. It is not supported in earlier releases of Baremetal Agent.

Files and Folders Used In Simultaneous Deployment

The following files and folders are used during simultaneous deployment of Windows operating systems:

PXElinux.cfg File

The `PXElinux.cfg` file contains the MAC addresses for each of the servers and points to the `WinPE.wim` file.

Samba Folder

The `/samba` folder contains a folder for each of the following items. Additional information about the script and folder is provided below.

- Windows images to be deployed on the baremetal servers

- `EnRoute.ps1` script

- `as-repository` folder

AS-Repository Folder

The `/samba/as-repository` folder contains a folder for each MAC address of the servers for which a Windows operating is to be deployed. The PXE boot task creates and stores a separate Windows answer file for each of these servers in the appropriate MAC address folder. This folder might not be created until after the first PXE boot workflow is run.

EnRoute.ps1 Script

The `EnRoute.ps1` script determines which Windows answer file in the `as-repository` folder belongs to the server that is being provisioned. If desired, you can customize this script. However, when you add the Baremetal Agent to Cisco UCS Director, the script in the `as-repository` folder will revert to the default script without the customizations.

Note By default, the `EnRoute.ps1` script is hardcoded with the Windows Server 2012 R2 operating system. To deploy a different supported Windows Server operating system, replace the default value of `$OsPath="R:\Win2k12R2x64\"` with one of the following values:

- For Windows Server 2012: `$OsPath="R:\Win2k12x64\"`

- For Windows Server 2008 R2: `$OsPath="R:\Win2k8R2x64\"`

Windows Answer File

The Windows answer file contains settings and values that are used during the deployment of a Windows operating system. This answer file is typically named unattend.xml. During simultaneous deployment, a

separate Windows answer file is created in each MAC address folder and then sent to the server to be used during the Windows operating system setup.

When the installation is successfully completed, the name of the answer file is changed to include "Completed."

For more information, see the Microsoft TechNet article on Understanding Answer Files.

Example: Simultaneous Deployment of Windows Server Operating Systems

This example describes what actions Baremetal Agent performs when you execute two workflows at the same time, with each workflow designed to provision a baremetal server with a Windows operating system. The illustrations below describe how server 1 and server 2 are provisioned when the PXE tasks in the workflows are executed.

Figure 3: Server 1 Provisioning
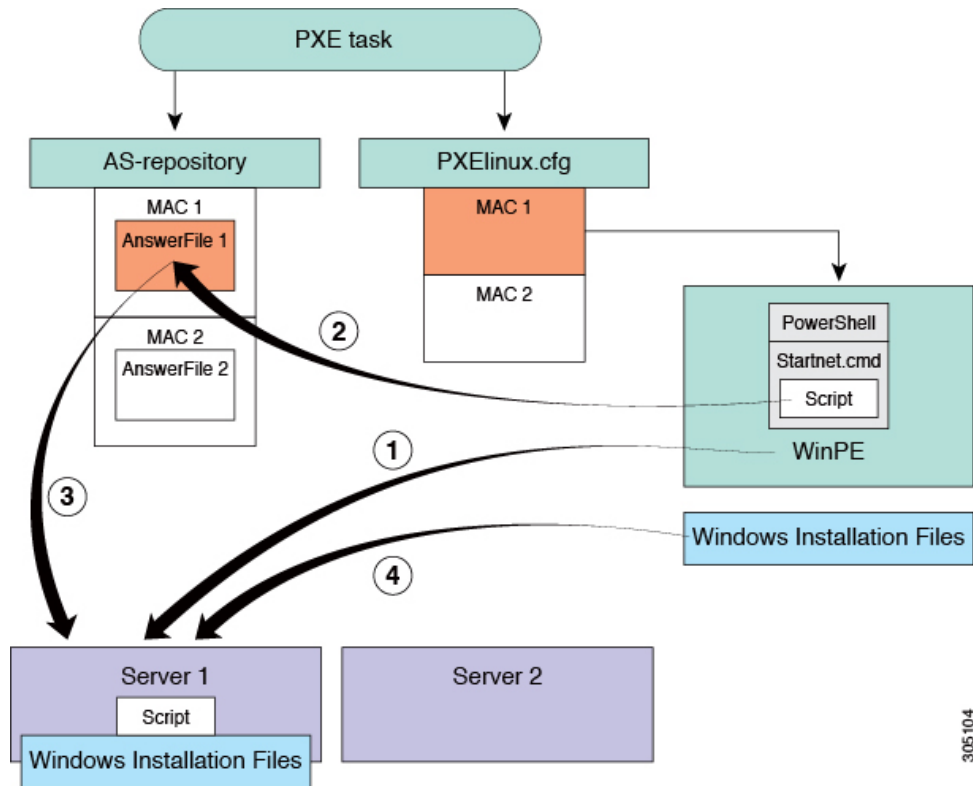
When the PXE boot task is executed in the workflow that provisions Server 1, the steps shown in the above illustration occur:

Step	Action
1	Server 1 boots up. The `WinPE.wim` file, together with its PowerShell packages and `Startnet.cmd`, is copied to the server.

