

Tivoli Provisioning Manager for OS Deployment 7.1.1

Product overview



In this module, you will learn about the Tivoli® Provisioning Manager for OS Deployment product features, the available product versions and packaging, and the installation and upgrade procedures. You will also learn about the architecture and each product component.

Benefits of using the product

- Tivoli Provisioning Manager for OS Deployment
- Manages computers booting through the PXE protocol
- Displays each computer with detailed information that can be customized
- Has options that you can use to create and customize
 - Clone profiles of a prepared computer or clone profiles from reference image files
 - Unattended profiles of any MSDN or Unix CD/DVD
 - Deployment CD/DVD/USB key for a PXE-free OS installation
 - Software packages from the most common installers
 - Software packages from driver files
 - Hardware configuration tasks, such as disk configuration
- Provides a fully installed computer

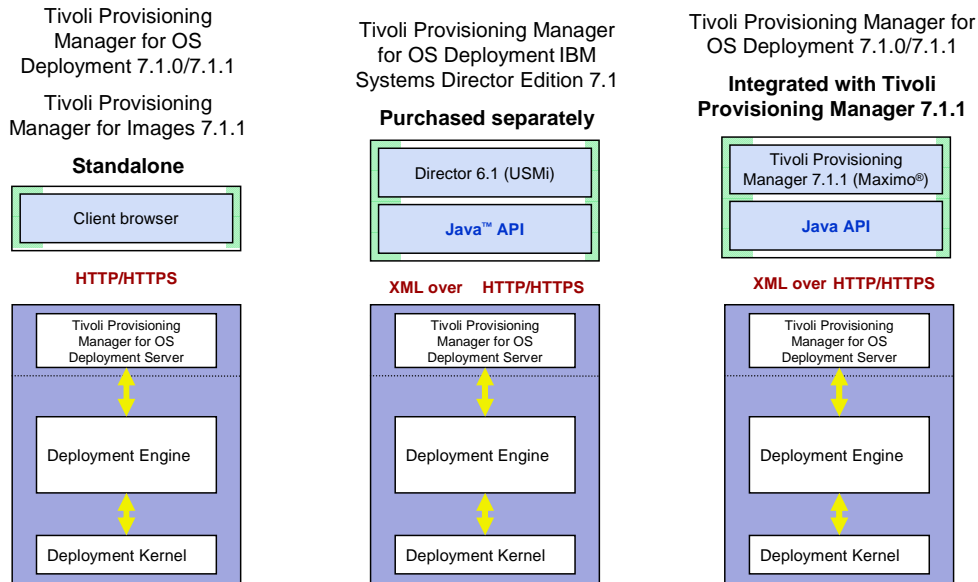
Manual operating system deployment is a time-consuming and error-prone task when it involves hundreds of computers on different operating systems across multiple sites. IBM Tivoli Provisioning Manager for OS Deployment offers a central solution to remotely manage the image deployment of different operating systems. You can deliver fully installed computers without performing any manual operation on the target systems. By means of the preboot execution environment (PXE) protocol, the target computer connects to the Tivoli Provisioning Manager for OS Deployment boot server and starts the scheduled deployment of an operating system profile that was previously created and customized on the boot server. The image provisioning does not require any installed software on the target computer because PXE is used by Tivoli Provisioning Manager for OS Deployment to download the Tivoli Provisioning Manager for OS Deployment kernel that is needed to boot the computer and undertake the actions to deploy an operating system. In summary, the target computer PXE boots (network boots) into the boot server and registers so that you can customize it through the product WEBUI. Then, you can deploy that target with a system profile previously created and customized by the WEBUI. A system profile can be: a cloning image, which is a build from a prepared computer that is already installed or from a reference image file (for example, a Windows® Imaging Format file); an unattended setup created from a Windows or Unix OS image (for example, a CD/DVD image). During the deployment you can also install drivers and various software packages for the different supported platforms or even perform preinstallation tasks, like the RAID disk configuration or the BIOS update.

