

Preboot Services



The following sections provide information on Novell® ZENworks® Linux Management Preboot Services features and procedures:

- [Chapter 21, “Preboot Services Overview,” on page 211](#)
- [Chapter 22, “Understanding Preboot Services in ZENworks Linux Management,” on page 215](#)
- [Chapter 23, “Setting Up Preboot Services,” on page 239](#)
- [Chapter 24, “Using Preboot Services,” on page 285](#)

Preboot Services Overview

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Novell® ZENworks® Linux Management Preboot Services contains functionality that allows you to perform tasks on devices before their operating systems boot. Currently for ZENworks Linux Management, “devices” are servers and workstations.

The following sections provide an overview of Preboot Services:

- [Section 21.1, “Preboot Services Functionality,” on page 211](#)
- [Section 21.2, “Preboot Services Strategies,” on page 211](#)
- [Section 21.3, “Preboot Bundles,” on page 212](#)
- [Section 21.4, “Configuring Preboot Services,” on page 212](#)
- [Section 21.5, “Setting Up Devices to Use Preboot Bundles,” on page 213](#)

21.1 Preboot Services Functionality

Preboot Services allows you to automatically or manually do any of the following to a Linux device when it boots:

- Run AutoYaST and kickstart installations
- Run ZENworks scripts on the device
- Make an image of the device’s hard drives
- Restore an image to the device
- Apply an existing image to multiple devices

To accomplish these tasks automatically using the ZENworks Control Center, you simply need to have PXE (Preboot Execution Environment) enabled on your devices, and have preboot bundles configured and assigned to the devices. Then, the devices can automatically execute these bundles when they boot.

You can also execute some Preboot tasks on devices using CDs, DVDs, or a ZENworks partition, rather than using PXE.

21.2 Preboot Services Strategies

The following are some ways you can use Preboot Services:

- **Automate Linux installations.** You can automate kickstart or AutoYaST installations.
- **Create and restore base images.** You can create base images from existing devices, as well as restoring images to any manageable device.
- **Restore devices to a clean state.** You can quickly and efficiently reset devices to an initial state, such as in a lab.
- **Set up devices for future reimaging.** You can set up devices so that the next time they reboot, they do the imaging work that is contained in their assigned bundle.
- **Multicast images.** You can apply an image of one device to many other devices. This is an excellent feature for initially setting up a lab.

21.3 Preboot Bundles

In the ZENworks Control Center, Preboot Services tasks are contained in Preboot bundles. The following five Preboot bundle types are available:

- **AutoYaST bundle:** Describes the location and access protocol of an AutoYaST response file and network installation directory for SUSE® Linux. This bundle allows you to launch an AutoYaST automated installation of SUSE Linux using Preboot Services. This is only available for Linux devices that are PXE-enabled.
- **Kickstart bundle:** Describes the location and access protocol for a kickstart response file. This bundle allows you to launch an automated kickstart installation of Red Hat Linux using Preboot Services. This is only available for Linux devices that are PXE-enabled.
- **ZENworks Image bundle:** Lists one or more ZENworks images (base plus add-ons) that can be restored on a device. This bundle allows you to define simple imaging operations.
- **ZENworks Multicast bundle:** Specifies an image that can be sent using the multicast protocol. This bundle allows you to send an image to a large number of devices in a single operation, thus minimizing network traffic. It is ideal for labs, classrooms, and staging areas.
- **ZENworks Script bundle:** Allows you to write a custom Linux bash script. This provides detailed control over ZENworks imaging operations, as well as most Linux-based preboot tasks.

To create one of these bundles, in the ZENworks Control Center interface, click *Bundles > New > Bundle > Preboot bundle > Next*, then select a bundle type. For more information, see [Chapter 24, “Using Preboot Services,”](#) on page 285.

21.4 Configuring Preboot Services

In the ZENworks Control Center, you can set up default Preboot Services configurations for all of your devices. Some settings can be overridden at the device, group, or folder level.

You can configure the following settings per [ZENworks Management Zone](#):

- **Preboot Menu options:** The Preboot Menu contains five options: 1) *Start ZENworks imaging* (automatically executes the bundle); 2) *Start ZENworks imaging maintenance* (accesses the bash prompt); 3) *Disable ZENworks partition*; 4) *Enable ZENworks partition*; and, 5) *Exit* (resumes booting). You can configure whether the Preboot Menu is displayed upon booting, not displayed, or allowed to be displayed only when Ctrl+Alt is pressed during booting.
- **Image storage security:** You can restrict where to save image files on the imaging server.
- **Non-registered device settings:** You can use Preboot Services to automatically name your non-registered devices using such criteria as prefixes, BIOS information (like asset tags or serial numbers), DNS suffixes, and you can set up DHCP or IP addresses.
- **Preboot work assignment rules:** Work assignment rules are used to determine which bundle should be applied to which device. The work rules use logic to determine whether a device meets the requirements for applying the Preboot bundle. A rule is comprised of filters that are used to determine whether a device complies with the rule. The AND and OR logical operators are used for creating complex filters for the rule.
- **Preboot referral lists:** When a device boots, it is necessary for it to find its home ZENworks Management Zone to get its assigned preboot work. If multiple management zones exist on the network, referral lists provide a method for allowing a managed device to find its home zone.

- **Intel Active Management Technology (AMT):** Intel* AMT provides Preboot Services with persistent device identification.

To configure these settings, click *Configuration > Preboot Services*. For more information, see [Section 23.4, “Configuring Preboot Services Defaults,” on page 260](#).

21.5 Setting Up Devices to Use Preboot Bundles

In order for a device to automatically use a Preboot bundle, there are 2 steps: 1) assign a Preboot bundle to the device, its parent folder, or its group; and 2) set up the device to apply the bundle.

Preboot Services utilizes PXE and other boot mechanisms and media to trigger the preboot work.

The following paths represent many of the methods for accessing the Add button to assign bundles to devices, or devices to bundles:

- Click *Devices*, select the box next to *Name*, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the *Servers* and *Workstations* folders.
- Click *Devices*, select the box next to *Servers*, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the *Servers* folder.
- Click *Devices*, select the box next to *Workstations*, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the *Workstations* folder.
- Click *Devices > Servers*, select the box next to *Status Name*, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the *Servers* folder.
- Click *Devices > Servers*, select the box next to one or more servers, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the selected *Servers* and *Workstations* folders.
- Click *Devices > Workstations*, select the box next to *Status Name*, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the *Workstations* folder.
- Click *Devices > Workstations*, select the box next to one or more workstations, then click *Action > Assign bundle*.
Assigns bundles to all of the devices in the selected *Workstations* folder.
- Click *Devices > Servers*, select a server, then click *Advanced (in Effective Bundles)*.
Assigns bundles to the selected server.
- Click *Devices > Workstations*, select a workstation, then click *Advanced (in Effective Bundles)*.
Assigns bundles to the selected workstation.
- Click *Bundles*, select the box next to *Status Name*, then click *Action > Assign bundle*.
Assigns all bundles to the devices that you select in the wizard.
- Click *Bundles*, select the box next to one or more bundle names, then click *Action > Assign bundle*.
Assigns the selected bundles to the devices that you select in the wizard.

For more information, see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#).

Understanding Preboot Services in ZENworks Linux Management

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This section provides an understanding of Novell® ZENworks® Linux Management Preboot Services and how you can use it in your Linux network:

- [Section 22.1, “How Do You Implement Preboot Services?,” on page 215](#)
- [Section 22.2, “What Is the Preboot Execution Environment \(PXE\)?,” on page 215](#)
- [Section 22.3, “Preboot Services Functionality,” on page 217](#)
- [Section 22.4, “The Preboot Services Processes,” on page 224](#)
- [Section 22.5, “Preboot Strategies,” on page 232](#)

22.1 How Do You Implement Preboot Services?

Preboot Services utilizes any of the following to make its functions possible:

- **PXE (Preboot Execution Environment):** An Intel specification that allows a device to boot from the network, instead of its hard drive or other local media. ZENworks Linux Management can use PXE to launch Preboot Services.
- **Preboot Services bootable CD or DVD:** Used where PXE is not installed or where you want to manually perform a Preboot Services operation.
- **Preboot Services bootable diskette:** Enables using the Preboot Services bootable CD or DVD when the device doesn't support booting from a CD or DVD.
- **ZENworks partition:** Enables you to set up a device for unattended imaging operations where the device is not PXE enabled or does not have access to PXE network services.

22.2 What Is the Preboot Execution Environment (PXE)?

The following sections provide information on using PXE in Linux Management:

- [Section 22.2.1, “Understanding How Preboot Services Uses PXE,” on page 215](#)
- [Section 22.2.2, “Understanding the ZENworks NBPs,” on page 216](#)
- [Section 22.2.3, “Setting Up to Use PXE,” on page 217](#)

22.2.1 Understanding How Preboot Services Uses PXE

PXE uses DHCP (Dynamic Host Configuration Protocol) and TFTP (Trivial File Transfer Protocol) to locate and load bootstrap programs from the network. The PXE environment is loaded from the BIOS on the NIC.

In ZENworks Linux Management, Preboot Services uses PXE to discover if there is Preboot Services work specified for a device and to provide the device with the files necessary to execute the assigned work.

Using Preboot Services, you can automatically place an image on a device, even if the device's hard disk is blank. You do not need to use the CD or DVD, or a ZENworks partition on the device.

22.2.2 Understanding the ZENworks NBPs

The Intel PXE specification defines mechanisms and protocols that allow PXE devices to use their network interface cards (NICs) to find bootstrap programs located on network servers. In the PXE specification, these programs are called Network Bootstrap Programs (NBPs).

NBPs are analogous to the bootstrap programs found in the Master Boot Records (MBRs) of other boot media, such as hard drives, floppy disks, CDs, and DVDs. The purpose of a bootstrap program is to find and load a bootable operating system. MBRs on traditional boot media accomplish this by locating the necessary data on their respective media. NBPs accomplish this by using files found on network servers, usually TFTP servers.

ZENworks Preboot Services uses two separate NBPs working in concert:

- “`nvlnbp.sys`” on page 216
- “`pxelinux.0`” on page 216

nvlnbp.sys

This NBP has the following responsibilities:

- Detect various SMBIOS parameters and local hardware
- Read the ZENworks identity information from the hard drives
- Communicate with `novell-zmgprebootpolicy` to determine if there is any preboot work applicable to the device
- Present and manage the Preboot Services menu
- If necessary, launch `pxelinux.0` to execute the assigned preboot work

pxelinux.0

The primary purpose of this NBP is to load the operating system that is required to execute the assigned preboot work.

The `pxelinux.0` file is a modified version of part of an open-source project called `syslinux`. While `pxelinux.0` is primarily a Linux loader, it is capable of loading other operating systems. It operates by using configuration files located on a TFTP server to provide boot instructions. The various `pxelinux.0` configuration files used by Linux Management can be found on your imaging server in the `/srv/tftp` directory.

In Linux Management, when PXE devices are assigned preboot work, they are also told which `pxelinux.0` configuration file they should use to execute that work. Similarly, when using the Preboot Services Menu, each menu option corresponds to a `pxelinux.0` configuration file. For more information, see [Section 23.3.4, “Editing the Preboot Services Menu,” on page 258](#).

For more information on `pxelinux.0` and its configuration files, see the [syslinux home page \(http://syslinux.zytor.org/pxe.php\)](http://syslinux.zytor.org/pxe.php).

For a copy of the Novell modifications to the `syslinux` open-source project, see [Novell Forge \(http://forge.novell.com\)](http://forge.novell.com).

22.2.3 Setting Up to Use PXE

Before you can use Preboot Services with PXE, you need to do the following:

1. Install ZENworks 7 Linux Management on your imaging server.
2. Enable PXE on your ZENworks Linux Management devices.
3. Have a standard DHCP server, either on your imaging server or on another network server.

22.3 Preboot Services Functionality

Review the following sections to understand Preboot Services functionality:

- [Section 22.3.1, “Preboot Bundles,” on page 217](#)
- [Section 22.3.2, “Preboot Services Menu,” on page 219](#)
- [Section 22.3.3, “Image Storage Security,” on page 219](#)
- [Section 22.3.4, “Non-registered Device Settings,” on page 220](#)
- [Section 22.3.5, “Preboot Work Assignment Rules,” on page 220](#)
- [Section 22.3.6, “Preboot Referral Lists,” on page 222](#)
- [Section 22.3.7, “Intel Active Management Technology \(AMT\),” on page 222](#)

22.3.1 Preboot Bundles

In ZENworks Linux Management, Preboot Services uses bundles to apply Preboot Services work to devices. For example, Preboot bundles can contain tasks, such as to restore an image, that are performed at the time a device boots.

In order for a device to utilize a Preboot bundle, the bundle must be assigned to the device, its group, or its folder.

The available Preboot bundles are:

- [“AutoYaST Bundle” on page 217](#)
- [“Kickstart Bundle” on page 217](#)
- [“ZENworks Image Bundle” on page 218](#)
- [“ZENworks Multicast Bundle” on page 218](#)
- [“ZENworks Script Bundle” on page 219](#)

AutoYaST Bundle

Provides the location and access protocol for installing using AutoYaST, including the network installation directory for SUSE Linux. This bundle allows you to launch an automated installation of SUSE Linux using Preboot Services.

Kickstart Bundle

Provides the location and access protocol for installing using kickstart. This bundle allows you to launch an automated installation of Red Hat Linux using Preboot Services.

ZENworks Image Bundle

Lists one or more ZENworks images that can be restored on a computer. This bundle allows you to quickly define simple image restoration operations.

Scope

You can restore an image all of a device's hard disks, specific add-on images, and file sets.

Boot Manager Limitation

If the device you want to image has an unsupported boot manager running, such as System Commander, you must disable or remove it before attempting to image those devices. This is because boot managers create their own information in the MBR and overwrite the ZENworks boot system, preventing ZENworks imaging from being performed.

Base Images

A base image contains descriptions of all partitions and files on a hard drive. When it is restored, all existing partitions are deleted, new partitions are created from the descriptions in the base image, and all files are restored from the image.

Base images are created by taking an image of a device. You can use an [option in the ZENworks Control Center](#) or [imaging commands on a bash prompt](#) to create a base image.

Add-On Images

These images are a collection of files added non-destructively to existing partitions. The existing partitions and files are left intact, except for any files that the add-on image might update.

Add-on images allow you to customize a device after a base image is restored. This allows you to use a base image for multiple purposes.

You can create add-on images using the [Image Explorer](#) utility.