Step	Action
2	The `Startnet.cmd` calls the `EnRoute.ps1` script from the `/samba` folder on the Baremetal Agent VM.
	A folder is created under `/samba/as-repository/` with MAC address of Server 1 as its name, for example, `/samba/as-repository/MAC 1`, and a Windows answer file is placed into that folder.
3	The `EnRoute.ps1` script compares the MAC address on Server 1 with the MAC address folders available in the `/samba/as-repository` folder and finds the Windows answer file for Server 1 in the `/samba/as-repository/MAC 1` folder.
4	Using the Windows answer file, the appropriate Windows operating system (shown as Windows installation files) is installed on Server 1.
	When the installation is successfully completed, the name of the answer file is changed to include "Completed."

Figure 4: Server 2 Provisioning
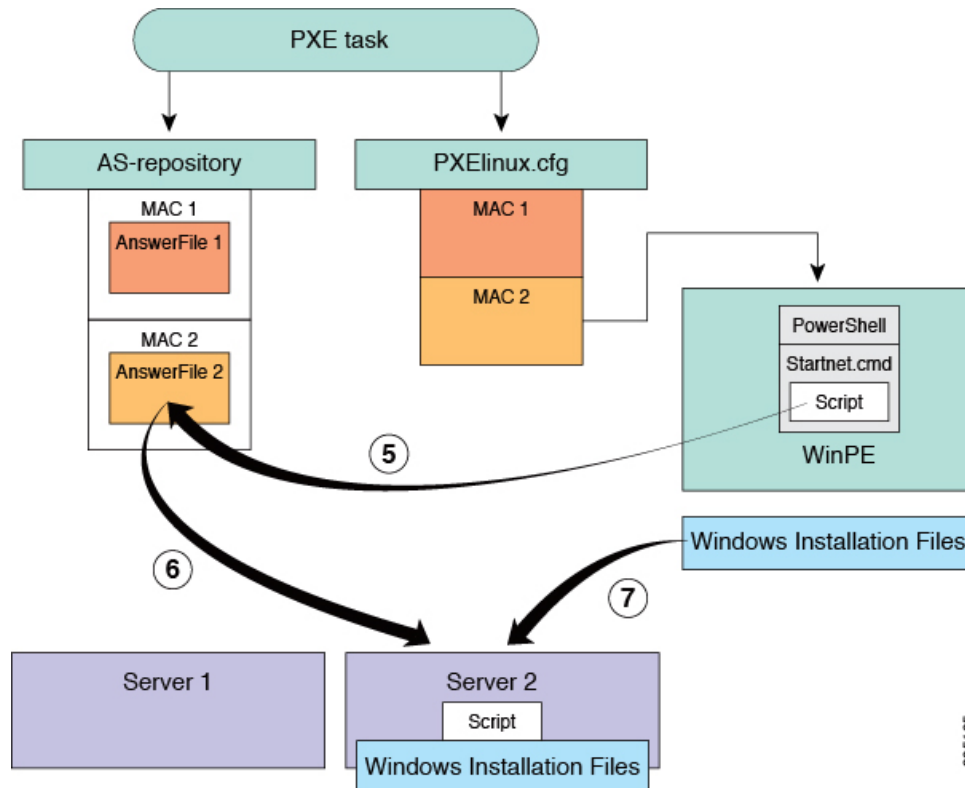

At the same time as Server 1 is being provisioned, when the PXE boot task is executed in the workflow that provisions Server 2, the steps shown in the above illustration occur:

Step	Action
5	Server 2 boots up. The `WinPE.wim` file, together with its PowerShell packages and `Startnet.cmd`, is copied to the server.
	The `Startnet.cmd` calls the `EnRoute.ps1` script from the `/samba` folder on the Baremetal Agent VM.
	A folder is created under `/samba/as-repository/` with MAC address of Server 2 as its name, for example, `/samba/as-repository/MAC 2`, and a Windows answer file is placed into that folder.
6	The `EnRoute.ps1` script compares the MAC address on Server 2 with the MAC address folders available in the `/samba/as-repository` folder and finds the Windows answer file for Server 2 in the `/samba/as-repository/MAC 2` folder.
7	Using the Windows answer file, the appropriate Windows operating system (shown as Windows installation files) is installed on Server 2.
	When the installation is successfully completed, the name of the answer file is changed to include "Completed."