Target operating systems

- You can create, customize, and deploy the following operating system images:
 - Windows cloning and unattended setup
 - AIX® unattended setup
 - Linux® cloning and unattended setup (Linux cloning is not supported on Linux PPC and Cell Blades)
 - Solaris unattended setup
 - VMWare ESX unattended setup

You can use Tivoli Provisioning Manager for OS Deployment to create, customize, and deploy various operating systems on target machines. You can deploy Windows clone and unattended setup images. You can perform an AIX unattended setup. You can perform Linux cloning and unattended setup. However, Linux cloning is not supported on Linux PPC and Cell Blades. You can also perform a Solaris or VMWare ESX unattended setup.

Product offerings



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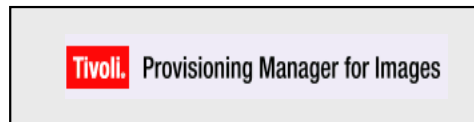
Product overview

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Tivoli Provisioning Manager for OS Deployment can be a standalone package, as shown in the left picture. It can also be a separate product for IBM Systems Director, as shown in the center picture, or as a part of the Tivoli Provisioning Manager 7.1.0 packaging. In this module, you will focus on the standalone package. Notice that, as a standalone product, Tivoli Provisioning Manager for Images 7.1.1 provides the same functions as Tivoli Provisioning Manager for OS Deployment 7.1.1 plus the virtualization support.

Tivoli Provisioning Manager for Images 7.1.1

- Provides all the functions of Tivoli Provisioning Manager for OS Deployment 7.1.1 plus virtualization support
 - Image discovery
 - OVF export and import
 - Offline and online image capture



Tivoli Provisioning Manager for Images 7.1.1 provides you the features to work with hypervisors to: Discover virtual machines (guests); Export virtual disk images in Open Virtualization Format; Capture a virtual machine image; Deploy a virtual image on the guest machine. To work with hypervisors, you use the additional entry **Image Monitor** in the **Advanced features** menu inside the product WEBUI.

Trial version

- You can download a trial version from this Web site:
<http://www.ibm.com/software/tivoli/products/prov-mgr-os-deploy/>
 - The package contains all binaries for different platforms; download size is approximately 300 MB
 - The version works for 60 days and contains the full documentation
 - You can migrate from the trial version to the full version

If you want to try version 7.1.0, you can download a trial version from the URL shown on the slide. This trial version is valid for 60 days. If you buy the full version, you can migrate from the trial version to the licensed one.

New features in version 7.1.1

- Image deployment
 - New imaging method
 - SLES 11
 - USB or CD deployment
- Virtualization available with Tivoli Provisioning Manager for Images
 - Image discovery
 - OVF export and import
 - Offline and online image capture
- Web console
 - Software binding view
 - Welcome screen
 - Partitioning UI editor
- Automatic download of IBM drivers
- FIPS compliance

In this slide, you see the differences between Tivoli Provisioning Manager for OS Deployment versions 7.1.0 and 7.1.1. For the image deployment, the most important change in 7.1.1 is the introduction of WinPE/MCP as the deployment layers for Windows (XP, 2000, 2003) and Linux. With version 7.1.1, you can also use a USB pen as a media for the deployment or PXE-boot emulation. In the WEBUI, a welcome window is now available for you to verify whether all the product prerequisites are satisfied. For example, you might see if the WinPE software module required for the Windows deployments has been built. If not, you can fix the problem. The 7.1.1 version also introduces the virtualization support through the Tivoli Provisioning Manager for Images product packaging. Finally, in 7.1.1, you can set up the product to download automatically all the available IBM drivers during the deployment. The FIPS encryption compliance is also ensured.