ZENworks Multicast Bundle

Specifies an image that can be sent using the multicast protocol. This bundle allows you to send an existing image to a large number of devices in a single operation. It is ideal for labs, classrooms, and staging areas.

For more information, see [Section 22.5.6, “Multicasting Device Images,” on page 235](#).

Benefits

You can image multiple devices with the least amount of overhead. Devices to be imaged can have a variety of operating systems installed on them, or even no operating system installed.

Using the multicast capabilities of your network, you minimize network traffic by sending the image file across the network once for all devices to be imaged, rather than individually per device.

Limitations

Using the same image on multiple devices means they all have the same network identities. However, you can install the ZENworks Linux Management Imaging Agent ([novell-zislnx](#)) on these

devices prior to performing the multicast, because this agent saves each device's network identity settings and restores them after the multicast image is applied.

ZENworks Script Bundle

Allows you to write a custom Linux bash script that is executed on PXE-enabled Linux devices. This provides detailed control over ZENworks imaging operations, as well as most Linux-based preboot tasks.

22.3.2 Preboot Services Menu

Where PXE is enabled on a device, the Preboot Services Menu can be displayed during the boot process. The following menu choices are displayed on the Preboot Services Menu:

- **Start ZENworks Imaging:** Executes the effective Preboot Services imaging bundle.
- **Start ZENworks Imaging maintenance:** Displays the bash prompt, where you can execute imaging commands.
- **Disable ZENworks partition:** Prevents an existing ZENworks partition from being used during booting to execute the assigned Preboot bundles.
- **Enable ZENworks partition:** Allows an existing ZENworks partition to be used during booting to execute the effective Preboot bundle.
- **Exit:** Resumes normal booting of the device.

You can use the ZENworks Control Center to configure whether this menu should be displayed on a PXE-enabled device by selecting one of the following options:

Always Show Preboot Menu

Never Show Preboot Menu

Show Preboot Menu if CTRL+ALT is Pressed

For the procedures in configuring whether to display the menu, see [Section 23.4.1, “Configuring Preboot Menu Options,” on page 261](#).

22.3.3 Image Storage Security

You can determine the degree of security you want by restricting where to save image files on your imaging server. The following options in the ZENworks Control Center provide this storage security:

- **Allow Preboot Services to overwrite existing files when uploading:** Select this option only if you want existing image files to be overwritten during imaging.
- **Only allow uploads to the following directories:** This option allows you to determine where images can be restored on the imaging server. You specify a full path to the directory in the *Add* field, then click *Add* to enter it into the list box. These are the directories where images are allowed to be saved on the imaging server. These are the locations that can be selected when configuring where to store image files.

For the procedures in configuring imaging storage, see [Section 23.4.2, “Configuring Image Storage Security,” on page 262](#).

22.3.4 Non-registered Device Settings

Devices that are new to the ZENworks Management Zone and have received their first image, need certain IP configuration information to successfully access the network and network services. You can use Preboot Services to automatically name your non-registered devices using such criteria as prefixes, BIOS information (like asset tags or serial numbers), DNS suffixes, and you can set up DHCP or IP addresses.

For example, the device needs a unique IP address and the address of at least one DNS name server. In many networks, this information is distributed through the DHCP services, but can also be configured through the default Preboot Services configuration settings in the ZENworks Control Center.

After a device has registered with ZENworks, its configuration is set and the non-registered device settings in the ZENworks Management Zone no longer apply to it, because the ZENworks Linux Management server now knows its identity. After the device is imaged, whether it becomes a member of the zone or continues to be a non-registered device depends on whether the image applied to the device contains the ZENworks Linux Management Imaging Agent (**novell-zislnx**).

The settings that can be adjusted for a ZENworks Management Zone are:

- **NDS suffix:** Provides a suffix for all of your devices' names. For example, provo.novell.com.
- **Name servers:** This controls which DNS servers a device uses. You can specify multiple DNS name servers.
- **Device name:** Configured device names can include a prefix, the BIOS asset tag, the BIOS serial number, or none of these.
- **IP configuration:** For the IP configuration, you can specify to use DHCP or a specific IP address. If you select to use IP addresses, you can provide a list using a range or by specifying specific IP addresses. As devices are registered, they assume one of the available addresses. For IP addresses, you can also specify a subnet mask and a default gateway.

For the procedures in configuring defaults for non-registered devices, see [Section 23.4.3, “Configuring Non-registered Device Settings,”](#) on page 264.

22.3.5 Preboot Work Assignment Rules

You can set up hardware-based rules for your Preboot bundles. Work assignment rules are used to apply bundles to devices with specific hardware, or match a broad set of hardware requirements.

For example, you can create a rule that applies a bundle to any device with a specific MAC address or BIOS serial number. Rules like this can only match to a single device. On the other hand, you can create a rule that applies to any device with at least 512 MB of RAM and 150 GB of hard drive space.

A work rule is comprised of filters that are used to determine whether a device complies with the rule. The rules use logic to determine whether a device meets the requirements for applying the Preboot bundle. The AND and OR logical operators are used for creating complex filters for the rule.

When a device is seeking work to be done, it scans the rules until it finds a rule where all of the rule's filters match the device, then executes the bundle assigned to the rule.

Filter information that you can provide:

- **Device component:** Any of the following:

BIOS Asset Tag
BIOS Serial Number
BIOS Version
CPU Chipset
Hard Drive Controller
Hard Drive Size (in MB)
IP Address
MAC Address
Network Adapter
RAM (in MB)
Sound Card
System Manufacturer
Video Adapter

- **Relationship:** This defines the relationship for a filter between the *Device component* field and the value you specify for it.

Possibilities for the *Hard drive size* and *RAM* fields:

< (less than)
> (greater than)
= (equal to)
>= (greater than or equal to)
<= (less than or equal to)
<> (not equal to)

Possibilities for all other device components:

Contains
Equal To
Starts With

- **Component value:** This corresponds to the match you want for the component. For example, you select *RAM (in MB)* for the filter and enter 512 for its value. Then, the relationship you select determines whether it's less than, less than or equal to, equal to, not equal to, greater than or equal to, or just greater than 512 MB.

You can have multiple filters and sets of filters in a single rule, using the AND and OR operators, and you can have multiple rules associated with the same Preboot bundle. This allows you to specify exactly to which devices a particular Preboot bundle can be applied.

For the procedures in configuring work assignment rules, see [Section 23.4.4, “Configuring Preboot Work Assignments,”](#) on page 267.

22.3.6 Preboot Referral Lists

When a PXE device boots, it makes a broadcast request on the network for PXE services. The ZENworks Proxy DHCP server (novell-proxydhcp) responds to this request with information that includes the IP address of an imaging server where the device can send requests for assigned preboot work.

It is essential that the PXE device contact PXE services associated with its home zone so that it can correctly determine if there is any preboot work assigned to it. When there is only a single ZENworks Management Zone, this is fairly easy to do as all Proxy DHCP servers provide addresses to services that belong to the same zone. Any device can request preboot work from any imaging server in the same zone and get the same response. However, when multiple ZENworks management zones exist in the same network, things become more difficult, particularly when each zone has its own set of PXE services.

The PXE device's initial request for PXE services is sent as a broadcast to the network, and all Proxy DHCP servers respond with information pertaining to their respective zones. Because it is impossible to determine which Proxy DHCP server responds first, if multiple Proxy DHCP servers respond, or which response is used by the device, it is impossible to ensure that each PXE device will contact servers in its home zone.

A Preboot Referral List allows you to ensure that all devices contact their home zone for preboot work assignments. The list should contain the IP address of an imaging server in each known ZENworks management zone. When a device requests preboot work from a server, the server first determines if the device belongs to the same zone as the server. If it does not, the server refers the request to each server in its referral list until it finds the device's home zone. The device is then instructed to send all future requests to the correct daemon.

After you have specified all of the necessary servers in the referral list, you must place certain files in the `\tftp` directories of each server in the list. Which files are copied and modified depends on the version of ZENworks running on that server.

Note that the Preboot Referral Lists are only used by PXE devices, and only one ZENworks Management Zone needs to have an active Proxy DHCP server and Preboot Referral List.

For the procedures in configuring referral lists, see [Section 23.4.5, “Configuring the Server Referral List,” on page 274](#).

22.3.7 Intel Active Management Technology (AMT)

Review the following to understand how the Intel AMT functionality is used by ZENworks Linux Management:

- [“Using AMT in ZENworks Linux Management” on page 223](#)
- [“Understanding AMT Provisioning” on page 223](#)
- [“Accessing AMT Resources” on page 224](#)

For more information on Intel AMT, see the [Intel Web site \(http://www.intel.com/technology/manage/iamt/\)](http://www.intel.com/technology/manage/iamt/).

Using AMT in ZENworks Linux Management

The Intel AMT functionality allows you to accurately identify devices, even if they have had physical drive replacements. This provides ZENworks Preboot Services with persistent device identification by providing ZENworks with nonvolatile memory for storing the unique device identity.

With AMT and Preboot Services, if a device has a new, unformatted hard drive, ZENworks Linux Management can instantly and accurately identify the device and apply the appropriate Preboot bundle. If a device's hard drive is inactive or its drive is replaced, ZENworks can automatically identify the device in a preboot environment and provide the appropriate ZENworks Linux Management-created image during a system rebuild.

AMT with ZENworks also provides easier hardware upgrading capability. For example, to upgrade applications, some of your device hardware might not meet the minimum requirements. With AMT and Preboot Services, as soon as the hard drives are replaced and before any agents or operating systems are installed, you can continue to assign Preboot bundles using the device's ZENworks identity without having to re-register the device.

If you are using Intel AMT, support for it should be enabled in the `novell-zmgprebootpolicy.conf` file.

Understanding AMT Provisioning

For security purposes, AMT devices generally ship with all AMT features disabled. In this configuration, AMT devices act like normal computers, but none of the AMT features are available. To enable the AMT features, each device must go through a process that Intel refers to as “provisioning,” which sets up the device's AMT resources for access.

- “The Provisioning Modes” on page 223
- “The Provisioning Process” on page 223

The Provisioning Modes

An AMT device may be provisioned into one of two modes: enterprise or small business. Both modes offer the same off-line and remote management capabilities, but in enterprise mode AMT devices use local Certificate Authority credentials to grant remote access, and may require HTTPS protocol for communication rather than just HTTP. In small business mode, remote access is granted through standard HTTP authentication services.

While ZENworks Linux Management works equally well with devices provisioned in either enterprise or small business mode, only the small business mode is required. Therefore, ZENworks Linux Management does not provide a mechanism to provision AMT devices in enterprise mode.

If you use another AMT-enabled application that does require provisioning in enterprise mode, you should use the provisioning utilities of that application. Make sure you provision each AMT device with at least one “enterprise name.”

The Provisioning Process

The provisioning process for AMT devices allows you to specify many AMT-related configuration settings. Examples include users, passwords, enterprise names, and allocation of NVRAM space to specific AMT-enabled applications.

To use the AMT features in ZENworks Linux Management, all that is necessary is each AMT device be provisioned with at least one valid enterprise name, which is used to access the NVRAM where Linux Management stores the ZENworks identity information.

Intel suggests that the enterprise name be chosen to indicate the device's general location. For example, all the devices in the home office may be given an enterprise name of "Company_HQ," and all devices in field offices may be given enterprise names reflecting their geographical locations.

While it is not required, it is assumed that large numbers of devices will have the same Enterprise name. Each AMT device itself may have up to four different enterprise names.

ZENworks Linux Management provides a utility (`smb-provisioning.exe`) to help provision AMT-devices in small business mode with enterprise names. This utility can be found in the `/opt/novell/zenworks/zdm/imaging/winutils` directory on your imaging server. It requires .NET framework.

For the procedures in providing Intel AMT enterprise names to ZENworks Linux Management, see [Section 23.4.6, "Configuring Intel Active Management Technology \(AMT\)," on page 275](#).

Accessing AMT Resources

For more information, see ["Downloading and Installing the iAMT Redirection Drivers" on page 275](#).

22.4 The Preboot Services Processes

The following sections explain how the Preboot Services processes work:

- [Section 22.4.1, "A Typical Preboot Services Operation," on page 224](#)
- [Section 22.4.2, "Illustrating the Preboot Services Processes," on page 225](#)

22.4.1 A Typical Preboot Services Operation

A typical Preboot Services operation can flow as follows:

1. A Preboot bundle is created in the ZENworks Control Center and assigned to a PXE-enabled device.
2. The PXE-enabled device starts to boot.
3. The device sends a DHCP discovery request to determine the IP address of the Preboot Services imaging server.
4. The DHCP server responds with an IP address for the device to use.
5. The `novell-proxydhcp` daemon responds with the IP addresses of the TFTP server, as well as the filename of the Preboot Services bootstrap program (`novlntp.sys`).
6. The PXE device downloads the Preboot Services bootstrap program using `novell-tftp`.
7. After the Preboot Services bootstrap program is downloaded and executed, the device checks `novell-zmgprebootpolicy` to see if there is any imaging work to do.
8. If there is imaging work to do (as contained in a Preboot bundle that is assigned to the device), the device downloads the Linux Management imaging environment from the server so that the it can be booted to Linux.
9. Any imaging tasks contained in the Preboot bundle are performed.

10. If there are no imaging tasks to perform, files are not downloaded and the device proceeds to boot to its operating system.

In addition to using PXE for automation, you can also execute Preboot work manually using one of the following:

- Preboot Menu (if enabled for the device)
- Preboot Services bootable CD or DVD
- ZENworks partition

22.4.2 Illustrating the Preboot Services Processes

The following illustrations show the interaction between a Preboot Services (PXE) device and a Preboot Services imaging server, starting when the PXE device is turned on and begins to boot, and ending when imaging work begins on that device.

The following example assumes that the devices and imaging servers are in the same network segment.