Manual Setup of Operating System Images

This chapter contains the following sections:

Manual Setup of Linux and ESXi Operating System Images for PXE Installation

We recommend that you set up Linux and ESXi operating system (OS) images for Cisco UCS Director Baremetal Agent (Baremetal Agent) through a PXE boot request or orchestration workflow, as described in Adding and Configuring PXE Boot Requests, on page 21 and Orchestration Workflow Tasks for PXE Boot, on page 31. However, if you prefer, you can set up these OS images manually.

Adding a Linux Operating System Image

Procedure

Step 1 Create a directory for the operating system image in the `/opt/cnsaroot/images` directory of the Baremetal Agent VM.
mkdir /opt/cnsaroot/images/_image_name_

This directory is used to store the operating system image files required for PXE installation.

Note This directory name is included in the **OS Type** drop-down list in the Setup PXE Boot task. We recommend that you make the directory name descriptive enough that you can identify the operating system of the images within it. For example, we recommend that you name the directory `RHEL6.2` or `CentOS5`.

Step 2 Create a directory for the operating system image with the same name as the one that you created in Step 1 in the `/opt/cnsaroot/templates` directory of the Baremetal Agent VM.

mkdir /opt/csnaroot/templates/*new_image_name*

This directory is used to store the Kickstart and PXE configuration template files for the operating system image.

Step 3 Copy the `.iso` file or files for the required operating system to the `/tmp` directory of the Baremetal Agent VM.

Step 4 Mount the `.iso` file to the `iso` directory.
mount −o loop /tmp/*.iso_file* **/mnt/iso**

Step 5 Copy the entire contents of the `.iso` file to the `/opt/cnsaroot/images/`*image_name* directory that you created in Step 1.
cp −R /mnt/iso/* /opt/cnsaroot/images/*image_name*

Note   Make sure that you use the **cp −R** command to recursively copy the entire contents of the `.iso` file. This command copies the underlying directories and their contents also.

Step 6 When the copy operation is complete, unmount the `.iso` file.
umount /mnt/iso

Step 7 If the operating system image consists of more than one `.iso` file, repeat Steps 5, 6, and 7 for each `.iso` file until the contents of all `.iso` files have been copied to the `/opt/cnsaroot/images/`*image_name* directory.

Step 8 Create a `ks.cfg` file and a `pxe.cfg` file in the `/opt/cnsaroot/templates/`*image_name* directory that you created in Step 2.

touch /opt/cnsaroot/templates/*image_name***/ks.cfg**
touch /opt/cnsaroot/templates/*image_name***/pxe.cfg**

Step 9 Add the required configuration information to the `ks.cfg` and `pxe.cfg` files.
For sample `ks.cfg` and `pxe.cfg` files and more information about these files, see Sample Operating System Configuration Template Files, on page 69.

Step 10 Create a soft link in the `/var/www/html` directory for this operating system image.
ln −s /opt/cnsaroot/images/*image_name* **/var/www/html/**

Step 11 (Optional) If necessary, update the `initrd.img` and `vmlinuz` files for the operating system image as follows:

a) Copy the `initrd.img` and `vmlinuz` files from the `/opt/cnsaroot/images/`*image_name* directory to the `/opt/cnsaroot/` directory.

b) Overwrite the current files in this location.

Step 12 In Cisco UCS Director, verify that the operating system image is available from the **OS Type** drop-down list in the Setup PXE Boot task.
Wait two minutes, or for whatever duration has been set for the Baremetal Agent synchronization frequency. By default, Baremetal Agent is synchronized with Cisco UCS Director every two minutes. You can change this frequency with the bma.sync.frequency property in **service.properties.template** file under `/opt/infra` in the Baremetal Agent VM.

Adding a VMware vSphere ESXi Operating System Image

Procedure

Step 1 Create a directory for the operating system image data in the `/opt/cnsaroot` directory of the Baremetal Agent VM.
mkdir /opt/cnsaroot/*images*

This directory is used to store the operating system image files required for PXE installation.