Documentation

- Tivoli Provisioning Manager for OS Deployment 7.1.1 Installation Guide

Provides information about the supported platform for the server, the supported databases, and the supported target (hosts and OS) to deploy. Has recommendations and tips about environment, including network and DHCP

- Tivoli Provisioning Manager for OS Deployment 7.1.1 Quick Start Guide

Provides a review of the installation steps and references to the chapters in the documentation

Here you can see the main Tivoli Provisioning Manager for OS Deployment installation documents that are officially available on the IBM Information Center. You can use the installation guide to locate the supported platforms for the deployment, the steps for the product installation on the various supported operating systems, and the DHCP settings with some examples. Notice that you can also refer to the updated support platform matrix for the recent platforms certifications. For the installation, there is also a quick start guide.

Quick start guide

1 Step 1: Access your software and documentation



If you download your product from Passport Advantage®, follow the instructions in the download document available at <http://www.ibm.com/support/docview.wss?rs=3176&uid=swg24020415>

This product offering includes:

- A product CD-ROM
- A documentation CD-ROM

For complete documentation, including installation instructions, see the Tivoli Provisioning Manager for OS Deployment documentation at <http://publib.boulder.ibm.com/infocenter/tivihelp/v3r1/topic/com.ibm.tivoli.tpm.doc/welcome/osdhome.htm>

2 Step 2: Evaluate your hardware and system configuration



See the detailed system requirements at <http://www.ibm.com/support/docview.wss?rs=3176&uid=swg24020416> and ensure that your systems meet these requirements before installing the product.

3 Step 3: Review the base architecture and the installation steps



4 Step 4: Install Tivoli Provisioning Manager for OS Deployment



To install Tivoli Provisioning Manager for OS Deployment, follow the instructions provided in the Tivoli Provisioning Manager for OS Deployment 7.1 Installation Guide.

Instructions for installing on Windows are provided in Chapter 2.

Instructions for installing on UNIX and Linux are provided in Chapter 3.

5 Step 5: Configure the DHCP server



To configure your DHCP server to enable your hosts to boot on the Tivoli Provisioning Manager for OS Deployment server, follow the instructions provided in Chapter 4 of the Tivoli Provisioning Manager for OS Deployment 7.1 Installation Guide.

Here is a screenshot from the Quick Start Guide, which provides the main steps for setting up a working Tivoli Provisioning Manager for OS Deployment environment.

Installing the product

- Windows installation
 - Log on as an Administrator
 - Locate and double-click the package .exe file
 - Use an MDAC component of Microsoft® Access as the default database
 - Install a 64-bit database driver MSSQL 2005 before you install the package
- UNIX installation
 - Locate the .tar file
 - Execute the setup
 - Install a database before running the installer. The default setup has a Derby database

For the installation on Windows, you need to take the correct product packaging, based on the operating system platform (32-bit or 64-bit). Log on to the system as the Administrator, click the executable, and follow the installation wizard. By default, the product installs an Access database as a RDBMS repository. If you want to use a different RDBMS, follow the specific instructions in the product installation guide, where you can find information about setting up the RDBMS repository and creating the required ODBC data source before running the Tivoli Provisioning Manager for OS Deployment MSI setup. Notice that, if you plan to install the product on a Windows 64-bit OS, you need a 64-bit database driver. For the installation on Unix, you need to take the package .tar file, unpack it, and run the setup. By default, the installation on Unix uses a Derby database unless you install a different RDBMS and perform additional settings before running the product installer. These settings are listed in the installation guide.

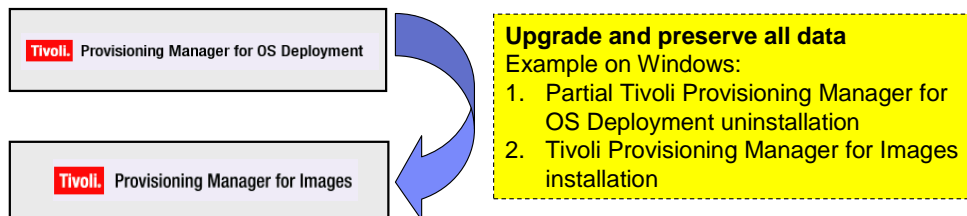
Upgrading the product

- Windows upgrade
 - Perform a partial uninstallation by clicking **Control Panel > Add/Remove Programs > Remove**
 - Install the new version; all data is preserved
- Unix upgrade
 - Unpack the tar file on the existing installation
 - Install the new version; all data is preserved