- [“Phase 1: Beginning the Process” on page 225](#)
- [“Phases 2 through 8: Continuing the Process” on page 228](#)

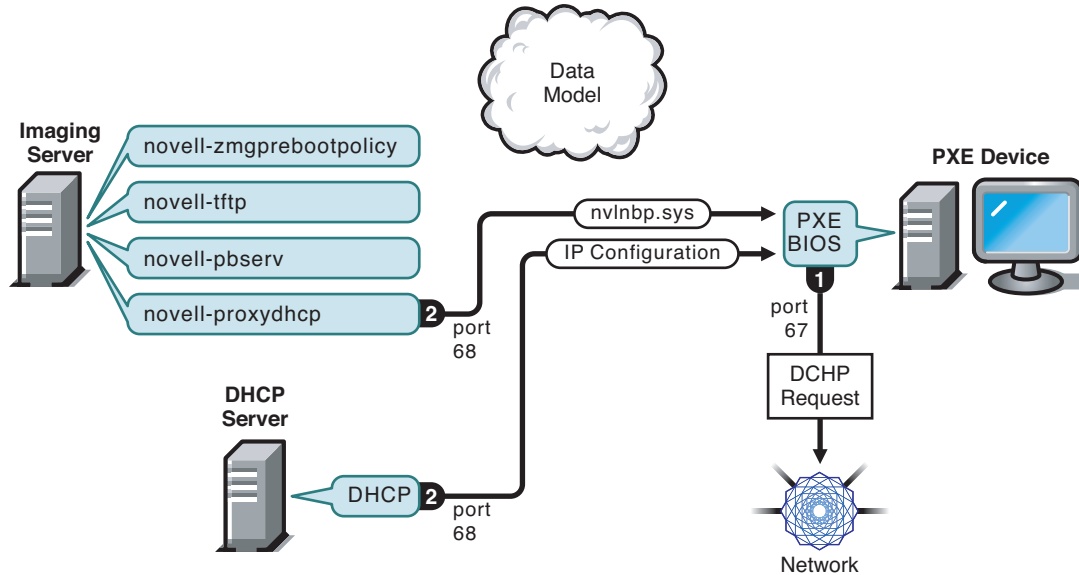
Phase 1: Beginning the Process

Depending on whether novell-proxydhcp is configured on the same server as the standard DHCP server or on a different server, the imaging process begins differently. The following sections illustrate how the process begins for each configuration, then the phases illustrated in [“Phases 2 through 8: Continuing the Process” on page 228](#) are the same for both.

Standard DHCP and Novell Proxy DHCP Configured on Separate Servers

For this example, the DHCP server and the Preboot Services imaging server are two separate servers on the network.

Figure 22-1 DHCP Configuration on Separate Servers



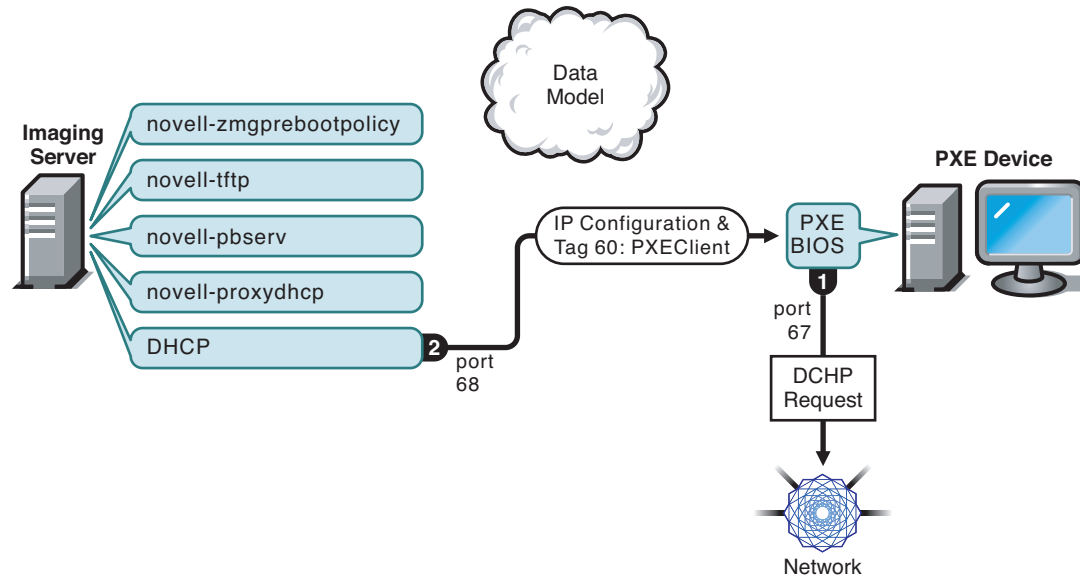
Processes:

1. When the device boots, the PXE BIOS issues a DHCP request with PXE extensions. The request is broadcast on port 67.
2. The DHCP server responds with IP configuration information on port 68, and the Proxy DHCP server responds on port 68 with the name of the bootstrap program (`novlnbp.sys`) and the IP address of the TFTP daemon where it can be found.
3. Continue with **“Phases 2 through 8: Continuing the Process”** on page 228.

Standard DHCP and Novell Proxy DHCP Configured on the Same Server: Part A

For this example, the DHCP server and the Preboot Services imaging server are configured on the same server on the network. This example contains parts A and B.

Figure 22-2 DHCP Configuration on the Same Server; Part A

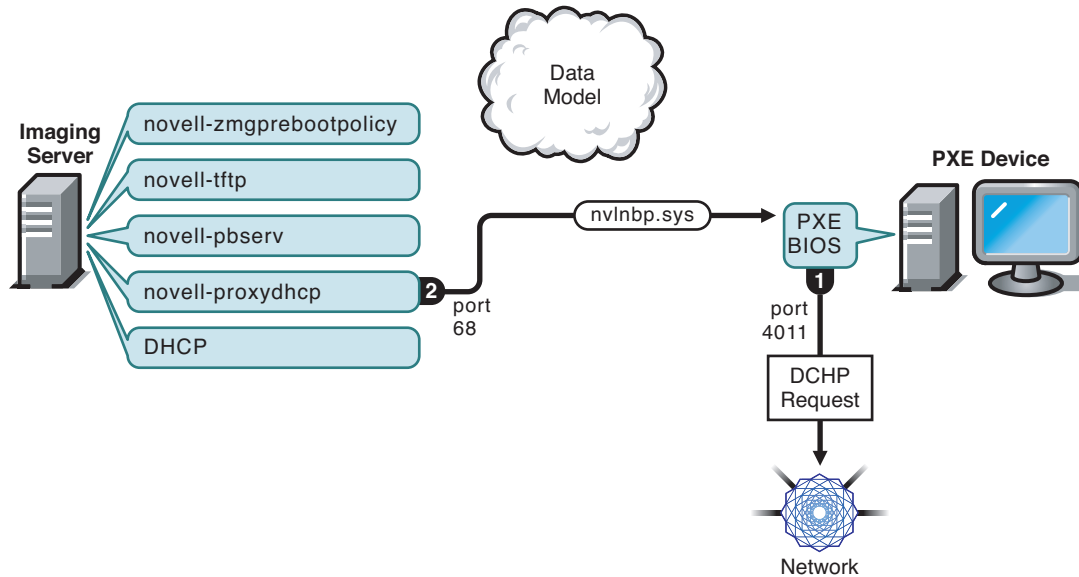


Processes:

1. When the device boots, the PXE BIOS issues a DHCP request with PXE extensions. The request is broadcast on port 67.
2. The DHCP server responds with IP configuration information on port 68, including **tag 60 for PXEClient**, which indicates that novell-proxydhcp is running on the same server.

Standard DHCP and Novell Proxy DHCP Configured on the Same Server: Part B

Figure 22-3 DHCP Configuration on the Same Server, Part B



Processes:

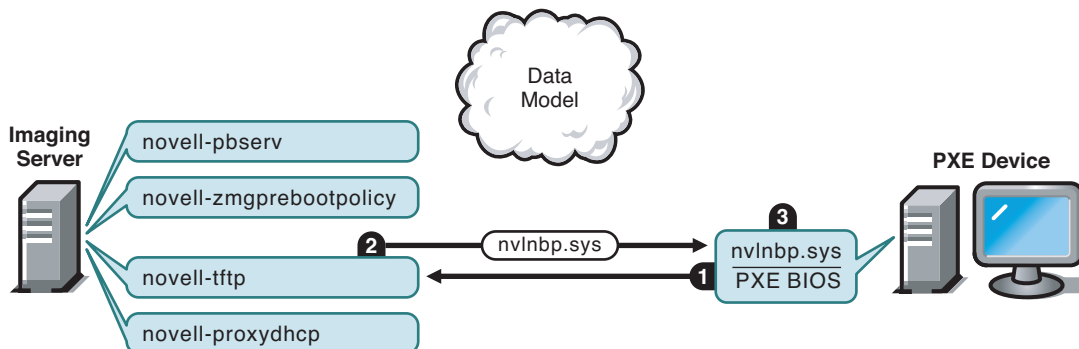
1. When the device sees tag 60 in the DHCP response, the PXE BIOS reissues the DHCP request on port 4011.
2. The Proxy DHCP server responds on port 68 with the name of the bootstrap program (`nvlnbp.sys`) and the IP address of the TFTP daemon where it can be found.
3. Continue with [“Phases 2 through 8: Continuing the Process” on page 228](#).

Phases 2 through 8: Continuing the Process

The following phases are continued after one of the Phase 1 sections above.

Phase 2

Figure 22-4 Phase 2 of the Preboot Services Process

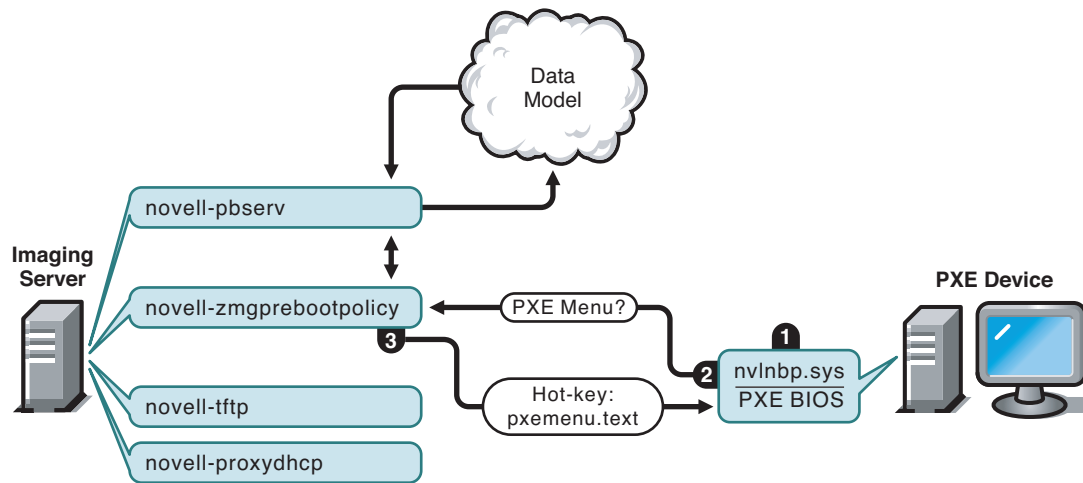


Processes:

1. The PXE BIOS requests `nvlmbp.sys` from the TFTP server.
2. The TFTP server sends `nvlmbp.sys` to the PXE device.
3. The PXE device loads `nvlmbp.sys` into memory.

Phase 3

Figure 22-5 *Phase 3 of the Preboot Services Process*

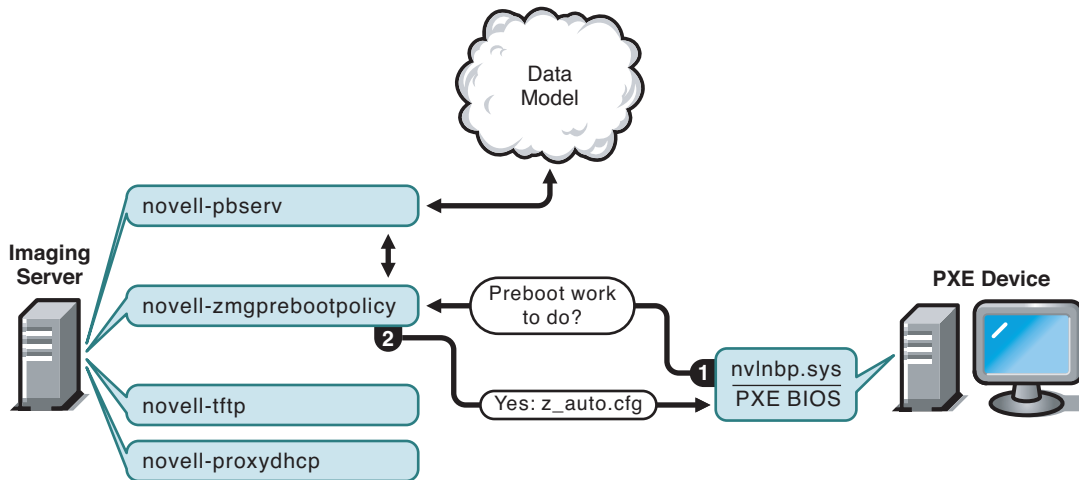


Processes:

1. Hardware detection is performed by `nvlnbp.sys` and it reads the image-safe data.
2. `Nvlnbp.sys` requests the PXE Menu configuration from the Data Model via the `novell-zmgprebootpolicy` daemon.
3. The `novell-zmgprebootpolicy` daemon returns the PXE Menu configuration. In this case, the menu described in `pxemenu.txt` is displayed when a user presses the hot key.

Phase 4

Figure 22-6 Phase 4 of the Preboot Services Process

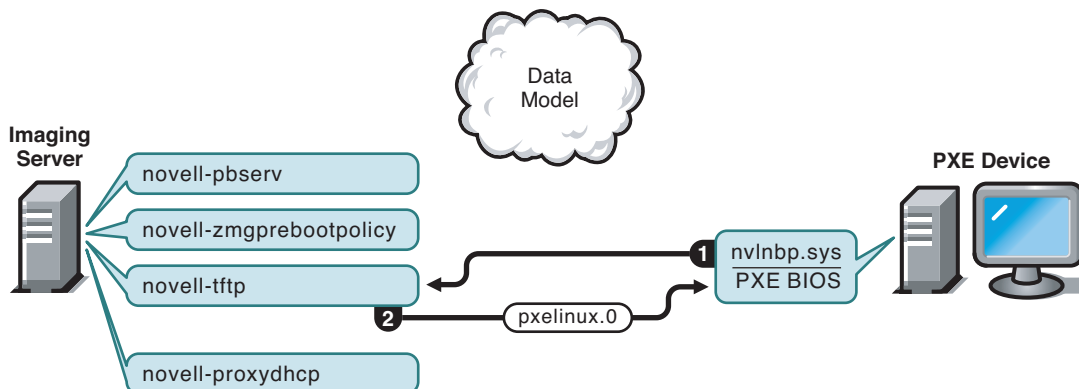


Processes:

1. Assuming no PXE Menu is displayed, the device asks the Data Model (via `novell-zmgprebootpolicy`) if any work is assigned.
2. Assuming work is assigned, the `novell-zmgprebootpolicy` daemon responds with the name of the configuration file to use in performing the preboot work (`z_auto.cfg` in this example).