Note This directory name is included in the **OS Type** drop-down list in the Setup PXE Boot task. We recommend that you make the directory name descriptive enough that you can identify the operating system of the images within it. For example, we recommend that you name the directory `ESXi5.0-update1` or `ESXi5.1`.

Step 2 Create a directory for the operating system image with the same name as the one that you created in Step 1 in the `/opt/cnsaroot/templates` directory of the Baremetal Agent VM.
mkdir /opt/cnsaroot/templates/*new_image_name*

This directory is used to store the Kickstart and PXE configuration template files for the operating system image.

Step 3 Copy the `.iso` file or files for the required operating system to the `/tmp` directory of the Baremetal Agent VM.

Step 4 Mount the `.iso` file to the `iso` directory.
mount −o loop /tmp/*.iso_file* **/mnt/iso**

Step 5 Copy the entire contents of the `.iso` file to the `/opt/cnsaroot/`*image_name* directory that you created in Step 1.
cp −R /mnt/iso/* /opt/cnsaroot/*image_name*

Note Make sure that you use the **cp −R** command to recursively copy the entire contents of the `.iso` file. This command copies the underlying directories and their contents also.

Step 6 When the copy operation is complete, unmount the `.iso` file.
umount /mnt/iso

Step 7 If the operating system image consists of more than one `.iso` file, repeat Steps 5, 6, and 7 for each `.iso` file until the contents of all `.iso` files have been copied to the `/opt/cnsaroot/`*image_name* directory.

Step 8 Create a `ks.cfg` file and a `pxe.cfg` file in the `/opt/cnsaroot/templates/`*image_name* directory that you created in Step 2.

touch /opt/cnsaroot/templates/*image_name***/ks.cfg**
touch /opt/cnsaroot/templates/*image_name***/pxe.cfg**

Step 9 Add the required configuration information to the `ks.cfg` and `pxe.cfg` files.
For sample `ks.cfg` and `pxe.cfg` files and more information about these files, see .

Step 10 Copy the `boot.cfg` file from the `/opt/cnsaroot/`*image_name* directory to the `/opt/cnsaroot/templates/`*image_name* directory.

cd /opt/cnsaroot/templates/*image_name***/**
cp /opt/cnsaroot/*image_name***/boot.cfg ./**

Step 11 Edit the `boot.cfg` file in the `/opt/cnsaroot/templates/`*image_name* directory as follows:

a) After the `title=` line, add a prefix=/*image_name*/ line.

b) Append pxebooting ks=$PXE_KS_URL to the end of the `kernelopt=runweasel` line.

c) Remove the leading / from all modules listed in the `boot.cfg` file.

d) Save the edited file.

Step 12 In Cisco UCS Director, verify that the operating system image is available from the **OS Type** drop-down list in the Setup PXE Boot task.
Wait two minutes, or for whatever duration has been set for the Baremetal Agent synchronization frequency. By default, Baremetal Agent is synchronized with Cisco UCS Director every two minutes. You can change this frequency with the bma.sync.frequency property in **service.properties.template** file under `/opt/infra` in the Baremetal Agent VM.

APPENDIX C

Sample Operating System Configuration Template Files

This chapter contains the following sections:

Sample Linux Configuration Template Files

Sample Kickstart Configuration Template File for Linux Operating Systems

The following example shows the Kickstart configuration template file (`ks.cfg`) that is required for Linux operating system images:

```
#platform=x86, AMD64, or Intel EM64T

# System authorization information
auth  --useshadow  --enablemd5

# System bootloader configuration
bootloader --append="rhgb quiet" --location=mbr --driveorder=sda

# Partition clearing information
clearpart --linux --initlabel

# Use text-based install
text

# Firewall configuration
firewall --disabled

# Run the Setup Agent on first boot
firstboot --disable

# System keyboard
keyboard us

# System language
```

```
lang en_US

# Installation logging level
logging --level=info

# Provide url/location of image over http.
url --url=http://$PXE_NATIVE_WEBSERVER/image_name

#Reboot after installation
reboot

# Network information
network --bootproto=static --device=eth0 --ip=$PXE_IP
  --netmask=$PXE_NETMASK --gateway=$PXE_GATEWAY
  --hostname=$PXE_NAME --onboot=on

#Root password
rootpw $PXE_PASSWD

# SELinux configuration
selinux --disabled

# System timezone
timezone --utc America/New_York

# Install OS instead of upgrade
install

# Disk partitioning information
part /  --fstype="ext3" --size=8000

#Install required packages
%packages --nobase
wget

%post
wget http://$PXE_WEBSERVER/$PXEID/notify.html
```