An upgrade on Windows is a partial un-installation of a previous product version. To perform the upgrade, you use the Add/Remove Windows panel without removing manually any Tivoli Provisioning Manager for OS Deployment folder and files. Then, you install the new version. All objects created with the previous version are preserved. An upgrade on Unix consists only in unpacking the new .tar file on top of the existing installation. All previous data are preserved.

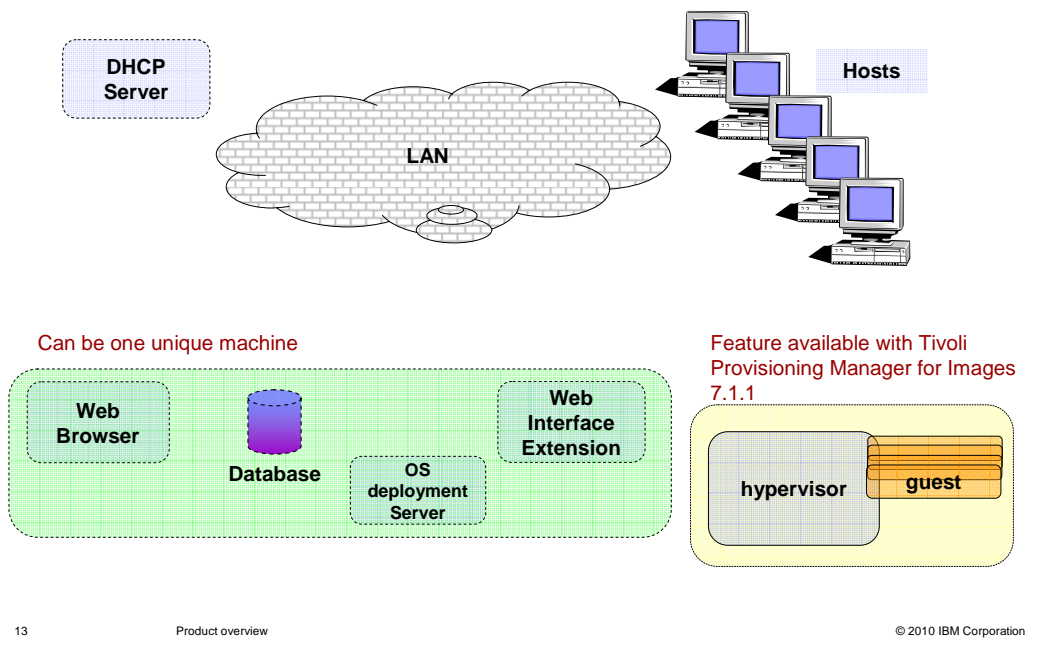
Migrating from Tivoli Provisioning Manager for OS Deployment to Tivoli Provisioning Manager for Images

- Tivoli Provisioning Manager for Images can be installed as a Tivoli Provisioning Manager for OS Deployment upgrade
- Tivoli Provisioning Manager for Images installation and upgrade is the same as for Tivoli Provisioning Manager for OS Deployment