Phase 5

Figure 22-7 Phase 5 of the Preboot Services Process

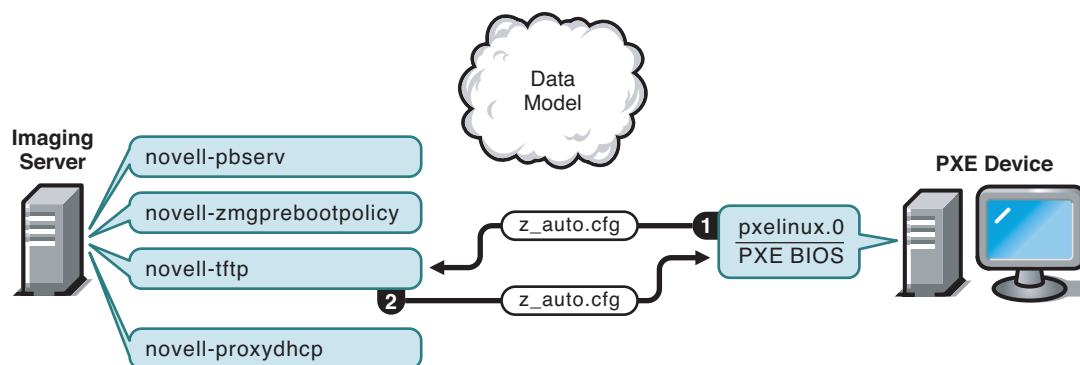


Processes:

1. The PXE device requests `pxelinux.0` from the TFTP server.
2. The TFTP server sends `pxelinux.0` to the device.

Phase 6

Figure 22-8 Phase 6 of the Preboot Services Process

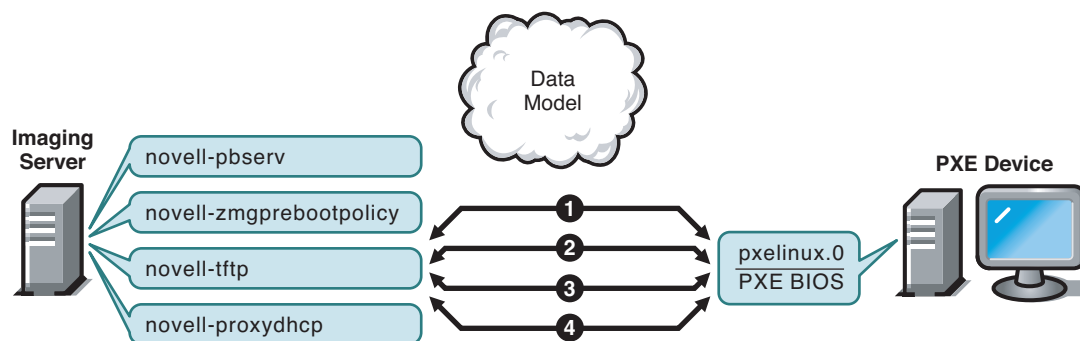


Processes:

1. `Pxelinux.0` replaces `nvlnbp.sys` in memory and requests `z_auto.cfg` from the TFTP server.
2. The TFTP server sends the `z_auto.cfg` file to the device.

Phase 7

Figure 22-9 Phase 7 of the Preboot Services Process

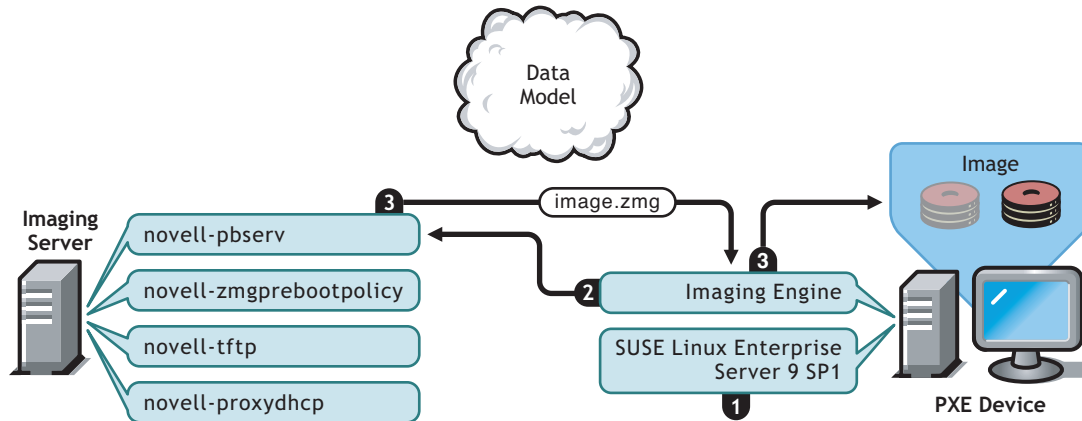


Processes:

1. `Pxelinux.0` requests and receives `/boot/kernel` from the TFTP server.
2. `Pxelinux.0` requests and receives `/boot/initid` from the TFTP server.
3. `Pxelinux.0` requests and receives `/boot/root` from the TFTP server.
4. `Pxelinux.0` requests and receives `/boot/updateDrivers.tgz` from the TFTP server, but is denied because the file does not exist (it is used to provide post-release software updates).

Phase 8

Figure 22-10 Phase 8 of the Preboot Services Process



Processes:

1. SUSE Linux Enterprise Server (SLES) 9 SP1 is loaded and run on the device.
2. The ZENworks Imaging Engine (img) requests the assigned Preboot Services work details and performs the work.
3. The image is laid down on the device and it automatically reboots.

22.5 Preboot Strategies

The following sections present possible approaches to using Preboot Services. Use the following sections to determine which procedures to perform. The steps are documented in subsequent sections.

- [Section 22.5.1, “Automating Updates and Installations,” on page 232](#)
- [Section 22.5.2, “Creating, Installing, and Restoring Standard Images,” on page 233](#)
- [Section 22.5.3, “Reimaging Corrupted Devices,” on page 234](#)
- [Section 22.5.4, “Restoring Lab Devices to a Clean State,” on page 234](#)
- [Section 22.5.5, “Setting Up Devices for Future Reimaging,” on page 235](#)
- [Section 22.5.6, “Multicasting Device Images,” on page 235](#)

22.5.1 Automating Updates and Installations

You can automate Linux installations and software updates using Preboot Services in the following ways:

- **SUSE Linux installation:** The AutoYaST bundle can automate installation of SUSE Linux on a Linux device.
- **Red Hat Linux installation:** The kickstart bundle can automate installation of Red Hat Linux on a Linux device.
- **ZENworks script execution:** The ZENworks Script bundle can automate execution of any ZENworks script on a Linux device, including imaging commands.

- **Device imaging:** The ZENworks Imaging bundle can be used to place an image on a Linux device.
- **Imaging multiple devices:** The ZENworks Multicast bundle can be used to place an image on multiple Linux devices with one pass of the image file over the network, such as in resetting lab devices.

All you need to do to accomplish the above is to create and configure one of the five Preboot bundle types, then assign the bundle to the desired devices.

When a device boots, the assigned bundle is automatically applied before the device's operating system starts.

You can also manually accomplish these tasks per device using the Preboot Services Menu's *Start ZENworks Imaging Maintenance* option to access the bash prompt, if you have enabled the Preboot Services Menu for the device. Or, you can use a Preboot Services bootable CD or DVD, which does not require PXE to be enabled on the device.

22.5.2 Creating, Installing, and Restoring Standard Images

As new devices are purchased and before deploying them, you can install a standard software platform and enable the device for future unattended reimaging.

1. Create a model device of each type that you'll deploy.
2. Create an image of each model device on a ZENworks Linux Management imaging server. For more information, see [“Manually Taking an Image of a Device” on page 303](#).

These images should include the Novell ZENworks Linux Management Imaging Agent (`novell-zslnx`).

3. Optionally, you may create a preboot imaging bundle for this image. This allows the image to be assigned automatically for later use.
4. If you are using Preboot Services, install ZENworks Linux Management on your imaging server. For more information, see [Section 23.1, “Preparing a Preboot Services Server,” on page 239](#).

or

If you are using a bootable CD or DVD, or a ZENworks partition, create a boot CD or DVD that points to the ZENworks Linux Management imaging server where the model images are stored. For more information, see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#).

As each new device comes in, if you are using Preboot Services do the following:

1. Check to see if the device is PXE capable. Enable PXE if it isn't enabled by default. For more information, see [Section 23.6, “Enabling PXE on Devices,” on page 281](#).
2. Physically connect the device to the network.
3. Boot the device from the Preboot Services imaging server.

If you are not using Preboot Services, boot the device with the imaging boot CD or DVD and consider installing the ZENworks partition to enable auto-imaging without needing to supply the CD or DVD. For more information, see [Step 3 on page 244](#) of [Section 23.7.2, “Enabling a Device for Imaging Operations,” on page 283](#). After you have installed the partition, reboot the device from the ZENworks partition.

22.5.3 Reimaging Corrupted Devices

Without data loss or undue disruption to users, you can fix devices that have become misconfigured or corrupted.

1. When a device needs to be fixed, have the user back up any files to the network that he or she wants to keep (if possible).
2. Create and/or assign an appropriate imaging bundle to the device.
3. If it is a device with a ZENworks partition or it is PXE-enabled, the user should boot the device from the ZENworks partition or the Preboot Services imaging server (via PXE) to find and execute the assigned bundle. If you are using PXE, make sure that Preboot Services is installed on your imaging server. For more information, see [Chapter 24, “Using Preboot Services,” on page 285](#).

or

If the device does not have a ZENworks partition and is not PXE-enabled, the user should boot the device with the imaging boot CD or DVD and restore the appropriate images manually.

4. After the image is laid down, restore any user files that were backed up to the network.

22.5.4 Restoring Lab Devices to a Clean State

You can restore devices to a clean state, removing any changes or additions made since the last time you restored the image on that device. This is useful for updating lab devices.

The following steps assume that the devices are unregistered.

1. Create an image of a clean model device and store it on a ZENworks Linux Management imaging server. For more information, see [“Manually Taking an Image of a Device” on page 303](#).
2. If you are using Preboot Services, make sure that ZENworks Linux Management is installed on your imaging server. For more information, see [Section 23.1, “Preparing a Preboot Services Server,” on page 239](#).
3. If you are using Preboot Services and the devices are PXE capable, make sure that PXE is enabled. For more information, see [Section 23.6, “Enabling PXE on Devices,” on page 281](#).

or

If you are not using Preboot Services or the Linux partition, create an imaging boot CD or DVD that points to the ZENworks Linux Management imaging server where the clean image is stored. For more information, see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#).

Deploy each lab device as follows:

1. Physically connect the device to the lab network.
2. If you are using Preboot Services, boot the device from the Preboot Services imaging server.

or

If you are not using Preboot Services, boot the device with the imaging boot CD or DVD and install the ZENworks partition. For more information, see [Step 3 on page 244 of Section 23.7.2, “Enabling a Device for Imaging Operations,” on page 283](#). After you have installed the partition, reboot the device from the ZENworks partition.

3. At the end of each lab session, assign the Preboot bundle to the lab devices.
4. Reboot each device and let it be auto-imaged by its assignment to a ZENworks Preboot bundle.

22.5.5 Setting Up Devices for Future Reimaging

With minimal disruption to users, you can enable existing devices for possible future reimaging.

This process might need to be phased in by local administrators. Each administrator could do the following:

1. Install the Novell ZENworks Linux Management Imaging Agent (**novell-zislnx**) on each device.
2. If the devices are PXE capable, make sure PXE is enabled (see [Section 23.6, “Enabling PXE on Devices,” on page 281](#)) and make sure that ZENworks Linux Management is installed on your imaging server (see [Section 23.1, “Preparing a Preboot Services Server,” on page 239](#)).
or
Prepare a few sets of imaging CDs or DVDs that users can use when they run into trouble (see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#)). These devices could point to an imaging server that contains the same clean images used for new devices.
3. If a user runs into trouble, use the strategy for reimaging corrupted devices. For more information, see [Section 22.5.3, “Reimaging Corrupted Devices,” on page 234](#).

22.5.6 Multicasting Device Images

The following sections explain the multicasting images feature:

- [“Understanding Multicasting” on page 235](#)
- [“What Are Practical Uses For Multicasting?” on page 236](#)
- [“Automatic Multicasting Example” on page 237](#)

For instructions on using multicasting, see [Section 24.4, “Multicasting Images,” on page 317](#).

Understanding Multicasting

Multicasting is a way to send the same image to multiple devices without sending that image multiple times across the network. It is done by inviting participants to join a multicast session. Multicasting is similar to broadcasting on the network, in that you send the image once to the network and only those devices belonging to the multicast session can see and receive it. This saves on network bandwidth usage.

For example, if you have 10 devices in the multicast session and the image is 3 GB in size, your network experiences only 3 GB of network traffic to image all 10 devices. Without Multicasting, the network experiences 30 GB of network traffic to image all 10 devices individually.

The devices to be imaged must be physically connected to the network. They can be devices with existing operating systems of any kind, or they can be new devices with no operating system installed.

IMPORTANT: For multicasting to work properly, all routers and switches on the network must have their multicast features configured. Otherwise, multicast packets might not be routed properly.

Multicasting can be done automatically or manually:

- [“Automatic Multicasting” on page 236](#)
- [“Manual Multicasting” on page 236](#)

Automatic Multicasting

In the ZENworks Control Center, multicasting is accomplished by configuring a Multicast bundle. The bundle contains a base image that is taken previously from a device and is stored on an imaging server. This base image is applied to all multicast session participants.

When using a Preboot bundle to perform multicasting, the imaging server is the session master, which sends the `.zmg` image file to the session participants. The `novell-pbserv` daemon is used in this process. All problems are reported and displayed on the session master device.

For more information, see [Section 24.4, “Multicasting Images,” on page 317](#).

Manual Multicasting

At a bash prompt, you can enter commands to configure and initiate a multicasting session. You enter the appropriate commands on a bash prompt at each device, specifying one of them to be the session master. An image of the session master’s hard drive is sent to each of the session participants.

For more information on the imaging commands, see [Section C.5, “Session \(Multicast\) Mode \(img session\),” on page 433](#).