Sample PXE Configuration Template File for Linux Operating Systems

The following example shows the PXE configuration template file (`pxe.cfg`) that is required for Linux operating system images:

```
default linux

label linux
kernel vmlinuz

append initrd=initrd.img ramdisk_size=9216 noapic acpi=off ip=dhcp ks=$PXE_KS_URL

prompt 0
timeout 0
```

Sample VMware vSphere ESXi Configuration Template Files

Sample Kickstart Configuration Template File for VMware vSphere ESXi Operating Systems

The following example shows the Kickstart configuration template file (`ks.cfg`) that is required for VMware vSphere ESXi operating system images:

```
vmaccepteula

#Set passsword for ESXi server, "$PXE_PASSWD" will be filled in by UCSD
rootpw $PXE_PASSWD

#For Local boot, uncomment the following line
#install --firstdisk --overwritevmfs

#For SAN boot, uncomment the following line
install --firstdisk=remote --overwritevmfs

#Configures the mangement vmknic interface for the ESXi host. All items
  starting with "$" are variables that will be replaced by UCSD during the
  PXE boot process.
network --bootproto=static --ip=$PXE_IP --netmask=$PXE_NETMASK
  --gateway=$PXE_GATEWAY --vlanid=$PXE_MGMTVLAN
  --nameserver=$PXE_NS --hostname=$PXE_NAME

%pre --interpreter=busybox
hwclock -d %LIVE_VAR_DATE_1% -t %LIVE_VAR_TIME_UTC_1%
date -s %LIVE_VAR_DATE_TIME_UTC_1%
cd /tmp
wget http://$PXE_WEBSERVER/$PXEID/web/track/log1

%firstboot --interpreter=busybox
cd /tmp
wget http://$PXE_WEBSERVER_MGMT_VLAN_IP/$PXEID/web/track/log3

wget http://$PXE_WEBSERVER_MGMT_VLAN_IP/$PXEID/web/track/log4


#Enable & start remote ESXi Shell  (SSH)
vim-cmd hostsvc/enable_ssh
vim-cmd hostsvc/start_ssh

#Enable & start ESXi Shell (TSM)
vim-cmd hostsvc/enable_esx_shell
vim-cmd hostsvc/start_esx_shell

wget http://$PXE_WEBSERVER_MGMT_VLAN_IP/$PXEID/web/track/log5


%post --interpreter=busybox --ignorefailure=true

cd /tmp
localcli network firewall set --default-action true
localcli network firewall set --enabled false
wget http://$PXE_WEBSERVER_MGMT_VLAN_IP/$PXEID/web/track/log2
wget http://$PXE_WEBSERVER_MGMT_VLAN_IP/$PXEID/notify.html -O /tmp/notify.html
localcli network firewall set --default-action false
localcli network firewall set --enabled true

#Power down the ESXi server after installation
poweroff
```

Sample PXE Configuration Template File for VMware vSphere ESXi Operating Systems

The following example shows the PXE configuration template file (`pxe.cfg`) that is required for VMware vSphere ESXi operating system images:

```
default image_name/menu.c32
menu title PXE Boot Home
timeout 70

label image_name
menu label Install VMware image_name
kernel image_name/mboot.c32
append -c /web/ks-repository/$PXE_ID/boot.cfg  +++
IPAPPEND 1
```