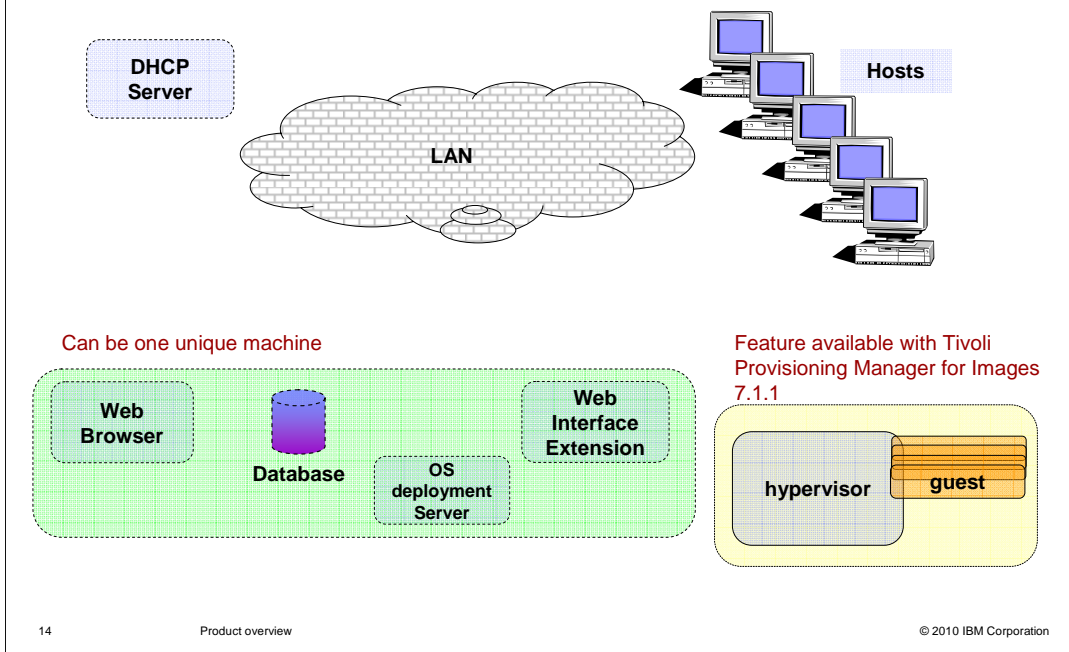
If you installed Tivoli Provisioning Manager for OS Deployment 7.1.1 and you want to use the new virtualization features provided by Tivoli Provisioning Manager for Images 7.1.1, you can migrate from Tivoli Provisioning Manager for OS Deployment to Tivoli Provisioning Manager for Images. As an example, on Windows, you have to partially uninstall the product using the Add/Remove panel and then install Tivoli Provisioning Manager for Images.

Product architecture overview (1 of 2)



The Tivoli Provisioning Manager for OS Deployment architecture is composed of the following nodes: a DHCP server that works as a PXE client; a Tivoli Provisioning Manager for OS Deployment server that can be installed on the same machine as the DHCP or on another machine. This server acts as the PXE server; a database, which, by default, is Microsoft Access on Windows and Apache Derby on Unix, embedded into the installation. This database can also be any other supported database vendor (RDBMS); A Web interface extension that is installed on the Tivoli Provisioning Manager for OS Deployment server and, if needed, can be installed also on separate machines for administration purposes; a browser installed on the same machine as the Web interface extension to enable the WEBUI to be opened. All the product components can be installed on one machine. Hypervisors can only be handled by installing Tivoli Provisioning Manager for Images 7.1.1.

Product architecture overview (2 of 2)



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Product overview

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A typical host **network-boot sequence** goes through the following phases. *Starting up:* A user or a wake-up event starts the remote-boot computer. *Network boot:* The BIOS configuration (boot order), a hot key (for example, F12) or the wake-up event instructs the computer to boot on the network. *IP address discovery:* The remote-boot target broadcasts a DHCP request for an IP address. Any DHCP server that knows the target (that is, recognizes its hardware address) or which has a pool of freely distributable dynamic addresses, sends an IP address. The target takes the first answer and confirms it to the server. In addition to the IP address, the server gives some other network parameters to the target and information about the boot procedure to follow. *OS deployment server discovery:* In the case of PXE remote-boot, the target computer then proceeds to the discovery of the OS deployment server. The OS deployment server is responsible for delivering a network boot program to the target. It is not necessarily the same computer as the DHCP server. The target responds to the first OS deployment server, which replies and downloads a small program using a simple multicast protocol (MTFTP). *Server connection:* If the network boot program is the deployment engine, it establishes a secure (encrypted) connection to the OS deployment server and receives instructions from the server to determine the name of the program to run. *Pre-OS configuration:* The deployment engine then downloads from the file server everything required by the OS configuration specified by the system administrator. These file transfers are done using a secure, robust, and efficient unicast or multicast protocol. Many actions can be performed at this stage: installing an operating system from scratch, repairing a corrupted operating system, or performing an inventory. *OS booting:* When instructed by the OS configuration, the deployment engine removes itself from memory. The computer starts the operating system as if the target is booting from the hard disk. This process ensures full compatibility with the installed operating system.