If you plan to set up multicasting by visiting each device, you need either an imaging boot CD or DVD, or the devices must be PXE-enabled. For more information, see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#).

What Are Practical Uses For Multicasting?

Multicasting is ideal for labs, classrooms, and staging areas, or for any place where you need to quickly create the same configuration on multiple devices, instead of taking the time to set up each device individually.

Benefits of Multicasting Images

Multicasting is the way to use ZENworks Imaging Engine for mass reimaging with the least amount of overhead. It is useful if you have one device with a clean software configuration that you want to duplicate on several other devices, or if you have a single image that you want to set up on multiple devices.

Limitations of Multicasting Images

One significant limitation of using multicast without installing any ZENworks Linux Management software is that it results in a set of devices that have duplicate network identities. The IP addresses (if the network is using static IP addressing) and device hostname are all the same and can cause conflicts if deployed on the network without change.

For a handful of devices, this might not be a problem. But for a larger number of devices, you should install the Novell ZENworks Linux Management Imaging Agent (`novell-zislnx`) on them before doing the multicast (see [Section 23.7.2, “Enabling a Device for Imaging Operations,” on page 283](#)).

The Imaging Agent saves the device's network identity settings before the multicast session and restores them afterwards.

Automatic Multicasting Example

To automatically multicast an image to multiple devices using the ZENworks Control Center:

1. In the ZENworks Control Center, create a Multicast bundle using a wizard.
2. Specify the source image for the bundle.

You can multicast an existing image from your imaging server.

3. Configure the trigger for multicasting the bundle. Trigger examples:

Client count: When the specified number of clients specified in the bundle have booted and registered, the multicast session begins.

Time count: When the specified length of time has passed with no new clients having registered, the multicast session begins regardless of the number of client participating.

The first trigger to be realized causes the multicast session to begin.

4. Assign the Multicast bundle to the desired devices.

The ZENworks Control Center provides a way to enable or disable a Multicast bundle, allowing you to temporarily stop the bundle from executing. This is more efficient than unassigning the bundle from many devices.

5. Wait for the trigger to happen.

Each device booting into the session has its boot process delayed until the session begins, which timing is determined by fulfillment of one of the triggers.

The multicast happens automatically when a device assigned to the Multicast bundle boots, according the configuration you set up for the Multicast bundle and for the devices you assigned to the bundle. This bundle is applied to each session device before it boots its operating system. The ZENworks Multicast bundle is sent over the wire just once, using the multicast capability of your network, and executed simultaneously on all participating devices.

The section provides instructions for setting up Novell® ZENworks® Linux Management Preboot Services:

- [Section 23.1, “Preparing a Preboot Services Server,” on page 239](#)
- [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#)
- [Section 23.3, “Deploying and Managing Preboot Services,” on page 246](#)
- [Section 23.4, “Configuring Preboot Services Defaults,” on page 260](#)
- [Section 23.5, “Overriding Preboot Services Defaults,” on page 279](#)
- [Section 23.6, “Enabling PXE on Devices,” on page 281](#)
- [Section 23.7, “Setting Up Devices for Imaging,” on page 282](#)

IMPORTANT: The Preboot Services software is automatically installed when you install ZENworks Linux Management.

23.1 Preparing a Preboot Services Server

When you install Novell ZENworks Linux Management on a server, the server is nearly ready to act as a Preboot Services server. To avoid confusion, the Proxy DHCP daemon (novell-proxydhcp) is installed, but not enabled. For PXE devices to be able to communicate with Preboot Services, this daemon must be started manually on at least one server on each network segment. Exactly how many servers and which specific servers should run this daemon is dictated by your network topology. As a rule of thumb, for every DHCP server deployed in your network, you should have a corresponding Proxy DHCP server.

For information on setting up management of your devices, see [Section 23.3, “Deploying and Managing Preboot Services,” on page 246](#) and [Section 23.4, “Configuring Preboot Services Defaults,” on page 260](#).

In addition to the specific hardware requirements for a ZENworks Linux Management server, the server used to store image files must meet the following requirements:

- **A fixed IP address:** When you connect to the imaging server during an imaging operation, you must do so using the fixed IP address or DNS name of the imaging server.
- **Enough space to store device images:** Unless you use compression (which is enabled by default) for your device images, they are nearly the same size as the data on the device hard disk, which could be many gigabytes.

If you want to store an image locally (on a CD, DVD, or hard disk) rather than on an imaging server, see [“Using a CD or DVD for Disconnected Imaging Operations” on page 312](#) and [“Using a Hard Disk for Disconnected Imaging Operations” on page 314](#).

23.2 Setting Up the Preboot Services Methods

The Novell ZENworks Imaging Engine that performs the actual imaging of a device is a Linux application. Unless you use automated Preboot Services with PXE-enabled devices, you need to prepare a boot medium that has the Linux kernel, ZENworks Imaging Engine, and network drivers installed.

The following sections contain additional information:

- [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#)
- [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#)
- [Section 23.2.3, “Using the ZENworks Imaging Floppy Boot Disk Creator,” on page 241](#)
- [Section 23.2.4, “Managing ZENworks Partitions,” on page 244](#)

23.2.1 Using Preboot Services (PXE)

Preboot Execution Environment (PXE) is an Intel specification that allows a device to boot off the network, instead of its hard drive or other local media. ZENworks Linux Management can use PXE to launch Preboot Services.

In ZENworks Linux Management, Preboot Services uses PXE to find out if there is imaging work specified for a device and to provide the device with the files necessary to boot to the ZENworks Linux Management imaging environment.

Before you can use Preboot Services with automated Preboot bundles, you need to do the following:

- Install the ZENworks Linux Management Imaging and Preboot Services (PXE Support) components on your imaging server.
- Enable PXE on the device.
- Have a standard DHCP server, either on your imaging server or on another network server.

Automated Preboot Services functions can also be performed using a ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).

Manual Preboot Services functions can be performed using CDs or DVDs. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).

23.2.2 Preparing Imaging Boot CDs or DVDs

If you have CD- or DVD-burning software and hardware, you can create an imaging boot CD or DVD for performing imaging operations.

NOTE: ZENworks Linux Management imaging does not currently support booting from a SCSI CD-ROM device.

You can use the `bootcd.iso` image available on the ZENworks Linux Management imaging server to create an imaging boot CD or DVD.

To create an imaging boot CD or DVD:

- 1 In a temporary working area, copy the `settings.txt` file containing the settings you want for the imaging boot process.

This file is located in the `opt/novell/zenworks/zdm/imaging/winutils` directory on your Linux imaging server. For more information, see [Section B.5, “Imaging Configuration Parameters \(settings.txt\),” on page 411](#).

- 2 In the temporary working area, add any image files you want to store on the CD or DVD.
- 3 Use your CD- or DVD-burning software to create a CD or DVD from the `bootcd.iso` image.

The `bootcd.iso` file is located in the `/opt/novell/zenworks/zdm/imaging/winutils` directory on your Linux imaging server.

- 4 Use your CD- or DVD-burning software to add the contents of your temporary working area to the root of the CD or DVD, including the `settings.txt` file and any ZENworks Linux Management image files.

IMPORTANT: Adding these files makes the CD or DVD a multisession CD or DVD. To boot a device from such a CD or DVD, the CD or DVD drive must support multisession CDs or DVDs.

If you can't create a multisession CD or DVD, or you are using a drive that does not support multisession CDs or DVDs and you don't need to store the image or Linux drivers on the CD or DVD, you can still create an imaging boot CD or DVD. Create the CD or DVD from the `bootcd.iso` file as in [Step 3](#). Boot the device using the CD or DVD. When you are prompted for `settings.txt`, insert the diskette containing the file into the diskette drive.

- 5 Use your CD- or DVD-burning software to finalize the CD or DVD.

If you have WinISO, a third-party CD-ROM image file utility, you can use it to insert the `settings.txt` and other needed files directly into the imaging boot CD or DVD.

For information on how to use the CD or DVD to perform disconnected imaging operations, see [Section 24.3.3, “Setting Up Disconnected Imaging Operations,” on page 312](#).

23.2.3 Using the ZENworks Imaging Floppy Boot Disk Creator

This utility allows you to do the following:

- [“Creating a Floppy Boot Diskette” on page 241](#)
- [“Managing the settings.txt File” on page 242](#)

Creating a Floppy Boot Diskette

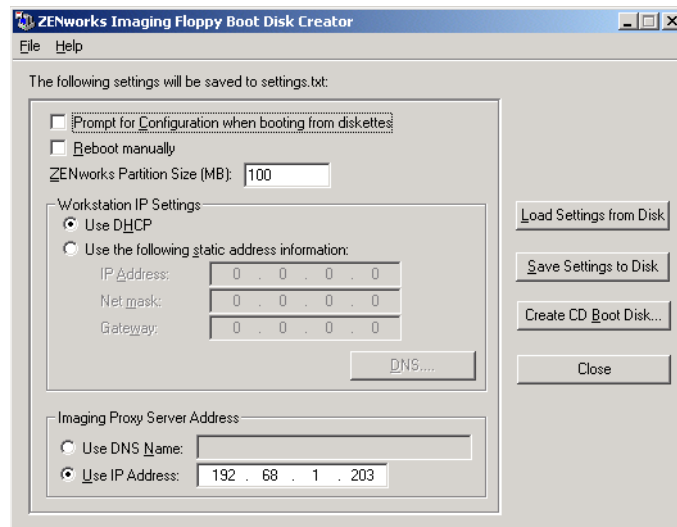
If you have devices that cannot normally boot a CD or DVD, but has the CD or DVD hardware installed, you can use the ZENworks Imaging Floppy Boot Disk Creator utility to create a diskette that enables the device to boot from a CD or DVD.

To create a boot diskette:

- 1 Format one high-density diskette, or use a preformatted blank diskette.
- 2 On a Windows machine, browse to the `opt/novell/zenworks/zdm/imaging/winutils` directory on your Linux imaging server and run `zimboot.exe`.

You might need to configure Samba on the Linux server in order for the Windows machine to have access to this directory.

The following dialog box is displayed:



- 3 Click *Create CD Boot Disk*.
- 4 After the diskette is created, click *Close*.
- 5 Insert both this diskette and the imaging CD or DVD on the device to be imaged, then boot the device.

The diskette enables the imaging CD or DVD to be booted by the device.

Managing the settings.txt File

There two `settings.txt` files shipped with ZENworks Linux Management:

- **/srv/tftp/boot/settings.txt:** PXE devices use this version of the file for automated preboot work. This file exists on the imaging server and usually does not need to be modified. During the boot process, this `settings.txt` file is read and the necessary settings information is discovered and used.
- **/opt/novell/zenworks/zdm/imaging/winutils/settings.txt:** The imaging server copy of this file needs to be modified for your network environment and a working copy of it should be maintained at the root of the imaging boot device (imaging CD or DVD, or a blank floppy diskette). When burning the imaging CD or DVD, be sure to include the edited copy of this `settings.txt` file.

You can manage the content of this copy of the `settings.txt` file with the ZENworks Imaging Floppy Boot Disk Creator utility, as outlined in the following steps.

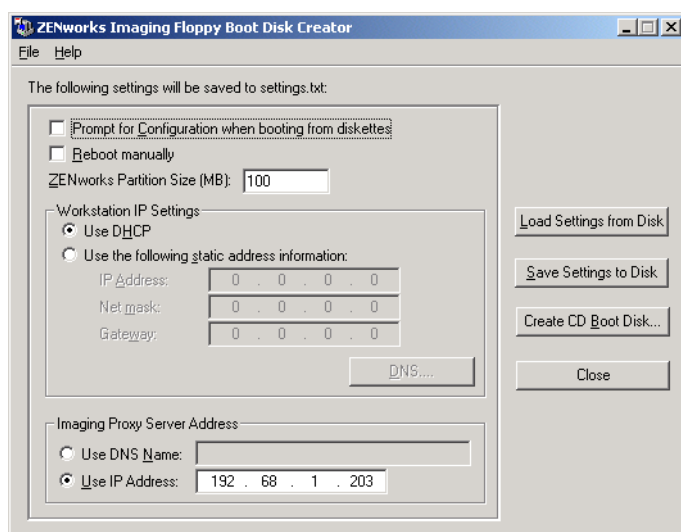
To manually edit the `settings.txt` file, see [Section B.5, “Imaging Configuration Parameters \(settings.txt\),” on page 411](#).

To manage the `settings.txt` file using the ZENworks Imaging Floppy Boot Disk Creator utility:

- 1 On a Windows machine, browse to the `opt/novell/zenworks/zdm/imaging/winutils` directory on your Linux imaging server and run `zimgboot.exe`.

You might need to configure Samba on the Linux server in order for the Windows machine to have access to this directory.

The following dialog box is displayed:



- 2 Click *Load settings from disk*.

This allows you to browse for the `settings.txt` file. Then, it populates the fields in this dialog box from information in the `settings.txt` file after you locate it in the next step, which you can modify in subsequent steps.

- 3 Browse for the `settings.txt` file, then click *Open*.

The default location is `A: \`. Browse to the `/opt/novell/zenworks/zdm/imaging/winutils/` directory for the copy to be modified.

- 4 (Required) In the ZENworks Imaging Floppy Boot Disk Creator dialog box (in the Imaging Proxy Server Address section), specify either the fixed IP address or the full DNS name of your imaging server (where novell-pbserv is running).
- 5 (Optional) For the other fields and options on the dialog box, keep the default settings, unless you have a specific reason to change a setting, such as to specify a particular device's IP Address in the Workstation IP Settings section.

Click *Help* for details on the specific settings, or see [Section B.5, “Imaging Configuration Parameters \(settings.txt\),” on page 411](#).

- 6 Click *Save settings to disk*.
- 7 Browse for where you want to save the `settings.txt` file, then click *Save*.

The default location is `A: \`. You can save to a different location for use in burning it to an imaging CD or DVD.

- 8 When you are finished using this utility, click *Close*.

23.2.4 Managing ZENworks Partitions

A ZENworks partition is used by a device when booting for automated Preboot Services work when the device does not have PXE available. The following sections explain how to manage ZENworks partitions:

- “Creating a ZENworks Partition” on page 244
- “Disabling a ZENworks Partition” on page 245
- “Removing a ZENworks Partition” on page 245

Creating a ZENworks Partition

If you want to set up a device for unattended imaging operations and are unable to use Preboot Services (PXE), you can create a ZENworks partition on the hard disk. If you make the partition large enough, you can even store an image of the device’s hard disk, which can be useful if the device becomes misconfigured or corrupted when the network connection is lost.