Sample Windows Answer File

The following is an example of a Windows answer file, named `AUTOUNATTEND.XML`, that can be used to set up a Windows Server 2008 R2 OS image for use with Cisco UCS Director Baremetal Agent.

```
<unattend>
 <servicing>
  <package action="configure">
    <assemblyIdentity name="Microsoft-Windows-Foundation-Package" version="6.1.7600.16385"

    processorArchitecture="amd64" publicKeyToken="xxxf3856ad364xxx" language=""/>
    <selection name="IIS-WebServerRole" state="false"/>
    <selection name="IIS-WebServer" state="false"/>
    <selection name="Microsoft-Hyper-V" state="true"/>
    <selection name="Microsoft-Hyper-V-Management-Clients" state="true"/>
    <selection name="Microsoft-Hyper-V-Management-Clients" state="true"/>
    <selection name="MultipathIo" state="true"/>
    <selection name="TelnetClient" state="true"/>
  </package>
 </servicing>
<settings pass="windowsPE">
 <component name="Microsoft-Windows-Setup" processorArchitecture="amd64"
   publicKeyToken="xxxf3856ad364xxx" language="neutral" versionScope="nonSxS">
  <ComplianceCheck>
 <DisplayReport>OnError</DisplayReport>
 </ComplianceCheck>
<Display>
    <VerticalResolution>600</VerticalResolution>
    <RefreshRate>60</RefreshRate>
    <HorizontalResolution>800</HorizontalResolution>
    <ColorDepth>32</ColorDepth>
 </Display>
 <EnableFirewall>false</EnableFirewall>
<UserData>
 <ProductKey>
  <WillShowUI>Never</WillShowUI>
  <Key>XXXXX-XXXXX-KQT8W-PMXWJ-XXXXX</Key>
 </ProductKey>
 <AcceptEula>true</AcceptEula>
 <FullName>Cisco</FullName>
 <Organization>CiscoUCSD</Organization>
 </UserData>
<DiskConfiguration>
 <WillShowUI>OnError</WillShowUI>
<Disk wcm:action="add">
<CreatePartitions>
```

```
<CreatePartition wcm:action="add">
 <Order>1</Order>
 <Type>Primary</Type>
 <Size>40000</Size>
 </CreatePartition>
 </CreatePartitions>
 <DiskID>0</DiskID>
 <WillWipeDisk>true</WillWipeDisk>
<ModifyPartitions>
<ModifyPartition wcm:action="add">
 <Active>true</Active>
 <Extend>false</Extend>
 <Format>NTFS</Format>
 <Label>OS</Label>
 <Letter>C</Letter>
 <Order>1</Order>
 <PartitionID>1</PartitionID>
 </ModifyPartition>
 </ModifyPartitions>
 </Disk>
 </DiskConfiguration>
<ImageInstall>
<OSImage>
<InstallTo>
 <DiskID>0</DiskID>
 <PartitionID>1</PartitionID>
 </InstallTo>
 <WillShowUI>Never</WillShowUI>
<InstallFrom>
<MetaData wcm:action="add">
 <Key>/IMAGE/NAME</Key>
 <Value>Windows Server 2008 R2 SERVERDATACENTER</Value>
 </MetaData>
 <Path>\\000.00.90.31\bits\sources\install.wim</Path>
 </InstallFrom>
 </OSImage>
 </ImageInstall>
 </component>
<component name="Microsoft-Windows-International-Core-WinPE" processorArchitecture="amd64"

 publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
<SetupUILanguage>
 <UILanguage>en-US</UILanguage>
 </SetupUILanguage>
 <UserLocale>en-US</UserLocale>
 <UILanguage>en-US</UILanguage>
 <SystemLocale>en-US</SystemLocale>
 </component>
 </settings>
<settings pass="specialize">
<component name="Microsoft-Windows-International-Core" processorArchitecture="amd64"
 publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
 <SystemLocale>en-US</SystemLocale>
 <UILanguage>en-US</UILanguage>
 <UILanguageFallback>en-US</UILanguageFallback>
 <UserLocale>en-US</UserLocale>
 </component>
<component name="Microsoft-Windows-TerminalServices-LocalSessionManager"
 processorArchitecture="amd64" publicKeyToken="nnnf3856ad364nnn"
 language="neutral" versionScope="nonSxS">
 <fDenyTSConnections>false</fDenyTSConnections>
 </component>
<component name="Microsoft-Windows-Deployment" processorArchitecture="amd64"
 publicKeyToken="31bf3856ad364nnn" language="neutral" versionScope="nonSxS">
<RunSynchronous>
<RunSynchronousCommand wcm:action="add">
 <Description>Disable IPv6</Description>
 <Path>reg add HKLM\SYSTEM\CurrentControlSet\Services\tcpip6\Parameters /v DisabledComponents
 /t
  REG_DWORD /d 255 /f</Path>
 <Order>1</Order>
 </RunSynchronousCommand>
<RunSynchronousCommand wcm:action="add">
```

```xml
        <Description>Disable Shutdown Tracker</Description>
        <Path>reg add "HKLM\SOFTWARE\Policies\Microsoft\Windows NT\Reliability" /v ShutdownReasonOn
        /t
         REG_DWORD /d 0 /f</Path>
        <Order>2</Order>
        </RunSynchronousCommand>
        </RunSynchronous>
        </component>
    <component name="Networking-MPSSVC-Svc" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <DomainProfile_EnableFirewall>false</DomainProfile_EnableFirewall>