Product components

- Tivoli Provisioning Manager for OS Deployment uses the following components to provision computers
 - Server-side components
 - Console component
 - Client-side applications
 - A configured Dynamic Host Configuration Protocol (DHCP) server

Tivoli Provisioning Manager for OS Deployment uses the following components to install the operating systems and to perform the additional operations on the target computers: two server-side components; a console component; two client-side applications; a configured Dynamic Host Configuration Protocol (DHCP) server.

Server-side components

- OS deployment server (or boot server)
 - Represented by the process rembo.exe on Windows and rembo on UNIX

- A database
 - Accessed through the standard JDBC interface by the Tivoli Provisioning Manager for OS Deployment TCP-to-ODBC/JDBC gateway service



Database

The server-side components are: The OS deployment server (or boot server), that is represented by the process rembo.exe on Windows and rembo on UNIX. The server provides the PXE remote-boot capability and manages the images and their deployment. A database that is accessed through the standard JDBC interface by the Tivoli Provisioning Manager for OS Deployment TCP-to-ODBC/JDBC gateway service. This database is represented by the process dbgw.exe on Windows and dbgw on UNIX. The database stores the Bill of Material (BOM) for every registered target and the information about profiles, software modules and bindings.

Console component

- The console component is provided by the Web Interface Extension service
 - A rbagent.exe process on Windows and rbagent.<platform> on UNIX
 - An installation on the Tivoli Provisioning Manager for OS Deployment boot server and on any supported system where it is required for administration

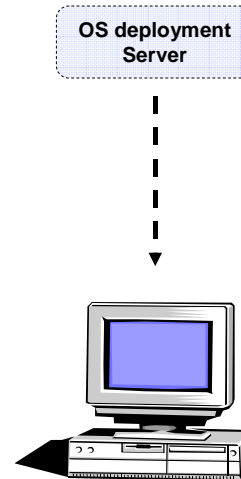


**Web Interface
Extension**

The console component is provided by the Web Interface Extension service and is represented by the rbagent.exe process on Windows and rbagent.<platform> on UNIX. For example, for the Linux platform, it is the rbagent.linux process. This component is installed on the Tivoli Provisioning Manager for OS Deployment boot server and on any supported system where this component is required for administration purposes.

Client-side applications

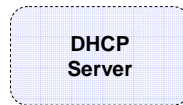
- The client-side applications include two standalone management platforms embedded in the boot server and sent to the target systems during the PXE boot
 - The deployment engine
 - The Web Interface Extension



The client-side applications include two standalone management platforms that do not require an operating system and are embedded in the boot server. These applications are sent to the target systems during the PXE boot or by way of media, such as a CD-ROM, a diskette, or hard disk partition. The deployment engine is a mini operating system that is needed for all provisioning tasks. These tasks might include installing a Windows or UNIX operating system, partitioning and formatting disks, and accessing and modifying Windows registries. The engine is downloaded automatically by the boot server to the target using a simple multicast protocol (MTFTP) when the target system PXE boots into the provisioning server by the DHCP configuration. The Web Interface Extension can be run either as a service or as a command-line tool (**rbagent.exe** on Windows and **rbagent.<platform>** on UNIX). For example, on Windows, it can be used to access the system information published by drivers using the Windows Management Interface (WMI). On Intel-based operating systems, it can start the deployment engine in offline mode.