WARNING: Installing the ZENworks partition destroys all data on that hard drive. Use this only on devices where you plan to reinstall the operating system and software programs.

To create a ZENworks partition, you must first create an imaging CD or DVD to boot the device from. (If the device cannot boot from a CD or DVD, see [Section 23.2.3, “Using the ZENworks Imaging Floppy Boot Disk Creator,”](#) on page 241.) Then, do the following:

- 1 Boot the device with the imaging CD or DVD, then select *Install/Update ZEN partition* from the menu.

This starts the process of creating the ZENworks partition in the first partition slot. It destroys all existing partitions, except an existing ZENworks partition or the Dell or Compaq configuration partitions. By default, the ZENworks partition size is 150 MB.

If the ZENworks partition already exists, it is upgraded, and your existing partitions are left intact.

- 2 After the ZENworks partition is installed or updated, remove the CD or DVD and press any key to continue.
- 3 After removing the CD or DVD and reboot the device, install the operating system on the device.

IMPORTANT: During installation of the operating system, you must install the boot loader where the root partition is being installed.

- 4 To take an image of the device using the ZENworks partition, see [“Creating an Image Using the Bash Prompt”](#) on page 314.
- 5 When the bash prompt is displayed, reboot the device.

The device should boot to Linux. If the bash prompt is displayed again, enter `lilo.s` and reboot a second time.

Disabling a ZENworks Partition

If you decide to enable PXE on a device, but have previously installed a ZENworks partition on it, you can disable or delete the partition, because it is then no longer necessary. For information on deleting the partition, see [“Removing a ZENworks Partition” on page 245](#).

When you boot to Linux using any imaging boot device or method other than booting from the ZENworks partition, you can disable (or enable) the ZENworks partition. Just select the menu option to do so when the PXE menu is presented.

Removing a ZENworks Partition

Because you should not delete the ZENworks partition if you booted using the partition, you should boot the device from an imaging boot method other than the ZENworks partition.

WARNING: After you have deleted the ZENworks partition, you need to make sure that the image you put on the device was made on a device without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the device fails to boot. You should only remove the ZENworks partition if you are going to restore an image that does not have the partition to the device.

The following are ways you can remove a ZENworks partition from a device:

- [“Using an Imaging CD or DVD” on page 245](#)
- [“Using a ZENworks Script Bundle” on page 246](#)
- [“Using FDISK” on page 246](#)

Using an Imaging CD or DVD

If you cannot perform a full restoration at this time, you should consider disabling the ZENworks partition.

To remove a ZENworks partition:

- 1 Boot the device using the ZENworks 7 Linux Management imaging CD or DVD.
- 2 Select the *Manual mode* option.
- 3 On the bash prompt, enter:

```
img zenPart remove
```
- 4 After the removal is complete, eject the CD or DVD (if you are not going to use it to reimage the device).
- 5 Reboot the device when ready.
- 6 Restore an image or install an operating system.

When the device boots, its ZENworks partition is removed, then the device can be imaged from the CD or DVD without a ZENworks partition.

If the device is assigned to a Preboot Services bundle, it is imaged according to that bundle.

Using a ZENworks Script Bundle

If you are using Preboot Services, but formerly booted from the ZENworks partition on the device, you can delete the ZENworks partition at the same time you put down an image. However, the new image should not contain a ZENworks partition.

For example, you can do the following:

- 1 In the ZENworks Control Center, create a ZENworks Script bundle.
- 2 In the *Script text* field in the Create New Preboot Bundle wizard, enter:

```
img zenPart remove
```
- 3 In the *Script text* field (after the above command), enter the other commands necessary for the imaging work you want for this device.
For more information, see [Appendix C, “ZENworks Imaging Engine Commands,” on page 425](#).
- 4 On the Summary page of the wizard, click *Finish* (not *Next*).
- 5 Reboot the device.

Using FDISK

You can remove a ZENworks partition by simply using FDISK to reconfigure the device’s hard drive. Then, you can either image the device using a ZENworks imaging CD or DVD, or enable PXE on the device and assign a Preboot bundle to it, then reboot it to use that bundle.

23.3 Deploying and Managing Preboot Services

The following sections explain how to set up, deploy, and manage Preboot Services:

- [Section 23.3.1, “Checking the Preboot Services Imaging Server Setup,” on page 246](#)
- [Section 23.3.2, “Deploying Preboot Services In a Network Environment,” on page 248](#)
- [Section 23.3.3, “Administering Preboot Services,” on page 255](#)
- [Section 23.3.4, “Editing the Preboot Services Menu,” on page 258](#)

For information on using Preboot, see [Chapter 24, “Using Preboot Services,” on page 285](#).

23.3.1 Checking the Preboot Services Imaging Server Setup

This section provides information on how to check the configuration of Preboot Services after it is installed, and how to set up standard DHCP and novell-proxydhcp daemons on the same server.

- [“Overview of Preboot Services Components” on page 247](#)
- [“Checking the Setup” on page 247](#)

Overview of Preboot Services Components

The following components are installed as part of Preboot Services:

Table 23-1 *Preboot Service Components*

Daemon	Description
novell-pbserv	The novell-pbserv daemon provides imaging services to devices.
novell-proxydhcp	The novell-proxydhcp daemon runs alongside a standard DHCP server to inform PXE devices of the IP address of the TFTP server. The Proxy DHCP server also responds to PXE devices to indicate which bootstrap program (<code>nvlnbp.sys</code>) to use.
novell-tftp	<p>The novell-tftp daemon is used by PXE devices to request files that are needed to perform imaging tasks. The TFTP server also provides a central repository for these imaging files, such as the Linux kernel, <code>initrd</code>, and <code>nvlnbp.sys</code>.</p> <p>A PXE device uses this server to download the bootstrap program (<code>nvlnbp.sys</code>).</p>
novell-zmgprebootpolicy	The PXE devices use the novell-zmgprebootpolicy daemon to check if there are any Preboot bundles that are assigned to the device.

The novell-proxydhcp daemon must be started manually and does not need to be run on all imaging servers.

The other three daemons are started automatically when installing ZENworks Linux Management, or any time the server is rebooted, and must run on all imaging servers.

For more information on these daemons, see [Section B.7, “Imaging Server,” on page 414](#).

Checking the Setup

After the Preboot Services components are installed, the following daemons should be installed and running on the server:

Table 23-2 *Preboot Services Daemons*

Service	Command to Check Its Status
novell-pbserv	<code>/etc/init.d/novell-pbserv status</code>
novell-tftp	<code>/etc/init.d/novell-tftp status</code>
novell-zmgprebootpolicy	<code>/etc/init.d/novell-zmgprebootpolicy status</code>

You should not need to change the default configuration of these daemons.

If the server where the Preboot Services components are installed is also a DHCP server, see [“Configuring LAN Environments for Preboot Services” on page 251](#).

23.3.2 Deploying Preboot Services In a Network Environment

To implement the network deployment strategies outlined in this section, you must have a solid understanding of the TCP/IP network protocol and specific knowledge of TCP/IP routing and the DHCP discovery process.

Deploying Preboot Services (with PXE) in a single network segment is a relatively simple process. However, Preboot Services deployment in a multi-segment network is far more complex and might require configuration of both the Preboot Services daemons and the network switches and routers that lie between the server and the PXE devices.

Configuring the routers or switches to correctly forward Preboot Services network traffic requires a solid understanding of the DHCP protocol, DHCP relay agents, and IP forwarding. The actual configuration of the switch or router must be performed by a person with detailed knowledge of the hardware.

We strongly recommend that you initially set up Preboot Services in a single segment to ensure that the servers are configured correctly and are operational.

This section includes the following information:

- [“Server Configuration” on page 248](#)
- [“Network Configuration” on page 249](#)
- [“Configuring Filters on Switches and Routers” on page 254](#)
- [“Spanning Tree Protocol in Switched Environments” on page 255](#)

Server Configuration

There are three important points about configuring servers for Preboot Services:

- **DHCP server:** The Preboot Services environment requires a standard DHCP server. It is up to you to install your standard DHCP server.
- **Preboot Services daemons:** The four Preboot Services daemons (novell-pbserv, novell-tftp, novell-proxydhcp, and novell-zmgprebootpolicy) are all installed on the imaging server when you install ZENworks Linux Management. These daemons must run together on the same server.
- **Imaging server:** The Preboot Services daemons can be installed and run on the same or different server than DHCP.

The following sections give general information about these services:

- [“The DHCP Server” on page 249](#)
- [“The novell-pbserv daemon” on page 249](#)
- [“The novell-proxydhcp daemon” on page 249](#)
- [“The novell-tftp daemon” on page 249](#)
- [“The novell-zmgprebootpolicy daemon” on page 249](#)

It is seldom necessary to make changes to the default configuration of these services. However, if you need more detailed configuration information, see [“Configuring Preboot Services Imaging Servers in Linux” on page 255](#).

The DHCP Server

The standard DHCP server must be configured with an active scope to allocate IP addresses to the PXE devices. The scope options should also specify the gateway or router that the PXE devices should use.

If Preboot Services (specifically novell-proxydhcp) is installed on the same server as the DHCP server, then the DHCP server must be configured with a special option tag. For more information, see [“Configuring LAN Environments for Preboot Services” on page 251](#).

The novell-pbserv daemon

The Preboot Services novell-pbserv daemon provides imaging services to devices.

This includes sending and receive image files, discovering assigned Preboot bundles, acting as session master for multicast imaging, and so on.

The novell-proxydhcp daemon

The Preboot Services Proxy DHCP server runs alongside a standard DHCP server to inform PXE devices of the IP address of the TFTP server, the IP address of the server where novell-zmgprebootpolicy is running, and the name of the network bootstrap program (`nvlnbp.sys`).

The novell-tftp daemon

The Preboot Services novell-tftp daemon is used by PXE devices to request files that are needed to perform imaging tasks. The TFTP server also provides a central repository for these files.

A PXE device uses one of these servers to download the network bootstrap program (`nvlnbp.sys`).

The novell-zmgprebootpolicy daemon

PXE devices uses novell-zmgprebootpolicy to check if there are any imaging actions that need to be performed on the device. It forwards requests to novell-pbserv on behalf of PXE devices.

If you are using [Intel AMT](#), support for it should be enabled in the `novell-zmgprebootpolicy.conf` file.

Network Configuration

The configuration required to run Preboot Services in your network depends on your network setup. Design your network so that PXE devices can effectively connect to the server where the Preboot Services daemons are running. Make sure you consider the number of PXE devices to be installed on the network and the bandwidth available to service these devices. To understand how the devices and servers need to interact during the Preboot Services process, see [Section 22.4, “The Preboot Services Processes,” on page 224](#).

You can configure Preboot Services where Preboot Services and DHCP are running on the same server or on different servers in both LAN and WAN/VLAN environments:

- [“Understanding Preboot Services in LAN and WAN/VLAN Environments” on page 250](#)
- [“Comparing Preboot Services Setups in LAN and WAN/VLAN Environments” on page 250](#)
- [“Configuring LAN Environments for Preboot Services” on page 251](#)

- “Configuring a WAN/VLAN with Preboot Services and DHCP Running on the Same Server” on page 252
- “Configuring a WAN/VLAN With Preboot Services and DHCP Running on Separate Servers” on page 252

Understanding Preboot Services in LAN and WAN/VLAN Environments

Imaging servers should be installed so that PXE devices have access to imaging services within their LAN. A good design ensures that a client does not need to connect to imaging services through a slow WAN link.

While you can have any number of imaging servers, generally only one Proxy DHCP server should be enabled per DHCP server scope.

In a WAN, the PXE device is usually separated from the Proxy DHCP and DHCP servers by one or more routers. The PXE device broadcasts for DHCP information, but by default the router does not forward the broadcast to the servers, causing the Preboot Services session to fail.

In a VLAN (Virtual LAN) environment, the PXE device is logically separated from the Proxy DHCP server and the DHCP server by a switch. At the IP level, this configuration looks very similar to a traditional WAN (routed) environment.

In a typical VLAN environment, the network is divided into a number of subnets by configuring virtual LANs on the switch. Devices in each virtual LAN usually obtain their IP address information from a central DHCP server. In order for this system to work, it is necessary to have Bootp or IP helpers configured on each gateway. These helpers forward DHCP requests from devices in each subnet to the DHCP server, allowing the DHCP server to respond to devices in that subnet.

Comparing Preboot Services Setups in LAN and WAN/VLAN Environments

The following illustrates the differences for a LAN configuration between installing Preboot Services on the same server as DHCP, or on a separate server. In this case, only the PXE devices on the LAN connect to the Preboot Services imaging server.

Table 23-3 LAN Configuration Differences Between Same and Separate Servers

Information	On the Same Server	On Separate Servers
Configuration	<p>Because Preboot Services and DHCP are running on the same server, option tag 60 must be set on the DHCP server.</p> <p>For information on setting this tag, see “Configuring LAN Environments for Preboot Services” on page 251.</p>	None required.
Advantages	<ul style="list-style-type: none"> • Easy installation and setup. • No network configuration is required. 	<ul style="list-style-type: none"> • Easiest installation and setup. • No network configuration is required. • No DHCP server configuration is required.

Information	On the Same Server	On Separate Servers
Disadvantages	<ul style="list-style-type: none"> DHCP server configuration is required (option tag 60). Limited use, because a single-LAN environment only exists in small lab-type networks. 	<ul style="list-style-type: none"> Limited use, because a single-LAN environment only exists in small lab-type networks.

The following illustrates the differences for a WAN/VLAN configuration between installing Preboot Services on the same server as DHCP, or on a separate server. In this case, all PXE devices over the entire WAN/VLAN connect to the Preboot Services imaging server.

Table 23-4 WAN/VLAN Configuration Differences Between Same and Separate Servers

Information	On the Same Server	On Separate Servers
Configuration	<p>The routers/switches have been configured with IP helpers to forward network traffic to the DHCP server.</p> <p>Because Preboot Services and DHCP are running on the same server, option tag 60 is set on the DHCP server.</p> <p>For information on setting this tag, see “Configuring a WAN/VLAN with Preboot Services and DHCP Running on the Same Server” on page 252.</p>	<p>A DHCP relay agent or IP helper is configured on the router/switch serving the subnet that the PXE device belongs to. The helper is configured to forward all DHCP broadcasts that are detected in the subnet to the DHCP and Proxy DHCP servers.</p> <p>This normally requires two helpers to be configured: the first to forward DHCP broadcasts to the DHCP server, and the second to forward the DHCP broadcasts to the Proxy DHCP server.</p>
Advantages	<ul style="list-style-type: none"> No network equipment (routers/switches) needs to be configured to forward network traffic to the TFTP server. 	<ul style="list-style-type: none"> Common network setup. Multiple Preboot Services imaging servers can be installed so that each server provides service only for certain subnets.
Disadvantages	<ul style="list-style-type: none"> DHCP server configuration required (option tag 60). Only one Preboot Services imaging server can be installed because it needs to run on the same server as the DHCP server (and there is usually only one DHCP server). 	<ul style="list-style-type: none"> The network equipment (routers/switches) must be configured with additional IP helpers. Some network equipment might not function properly when more than one additional IP helper is configured.