        <PrivateProfile_EnableFirewall>false</PrivateProfile_EnableFirewall>
        <PublicProfile_EnableFirewall>false</PublicProfile_EnableFirewall>
        </component>
    <component name="Microsoft-Windows-ServerManager-SvrMgrNc" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <DoNotOpenServerManagerAtLogon>true</DoNotOpenServerManagerAtLogon>
        </component>
    <component name="Microsoft-Windows-OutOfBoxExperience" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <DoNotOpenInitialConfigurationTasksAtLogon>true</DoNotOpenInitialConfigurationTasksAtLogon>

        </component>
    <component name="Microsoft-Windows-powercpl" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <PreferredPlan>8c5e7fda-e8bf-4a96-9a85-a6e23a8c635c</PreferredPlan>
        </component>
    <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <ComputerName>*</ComputerName>
        <ProductKey>XXXXX-XXXXX-KQT8W-PMXWJ-XXXXX</ProductKey>
        </component>
        </settings>
    <settings pass="oobeSystem">
    <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="amd64"
    publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
        <Display>
        <ColorDepth>32</ColorDepth>
        <HorizontalResolution>800</HorizontalResolution>
        <VerticalResolution>600</VerticalResolution>
        <RefreshRate>60</RefreshRate>
        </Display>
        <OOBE>
        <HideEULAPage>true</HideEULAPage>
        <HideWirelessSetupInOOBE>true</HideWirelessSetupInOOBE>
        <NetworkLocation>Work</NetworkLocation>
        <ProtectYourPC>3</ProtectYourPC>
        </OOBE>
        <VisualEffects>
        <FontSmoothing>ClearType</FontSmoothing>
        </VisualEffects>
        <WindowsFeatures>
        <ShowInternetExplorer>true</ShowInternetExplorer>
        </WindowsFeatures>
        <TimeZone>Pacific Standard Time</TimeZone>
        <RegisteredOrganization/>
        <ShowWindowsLive>false</ShowWindowsLive>
        <UserAccounts>
        <AdministratorPassword>
        <Value>987654321abc???=</Value>
        <PlainText>false</PlainText>
        </AdministratorPassword>
        </UserAccounts>
        <AutoLogon>
        <Password>
        <Value>123456abc???</Value>
        <PlainText>false</PlainText>
        </Password>
        <Enabled>true</Enabled>
        <LogonCount>1</LogonCount>
        <Username>Administrator</Username>
        </AutoLogon>
        <FirstLogonCommands>
```

```
<SynchronousCommand wcm:action="add">
<CommandLine>cmd /c winrm quickconfig -quiet -transport:HTTP</CommandLine>
<Description>Enable WinRS over HTTP to communicate with CPA</Description>
<Order>1</Order>
<RequiresUserInput>false</RequiresUserInput>
</SynchronousCommand>
<SynchronousCommand wcm:action="add">
<CommandLine>cmd /c winrm set winrm/config/client @{TrustedHosts="*"}</CommandLine>
<Description>Adding trusted hosts value for winrm client</Description>
<Order>2</Order>
<RequiresUserInput>false</RequiresUserInput>
</SynchronousCommand>
<SynchronousCommand wcm:action="add">
<CommandLine>cmd /c net use R: \\000.00.90.31\bits /user:smbuser cisco123</CommandLine>
<Description>Mapping the share to save the notification file</Description>
<Order>3</Order>
<RequiresUserInput>false</RequiresUserInput>
</SynchronousCommand>
<SynchronousCommand wcm:action="add">
<CommandLine>cmd /c ipconfig /all | findstr "Physical" >>
R:\notifications\completed.html</CommandLine>
<Description>Writing the completed notification log with MAC address at
 Share mapped in previous step</Description>
<Order>4</Order>
<RequiresUserInput>false</RequiresUserInput>
</SynchronousCommand>
<SynchronousCommand wcm:action="add">
<CommandLine>cmd /c R:\notifications\completed.bat</CommandLine>
<Description>executing powershell batch file like as wget</Description>
<Order>5</Order>
<RequiresUserInput>false</RequiresUserInput>
</SynchronousCommand>
</FirstLogonCommands>
</component>
</settings>
<settings pass="offlineServicing">
<component name="Microsoft-Windows-LUA-Settings" processorArchitecture="amd64"
 publicKeyToken="nnnf3856ad364nnn" language="neutral" versionScope="nonSxS">
<EnableLUA>false</EnableLUA>
</component>
</settings>
<cpi:offlineImage cpi:source="wim:D:/win2k8r2x64sp1/sources/install.wim#Windows
 Server 2008 R2 SERVERDATACENTER"/>
</unattend>
```