DHCP server

- A correctly configured **DHCP server** is required to boot correctly the target systems by way of PXE into the Tivoli Provisioning for OS Deployment boot server.



You must configure basic DHCP options (43 and 60)

You must configure additional, advanced options for some platforms

To use Tivoli Provisioning Manager for OS Deployment, you must configure a DHCP server. To support PXE clients on a network, the DHCP server needs to be configured with options 60 and 43. Other options are also required to provision operating systems on specific architectures and for Linux deployment. These options are described later in this module. You cannot run two PXE servers on the same computer, so if you have another PXE boot tool, such as Microsoft Automated Deployment Services (ADS), you have to disable it before installing Tivoli Provisioning Manager for OS Deployment.

DHCP server options 60 and 43

- To support PXE clients on a network, the DHCP server must be configured
 - Option 60 (class identifier) set to PXEClient
 - Option 43 for the precise location of the PXE server
- The option or options that you set depend on the specific situation. An example is a DHCP server on the same machine as the Tivoli Provisioning Manager for OS Deployment boot server or on a separate machine

Option 60 is needed to inform the targets that the location of the PXE server is known. Option 43 is required to indicate that the PXE server is not on the same computer as the DHCP server. Option 43 also has the precise location of the PXE server. The option or options you set depends on the specific situation. In general, if the DHCP server and the OS deployment server are on different machines, and they have the location of the PXE server, you must set both option 60 and 43. If the two options are already set, you can remove and redefine them. If the DHCP server and OS deployment server are on the same target, only option 60 is necessary. If option 43 is set, you have to remove it.

DHCP server options

- Options 66 and 67
 - Needed if you deploy SUN and PowerPC® targets and do not want to use the RARP/bootparams method to network boot them
- Options 1, 6, and 15
 - Needed if you deploy Linux profiles and take Linux clone profiles
 - Option 1: Subnet mask value
 - Option 6: IP address of the domain name server (DNS)
 - Option 15: Non-empty string indicating the domain name

As mentioned before, there are other options required to provision operating systems on specific architectures. These options include 66 and 67 for SUN and PowerPC targets, and options 1, 6, and 15 to deploy Linux systems and to create a Linux clone profile. If you plan to deploy SUN and PowerPC targets through Tivoli Provisioning Manager for OS Deployment, and you do not want to use the RARP/bootparams method to network boot them, you can use the DHCP server by setting options 66 and 67. The advantage of using DHCP is that you can work with boot servers in different subnets. If you are deploying Linux profiles and take Linux clone profiles, you have to set the following additional DHCP options: Option 1 (also known as subnet-mask under the ISC DHCP server) must be set to the subnet mask value; Option 6 (also known as domain-name-servers under the ISC DHCP server) must be set to the IP address of the domain name server (DNS); Option 15 (also known as domain-name under the ISC DHCP server) must be set to a non-empty string indicating the domain name.

Requirements for target systems

- On the target system:
- The boot order in the BIOS with the network boot first for deployments through PXE
- At least one of the following items defined
 - Universal Unique Identifier (UUID) as a property of the server object called `computer.uuid`
 - Serial number as a property of the server object `computer` called `computer.serialNumber`
 - A network interface card (NIC) that is PXE-enabled
- The minimum hardware requirements to install the operating system

To deploy a target system through Tivoli Provisioning Manager for OS Deployment, the system must meet the following requirements. Has the boot order configured in the BIOS so that the network boot occurs first. Has at least one of the following items defined: UUID (Universal Unique Identifier), which is a property of the server object called: `computer.uuid`; serial number, which is a property of the server object `computer` called `computer.serialNumber`; a NIC (network interface card) that is PXE-enabled and capable of booting from the network during computer's startup sequence. If the network card does not have the PXE boot ROM chip capability, you can emulate PXE on the target through media such as a network boot CD-ROM or USB key. Also, the target system must meet the minimum hardware requirements to install the specific operating system.