Configuring LAN Environments for Preboot Services

For the case where you have Preboot Services and DHCP running on separate servers, no network configuration is required.

For the case where you have Preboot Services and DHCP are running on the same server, option tag 60 must be set on the DHCP server. Do the following to set up standard DHCP and Proxy DHCP on the same server:

- 1 Stop the DHCP services on the Linux imaging server.

2 On this server, open the `dhcp.conf` file in an editor.

3 Insert the following line in the file:

```
option vendor-class-identifier "PXEClient";
```

4 Save the file.

5 Restart the DHCP service.

Configuring a WAN/VLAN with Preboot Services and DHCP Running on the Same Server

You can install ZENworks Linux Management (which includes Preboot Services) on the same server where DHCP is installed and running. However, you must do the following to make it work:

- Set option tag 60 on the DHCP server so that it can work with the `novell-proxydhcp` daemon. See the steps in the previous section ([“Configuring LAN Environments for Preboot Services” on page 251](#)).
- On the Linux server, edit the `/etc/opt/novell/novell-proxydhcp.conf` file and change:

```
LocalDHCPFlag = 0
```

to

```
LocalDHCPFlag = 1
```

Then restart the daemon so that the change is recognized by entering the following command on the Linux server:

```
/etc/init.d/novell-procydhcp restart
```

IMPORTANT: If the switch is acting as a firewall and limiting the type of traffic on the network, understand that the `novell-tftp` and `novell-zmgprebootpolicy` daemons are not firewall or network filter friendly. You should not attempt to run these daemons through a firewall. If users need to pass preboot work through a firewall, then all Preboot Services work needs to be on the outside and merely reference a Web service inside the firewall.

Configuring a WAN/VLAN With Preboot Services and DHCP Running on Separate Servers

You can install ZENworks Linux Management (which includes Preboot Services) on a separate server than where DHCP is installed and running. However, you must configure the network equipment so that it correctly forwards Preboot Services network traffic.

IMPORTANT: If the switch is acting as a firewall and limiting the type of traffic on the network, understand that the `novell-tftp` and `novell-zmgprebootpolicy` daemons are not firewall or network filter friendly. You should not attempt to run these daemons through a firewall. If users need to pass preboot work through a firewall, then all Preboot Services work needs to be on the outside and merely reference a Web service inside the firewall.

An example deployment is given below of a WAN/VLAN environment with Preboot Services and DHCP running on the same server. The following sections provide the specific steps required to configure network equipment so that it correctly forwards Preboot Services network traffic.

Example Deployment

In this example, three VLANs are configured on a Bay Networks Accel 1200 switch running firmware version 2.0.1. One VLAN hosts the Proxy DHCP server, the second VLAN hosts the

DHCP server, and the third VLAN hosts the PXE device. The PXE device's DHCP broadcast is forwarded by the switch to both the Proxy DHCP server and the DHCP server. The response from both servers is then routed correctly back to the PXE device, and the PXE device starts the Preboot Services session correctly.

The three VLANs are all 24-bit networks; their subnet mask is 255.255.255.0.

The first VLAN gateway is 10.0.0.1. This VLAN hosts the PXE device that is allocated an IP in the range of 10.0.0.2 to 10.0.0.128. This VLAN is named VLAN1.

The second VLAN gateway is 10.1.1.1. This VLAN hosts the DHCP server with IP 10.1.1.2. This VLAN is named VLAN2.

The third VLAN gateway is 196.10.229.1. This VLAN hosts the server running novell-proxydhcp and novell-zmgprebootpolicy. The server's IP is 196.10.229.2. This VLAN is named VLAN3.

Routing is enabled between all VLANs. Each VLAN must be in its own spanning tree group.

Configuring Cisco Equipment

- 1 Go to the Global configuration mode.
- 2 Type `ip forward-protocol udp 67`, then press Enter.
- 3 Type `ip forward-protocol udp 68`, then press Enter.
- 4 Go to the LAN interface that serves the PXE device.
- 5 Type `ip helper-address 10.1.1.2`, then press Enter.
- 6 Type `ip helper-address 196.10.229.2`, then press Enter.
- 7 Save the configuration.

Configuring Nortel Network Equipment

- 1 Connect to the router with Site Manager.
- 2 Ensure that IP is routable.
- 3 Enable the *Bootp* check box on the PXE device subnet/VLAN.
- 4 Select the interface that the PXE devices are connected to.
- 5 Edit the circuit.
- 6 Click *Protocols*.
- 7 Click *Add/Delete*.
- 8 Ensure there is a check mark in the *Bootp* check box.
- 9 Click *OK*.
- 10 Click *Protocols > IP > Bootp > Relay Agent interface table*.
The interface where Bootp was enabled is visible in the list.
- 11 Click *Preferred server*.
- 12 Change the *Pass through mode* value to Bootp and DHCP.
- 13 Set up the relay agents:
 - 13a Click *Add*.
 - 13b In the *Relay agent IP address* box, type the local LAN IP address.

- 13c** In the *Target server IP address* box, type the DHCP server IP address.
- 13d** Click *OK*.
- 13e** Change the *Pass through mode* value to Bootp and DHCP.
- 13f** Perform **Step 1** to **Step 5** again and specify the Proxy DHCP server IP address at **Step 3**.
- 13g** Apply the configuration.

Configuring Bay Network Equipment

Perform the following steps on the switch:

- 1** Enable DHCP for the client VLAN using the following command lines:


```
# config vlan1 ip
# dhcp enable
```
- 2** Configure IP helpers to forward DHCP requests from the device subnet to the TFTP server, using the following command lines:


```
# config ip dhcp-relay
# create 10.0.0.1 10.1.1.2 mode dhcp state enable
# create 10.0.0.1 196.10.229.2 mode dhcp state enable
```

The create command has the form `create agent server mode dhcp state enable`, where *agent* is the IP address of the gateway that serves the PXE device, and *server* is the IP address of the server that the DHCP frame should be forwarded to.
- 3** Save the configuration.

Configuring Filters on Switches and Routers

Some network devices filter network traffic that passes through them. Preboot Services makes use of several different types of traffic, and all of these must be able to successfully pass through the router or switch for the Preboot Services session to be successful. The Preboot Services session uses the following destination ports:

Table 23-5 Destination Ports for Preboot Services

Component	Port
DHCP and Proxy DHCP servers	UDP Port 67, 68, and 4011
TFTP server	UDP Port 69
novell-zmgprebootpolicy	UDP Port 13331

IMPORTANT: If the switch is acting as a firewall and limiting the type of traffic on the network, understand that the novell-tftp and novell-zmgprebootpolicy daemons are not firewall or network filter friendly. You should not attempt to run these daemons through a firewall. If users need to pass preboot work through a firewall, then all Preboot Services work needs to be on the outside and merely reference a Web service inside the firewall.

Spanning Tree Protocol in Switched Environments

The spanning tree protocol (STP) is available on certain switches and is designed to detect loops in the network. When a device (typically a network hub or a device) is patched into a port on the switch, the switch indicates to the device that the link is active, but instead of forwarding frames from the port to the rest of the network, the switch checks each frame for loops and then drops it. The switch can remain in this listening state from 15 to 45 seconds.

The effect of this is to cause the DHCP requests issued by PXE to be dropped by the switch, causing the Preboot Services session to fail.

It is normally possible to see that the STP is in progress by looking at the link light on the switch. When the device is off, the link light on the switch is obviously off. When the device is turned on, the link light changes to amber, and after a period of time changes to a normal green indicator. As long as the link light is amber, STP is in progress.

This problem only affects PXE devices that are patched directly into an Ethernet switch. To correct this problem, perform one of the following:

- Turn off STP on the switch entirely.
- Set STP to Port Fast for every port on the network switch where a PXE device is attached.

After the problem is resolved, the link light on the port should change to green almost immediately after a device connected to that port is turned on.

Information about STP and its influence on DHCP can be found at [Using PortFast and Other Commands to Fix End-Station Startup Connectivity Problems \(http://www.cisco.com/univercd/cc/td/doc/cisintwk/itg_v1/tr1923.htm#xtocid897350\)](http://www.cisco.com/univercd/cc/td/doc/cisintwk/itg_v1/tr1923.htm#xtocid897350).

23.3.3 Administering Preboot Services

This section includes information about administering and configuring Preboot Services:

- “Configuring Preboot Services Imaging Servers in Linux” on page 255
- “Configuring IP Port Usage” on page 257

Configuring Preboot Services Imaging Servers in Linux

In Preboot Services, the daemons do not use switches. Instead, to configure a daemon to do something that is not a default, you need to edit the configuration files.

You can edit configuration files while the daemon is running, because they are only read when the daemon starts. Therefore, after editing the file you must restart the daemon for the changes to take effect.

For more information on the daemon configuration files, see [Section B.7, “Imaging Server,” on page 414](#).

The following sections explain how to configure the following ZENworks Linux Management imaging servers:

- “Configuring the TFTP Server” on page 256
- “Configuring the Proxy DHCP Server” on page 256
- “Configuring the Novell-pbserv Daemon” on page 256

- “Configuring Novell-zmgprebootpolicy” on page 257
- “Configuring the DHCP Server” on page 257

Configuring the TFTP Server

It is seldom necessary to change the default TFTP server configuration values. If you need to change them, use the following procedure:

- 1 Open the following file in an editor:

```
/etc/opt/novell/novell-tftp.conf
```

- 2 Edit the configuration settings per instructions within the file.
- 3 Save the changes.
- 4 In a shell console, enter the following command:

```
/etc/init.d/novell-tftp restart
```

Configuring the Proxy DHCP Server

The Proxy DHCP server provides PXE devices with the information that they require to be able to connect to the Preboot Services system.

Use the following steps to modify the settings of novell-proxydhcp:

- 1 Open the following file in an editor:

```
/etc/opt/novell/novell-proxydhcp.conf
```

- 2 Edit the configuration settings per instructions within the file.
- 3 Save the changes.
- 4 In a shell console, enter the following command:

```
/etc/init.d/novell-proxydhcp restart
```

You can set any of the IP address fields in the configuration utility to 0.0.0.0. The server replaces these entries with the IP address of the first network adapter installed in the server.

Configuring the Novell-pbserv Daemon

The novell-pbserv daemon provides imaging services to the devices.

Use the following steps to modify the settings of novell-pbserv:

- 1 Open the following file in an editor:

```
/etc/opt/novell/zenworks/preboot/novell-pbserv.conf
```

- 2 Edit the configuration settings per instructions within the file.
- 3 Save the changes.
- 4 In a shell console, enter the following command:

```
/etc/init.d/novell-pbserv restart
```


Configuring Novell-zmgprebootpolicy

The novell-zmgprebootpolicy daemon is used to check if there are any imaging actions that need to be performed on the device. It forwards requests to novell-pbserv on behalf of PXE devices.

Use the following steps to modify the settings of novell-zmgprebootpolicy:

- 1 Open the following file in an editor:

```
/etc/opt/novell/zenworks/preboot/novell-zmgprebootpolicy.conf
```

- 2 Edit the configuration settings per instructions within the file.

- 3 Save the changes.

- 4 In a shell console, enter the following command:

```
/etc/init.d/novell-zmgprebootpolicy restart
```

Configuring the DHCP Server

The DHCP server needs to have option 60 (decimal) added to the DHCP tags if the Proxy DHCP and DHCP servers are running on the same physical server. This option should be a string type and must contain the letters PXEClient.

For more information, see [“Configuring LAN Environments for Preboot Services” on page 251](#).

Configuring IP Port Usage

This section describes the network ports used by Preboot Services. Using the information in this section, you can configure routers to correctly forward the network traffic generated by Preboot Services. For further information about configuring routers, see [Section 23.3.2, “Deploying Preboot Services In a Network Environment,” on page 248](#).

Preboot Services uses both well-known and proprietary IP ports.

The well-known IP ports include:

- **67 decimal:** The Proxy DHCP server listens on this port for PXE information requests. This is the same port used by a standard DHCP server.
- **68 decimal:** The DHCP/Proxy DHCP server responds to client requests on this port. This is the same port used by a standard DHCP server.
- **69 decimal:** The TFTP server listens on this port for file requests from PXE devices.
- **4011 decimal:** When running on the same server as the DHCP daemon, the Proxy DHCP server listens on this port for PXE information requests.

The proprietary IP ports include:

- **998 decimal:** novell-pbserv client connection port. The novell-pbserv daemon receives all connection requests from the Preboot Services devices on this port.
- **13331 decimal:** novell-zmgprebootpolicy client connection port. The novell-zmgprebootpolicy daemon receives all connection requests from the PXE devices on this port.

While PXE devices make their initial requests to the novell-tftp and novell-zmgprebootpolicy daemons on the ports listed above, the remainder of the transactions can occur on any available port. For this reason, imaging servers cannot be separated from their clients by a firewall.

IMPORTANT: The novell-tftp and novell-zmgprebootpolicy daemons are not firewall or network filter friendly. You should not attempt to run these daemons through a firewall. If users need to pass preboot work through a firewall, then all Preboot Services work needs to be on the outside and merely reference a Web service inside the firewall.

23.3.4 Editing the Preboot Services Menu

Depending on the configuration settings for Preboot Services in the ZENworks Control Center, PXE devices may be able to display the Preboot Services Menu during the boot process. The menu has the following options:

Start ZENworks Imaging
Start ZENworks Imaging Maintenance
Disable the ZENworks Partition
Enable the ZENworks Partition
Exit

For more information on configuring whether to display the menu, see [Section 23.4.1, “Configuring Preboot Menu Options,” on page 261](#).

There might be circumstances when you want to modify the options on the Preboot Services Menu. You can customize these options by editing a text file contained on the imaging server. For example, you can:

- Add, delete, and modify menu options
- Change the color scheme
- Change the menu title and screen name

The following procedure should be done on each imaging server where you want to customize the menu.