Ports

This appendix contains the following sections:

Cisco UCS Director TCP and UDP Port Usage

This section provides a list of the TCP and UDP ports that Cisco UCS Director uses for connections and communications with external applications or devices.

The following figure shows the network ports used for communication between the Cisco UCS Director appliance and managed devices, ESX servers, Baremetal Agent, PowerShell Agent, NTP, and Active Directory.

Figure 5: Cisco UCS Director TCP and UDP Port Usage
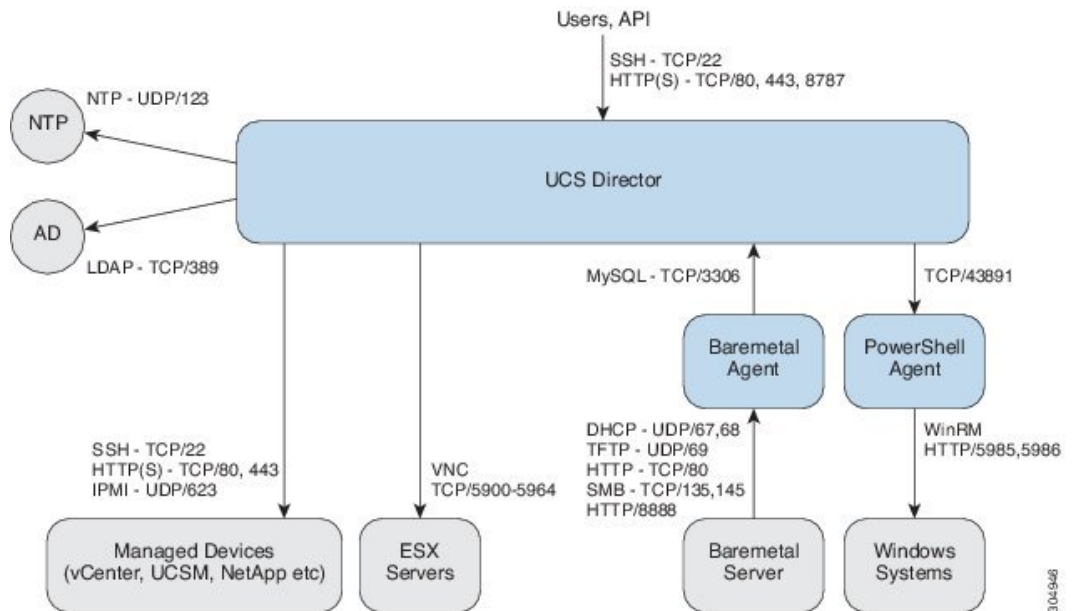
Port List

Default Port	Protocol	Description
22	TCP	SSH
80	TCP/UDP	HTTP
8888	TCP	HTTP for Cisco UCS Director Baremetal Agent
443	UDP	HTTPS
27000/7279/8082 (Mgmt)	TCP	Citrix licensing
2598/1494/2112/2513	TCP	Virtual Desktop Agent for Desktops
67/68	UDP	DHCP
389/636 3268/3269	TCP/UDP TCP	Active Directory
53	TCP/UDP	DNS
123	TCP/UDP	NTP
3306	TCP/UDP	MySQL
8787/5999	TCP	Cisco UCS Director + VNC Connectivity
3389	TCP/UDP	Cisco UCS Director + RDP Connectivity
80/443/8080	TCP/UDP	Cisco UCS Director + NetApp Connectivity
80/443	UDP	Cisco UCS Director + Cisco UCS Manager Connectivity
80/443	UDP	Cisco UCS Director + vCenter Connectivity
3389	TCP/UDP	RDP
135/445	TCP	SMB/RPC
88	TCP/UDP	Kerberos
137	TCP/UDP	NetBIOS Name (nbname)
138	TCP/UDP	NetBIOS datagram (nbdatagram)
139	TCP	NetBIOS session (nbsession)

Default Port	Protocol	Description
80/443	UDP	Desktop Delivery Controller <--> vCenter
8080 through ICA	TCP	Desktop Delivery Controller <--> Virtual Desktops
1494/2598/2512/2513	TCP	Users (Citrix Recvr) <--> Virtual Desktops
389/636 (LDAP Ports)	TCP/UDP	Desktop Delivery Controller <--> Active Directory
389/636, 3268/3269, 53	TCP/UDP	Virtual Desktops <--> Active Directory + DNS
5985/5986	TCP	PowerShell Agent <-> Xendesktop through WinRM
43891	TCP/UDP	Cisco UCS Director <--> PowerShell Agent
80/8081	TCP	XenApp