Multicast protocol support

- Activated by default
- Activated and deactivated at the OS Deployment server level or separately for a host or a deployment scheme



Routers can stop multicast according to the policies defined by the IT team of the client

- The server discovers the parameters of each subnet host
- These options are displayed in the panel **OS Deployment > Target Monitor** by selecting the requested subnet node in the left navigation tree

The multicast feature is enabled by default on the Tivoli Provisioning Manager for OS Deployment server. Multicast is detected because the first machine communicates with the Tivoli Provisioning Manager for OS Deployment server. If this machine manages the multicast properly, the related subnet is recorded as a subnet with multicast. If this machine cannot handle multicast packets, this related subnet is recorded as a subnet without multicast. In other words, the first machine that does a PXE boot determines if the whole subnet that it belongs to will use multicast. However, you can disable or enable multicast on the boot server by using the product WEBUI. You can either disable or enable multicast for the whole server (for all the targets) through the **Server parameters > Server configuration** panel. Or, for a specific target, you can select the **Disable multicast** option in the target details. If you have switches, you must configure multicast to work in multicast mode in Auto-Negotiate mode and must not block the multicast packets. If you cannot work in multicast mode, the first machine that booted might not be able to work in multicast, and the next machines work in unicast also. At any time, you can force the redetection of multicast for each specific subnet by selecting the OS Deployment > Target monitor panel and then PXE booting a machine in that subnet.

Multicast settings

Server parameters > Server configuration

File access module

Base directory for OS deployment server files: C:\TPMOS Files

Relative directory for the shared repository: shared

Disable multicast across subnets: **Yes**

First multicast IP address used for MCAST transfers: 239.2.0.1:10000

Number of multicast addresses to use for MCAST transfers: 256

Maximum number of PCast connexions: 8

Port for FILE requests: 4013

Disable the TCP module: No

Limit for shared idx in memory: 64

OS Deployment > Target Monitor

Folders	target / IP	mac address	serial	model
targets	192.168.104	00:0E:0C:22:AE:9A		2008-10
by Administrative group	b441	00:0E:0C:22:A7:06		15:32:4
Default	BT42	00:0E:0C:5D:E9:2E		2008-10
naz	BT44	00:0E:0C:22:AB:14		15:19:3
OS deployment servers	BT47	00:07:E9:19:9B:23		2008-10
by Custom Lists				
by Subnet				
127.0.0.0				
192.168.0.0				
192.168.101.0				
192.168.102.0				
192.168.104.0				
192.168.209.0				

The OS deployment server has detected the following settings for subnet 192.168.104.0:

TTL to OS deployment server: 1

multicast support: **enabled for local subnets (MCAST multicast disabled)**

Directed broadcast support: **auto-probe**

Force redetection of subnet settings

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Product overview

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You can enable or disable the multicast support on the Tivoli Provisioning Manager for OS Deployment server through the product WEBUI by setting the option **Disable multicast across subnet** to **Yes/No** in the File access module section of the **Server parameters > Server Configuration** page. This selection is shown in the screenshot at the top part of this slide. If a host does not use the multicast for the deployment, you can try the “Force redetection of subnet settings” through the **OS Deployment > Target Monitor** page that lists the hosts by subnet. This selection is shown in the screenshot at the bottom of the slide. The steps are: a) Shut down the target machine. b) On the server console, go to **OS Deployment > Target monitor > targets > By Subnet**. Then select the subnet for that target machine and click **Force redetection of subnet settings**. c) Net boot (PXE boot) a target machine in the specific subnet. d) Verify the multicast support value for the subnet has been changed from **auto-probe** to **enabled**.

Summary

In this module, you learned about:

- Benefits of using the product
- Tivoli Provisioning Manager for OS Deployment offerings
- Product installation and upgrade
- Architecture overview
- Product components
- Multicast support

In this module, you learned about: benefits of using the product; Tivoli Provisioning Manager for OS Deployment offerings; product installation and upgrade; architecture overview; product components; Multicast support.

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