To edit the Preboot Services Menu:

- 1 In a text editor, open the following file on an imaging server where novell-proxydhcp is running:

```
/srv/tftp/pxemenu.txt
```

IMPORTANT: If you want to save the default options for this menu, we recommend that you make a backup copy of `pxemenu.txt`, such as `pxemenu_orig.txt`.

A `pxemenu65.txt` file also exists for use by ZENworks 6.5 PXE devices that attach to ZENworks 7 servers through Preboot Services server referrals (see [Section 22.3.6, “Preboot Referral Lists,” on page 222](#)). Its content and format is the same as `pxemenu.txt`, so instructions in this section apply equally to `pxemenu65.txt`, except where data is different for ZENworks 6.5.

The following is the content of the default Preboot Services Menu's `pxemenu.txt` file:

```
#This file describes a PXEMenu

ScreenName = Novell Preboot Services Menu
ScreenInfo = Version 1.1 July, 2005
MenuTitle = ZENworks Preboot Options

#The screen colors determine the color of the main part of the menu
screen
ScreenColor = bright_white
ScreenBackgroundColor = blue

#The info colors determine the color of the screen information at
the top
#of the menu screen
InfoColor = yellow
InfoBackgroundColor = blue

#The hint colors determine the color of the hint line at the bottom
of the screen
HintColor = lt_cyan
HintBackgroundColor = blue

#The menu colors determine the color of the menu box and menu title
MenuColor = yellow
MenuBackgroundColor = blue

#The option colors determine the color of the menu option
OptionColor = BRIGHT_WHITE
OptionBackgroundColor = BLUE

#The chosen colors determine the color of the high-lighted option
ChosenColor = BRIGHT_WHITE
ChosenBackgroundColor = RED

#Maximum of 9 menu items
MenuOptionCount = 5

option1 = Start ZENworks Imaging
option2 = Start ZENworks Imaging Maintenance
option3 = Disable ZENworks Partition
option4 = Enable ZENworks Partition
option5 = Exit

CFG1 = z_auto.cfg
CFG2 = z_maint.cfg
CFG3 = z_zpdis.cfg
CFG4 = z_zpen.cfg
CFG5 = 0

Hint1 = ZENworks Imaging in Automated Mode
Hint2 = ZENworks Imaging Linux Session in Interactive Mode
Hint3 = Disable Existing ZENworks Partition
```

Hint4 = Re-enable a Disabled ZENworks Partition
Hint5 = Boot to Local Hard Drive

- 2 To change the appearance of the menu, edit the first seven sections (title and colors).

To change colors, the mnemonics you enter must be selected from the following:

BLACK	RED	GRAY	LT_GREEN
BLUE	MAGENTA	YELLOW	LT_CYAN
GREEN	BROWN	BRIGHT_WHITE	LT_RED
CYAN	WHITE	LT_BLUE	LT_MAGENTA

- 3 To change the menu options, edit the last four sections, beginning with “MenuOptionCount.”

The menu options, their code, and their hint descriptions are correlated by the number (see “#” where used below).

MenuOptionCount: This number must match the total number of options defined in the next three sections. The limit is 9 menu options.

option#: Displayed in the menu as the option’s text.

CFG#: The configuration file that is used upon selecting the menu option.

Hint#: Displayed in the bottom of the screen to explain the highlighted menu option’s function. It changes as you highlight a menu option.

IMPORTANT: If you add or subtract a menu option, make sure that you do the same thing to each of the last three sections. The numbering should be consecutive (such as 1 through 5). Be sure to keep the corresponding items matched in each of the last three sections.

- 4 When finished, save the `pxemenu.txt` file.

23.4 Configuring Preboot Services Defaults

You can configure Preboot Services default settings for a ZENworks Management Zone. These are settings that apply globally to all devices in the management zone.

Some of these settings enable you to automatically register devices with the ZENworks Linux Management server, and some can be overridden by configurations done for devices or folders containing devices. For more information, see [Section 23.5, “Overriding Preboot Services Defaults,” on page 279](#).

The following default settings can be configured in the ZENworks Control Center:

- [Section 23.4.1, “Configuring Preboot Menu Options,” on page 261](#)
- [Section 23.4.2, “Configuring Image Storage Security,” on page 262](#)
- [Section 23.4.3, “Configuring Non-registered Device Settings,” on page 264](#)
- [Section 23.4.4, “Configuring Preboot Work Assignments,” on page 267](#)
- [Section 23.4.5, “Configuring the Server Referral List,” on page 274](#)
- [Section 23.4.6, “Configuring Intel Active Management Technology \(AMT\),” on page 275](#)

23.4.1 Configuring Preboot Menu Options

To determine whether the Preboot Services Menu should be displayed on your devices when they boot:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings			
Category	Description	Is Configured	
System Variables	Configure system variables.	Yes	
Device Refresh Schedule	Configure the device refresh interval.	No	
Device Inventory	Configure inventory settings.	No	
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes	
Preboot Services	Configure Preboot Services.	Yes	
Remote Management	Enable and configure remote management.	Yes	
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes	
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes	
Platforms	Configuration of the available target platforms.	Yes	

- 2 In this section, click *Preboot Services* to display the configuration sections.
- 3 Locate the Preboot Menu Options section:

Preboot Menu Options		
Determine if the Preboot eXecution Environment (PXE) menu should be displayed when a client boots.		
<input type="radio"/>	Always show Preboot menu	
<input type="radio"/>	Never show Preboot menu	
<input checked="" type="radio"/>	Show Preboot menu if CTRL+ALT pressed	

- 4 Select one of the following:

Always Show Preboot Menu

Never Show Preboot Menu

Show Preboot Menu if CTRL+ALT Pressed

- 5 Click either *Apply* or *OK* to save the change.

This sets the default Preboot Services Menu display mode for the ZENworks Management Zone. This can be overridden at the folder or device level. For more information, see [Section 23.5, “Overriding Preboot Services Defaults,” on page 279](#).

IMPORTANT: PXE must be enabled on the device for the menu to be displayed.

The Preboot Services menu provides options for how Preboot Services can be used on your devices. The following options are presented when the menu is displayed:

Table 23-6 *Preboot Services Menu Options*

Menu Option	Function
<i>Start ZENworks Imaging</i>	Executes the assigned Preboot Services imaging bundles.
<i>Start ZENworks Imaging Maintenance</i>	Displays the bash prompt, where you can execute imaging commands.
<i>Disable ZENworks Partition</i>	Prevents an existing ZENworks partition from being used when booting to execute the assigned Preboot bundles.
<i>Enable ZENworks Partition</i>	Allows an existing ZENworks partition to be used when booting to execute the assigned Preboot bundles.
<i>Exit</i>	Resumes booting of the device without doing any Preboot bundle work.

Generally, if your Preboot Services work is completely automated, you should select to never display the Preboot Menu on the device when it boots. Conversely, if you need to do manual Preboot Services functions for some or all devices, then select to always display the menu. A compromise is where you select to display the menu if Ctrl+Alt is pressed, allowing unattended Preboot Services work while allowing you the opportunity to display the menu when needed.

23.4.2 Configuring Image Storage Security

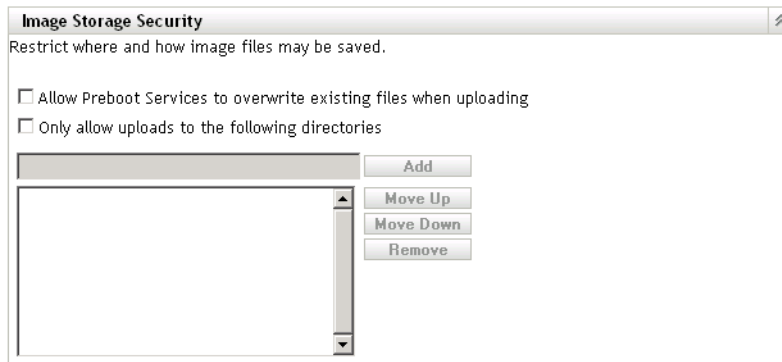
To determine the degree of security you want with respect to saving image files:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings		
Category	Description	Is Configured
System Variables	Configure system variables.	Yes
Device Refresh Schedule	Configure the device refresh interval.	No
Device Inventory	Configure inventory settings.	No
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes
Preboot Services	Configure Preboot Services.	Yes
Remote Management	Enable and configure remote management.	Yes
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes
Platforms	Configuration of the available target platforms.	Yes

- 2 In this section, click *Preboot Services* to display the configuration sections.

3 Locate the Image Storage Security section:



4 Select one or both of the following options:

Allow Preboot Services to overwrite existing files when uploading: Select this option only if you want existing image files to be overwritten during imaging.

Only allow uploads to the following directories: This option allows you to determine where images can be restored on the imaging server.

Specify a full path to the directory in the *Add* field, then click *Add* to enter it into the list box. These are the directories where images are allowed to be saved on the imaging server. These are the locations that can be selected when configuring where to store image files.

Use *Move up* or *Move down* to rearrange the order of the locations, including the order of the imaging servers that are listed.

To remove a directory path from the listing, select the path and click *Remove*. You can select multiple paths for removing.

5 Click either *Apply* or *OK* to save the changes.

This sets the default image storage settings for the ZENworks Management Zone.

23.4.3 Configuring Non-registered Device Settings

The following configurations can be set after a device is imaged. The settings are applied to devices not registered in the ZENworks Management Zone.

For more information, see [Section 22.3.4, “Non-registered Device Settings,”](#) on page 220.

To configure default ID settings for non-registered devices:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings			
Category	Description	Is Configured	
System Variables	Configure system variables.	Yes	
Device Refresh Schedule	Configure the device refresh interval.	No	
Device Inventory	Configure inventory settings.	No	
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes	
Preboot Services	Configure Preboot Services.	Yes	
Remote Management	Enable and configure remote management.	Yes	
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes	
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes	
Platforms	Configuration of the available target platforms.	Yes	

- 2 In this section, click *Preboot Services* to display the configuration sections.
- 3 Locate the Non-Registered Device Settings section:

Non-Registered Device Settings

Configuration settings to apply to non-registered devices after an image has been restored.

DNS Suffix:

Name Servers:

Device Name:
☐ Use Prefix:
☐ Use BIOS Asset Tag
☐ Use BIOS Serial Number
☒ Do not automatically assign a name

IP Configuration:
☐ Use DHCP
☒ Specify Address List:

4 Fill in the fields:

DNS suffix: Provides a suffix for all of your device's names.

For example, if you enter "provo.novell.com" and a device's name is "device1," that device's full name becomes "device1.provo.novell.com."

Name servers: To control what DNS servers the device uses, specify a DNS name server, then click *Add* to place it into the listing.

So that a booting device can find a name server efficiently, specify multiple DNS name servers.

For optimal availability of a DNS server for a device, you can rearrange the order using *Move up* and *Move down*, one name server entry at a time.

You can delete multiple name servers by selecting them and clicking *Remove*.

Device name: You can determine the default device names for non-registered devices. The name is applied after the device is imaged.

This can be useful for when you have multiple devices to be imaged. You can automatically provide unique names for each device (from its BIOS asset tag or its BIOS serial number), as well as group devices by providing the same prefix for their names.

Options:

- **Use prefix: ____:** This provides a common prefix to the device names, such as Lab1 to distinguish them from the devices in Lab2. This can be useful when doing bulk imaging of certain groups of devices. It is limited to 8 characters.

If this option is used, the prefix you enter here is appended with a random string of letters and numbers to make the device name 15 characters long. Underscores and hyphens are valid in your prefix. The remaining random string uniquely names the device.

For example, if you enter Lab1_, then ten other characters are randomly generated to complete the name with Lab1 separated from the random characters by the underscore for readability.

- **Use BIOS asset tag:** This is the asset tag stored in the device's BIOS, which is unique for every device. This can be useful for tracking a device based on its asset tag.
- **Use BIOS serial number:** This is the serial number stored in the device's BIOS, which is unique for every device. This can be useful for tracking a device based on its serial number.
- **Do not automatically assign a name:** Select this option if you do not want to use any of the above. This is the default option.

IP configuration: You can select either *Use DHCP* or *Specify address List* to identify devices for Preboot Services work.

IP Configuration:

☐ Use DHCP

☒ Specify Address List:

Subnet Mask:

Default Gateway:

IP Addresses Available for Machines:

Start and end of IP Address Range
(leave end of range field empty for single IP address entry)

to

Add

Move Up

Move Down

Remove

IP Addresses Currently Assigned:

These are the settings that the device is told to use after it is imaged. It uses them for Preboot Services work any time it reboots.

- **Use DHCP:** Select to use DHCP, which allows the devices to be dynamically assigned IP addresses.
- **Specify address list:** You can use IP addresses to identify your devices. The addresses you add to the list are available to be used by your devices. This way, you can specify a range of IP addresses or individual IP addresses that you want your devices to use. For example, you can ensure that all of your lab devices use addresses between 10.0.0.5 and 10.0.0.25.

If you select this option, the following fields are displayed:

Subnet mask: (Optional) For assigning devices to a specific subnet mask.

Default gateway: (Optional) For assigning devices to a specific gateway for access to the Internet or network after the device is imaged and rebooted.

IP addresses available for machines: According to the information you provide in this section, this list box displays the available IP addresses for your devices to use.

Start and end of IP address range: Do either of the following:

- Specify one IP address at a time in the first field and click *Add* each time to place it into the list box.
- Specify a range of IP addresses and click *Add* to place them into the list box. Each IP address in a range is listed independently, allowing you to selectively remove any of them from within the range.

You can select multiple IP addresses for removal.

IP addresses currently assigned: This display-only list box shows which IP addresses from the IP Addresses Available for Machines list have been assigned to a device. When they are displayed here, they are no longer displayed in the list box above.

After a device is imaged, IP settings are applied to the device. The IP address that is assigned to the imaged device is no longer in the available list, but is instead listed in this currently assigned list.

- 5 Click either *Apply* or *OK* to save the changes.

This sets the default device ID method for the ZENworks Management Zone.

23.4.4 Configuring Preboot Work Assignments

This section allows you to set up Preboot work assignments for your defined bundles for non-registered devices, or registered devices that do not have an effective bundle defined.

In this section of the Preboot Services page, you can set up rules for your Preboot bundles. Work assignment rules are hardware keys used to determine which bundle should be applied to which device. When a device is seeking work to be done, it scans the rules until it finds a rule where all of the rule's filters match the device, then executes the bundle assigned to the rule.

For more information, see [Section 22.3.5, “Preboot Work Assignment Rules,”](#) on page 220.

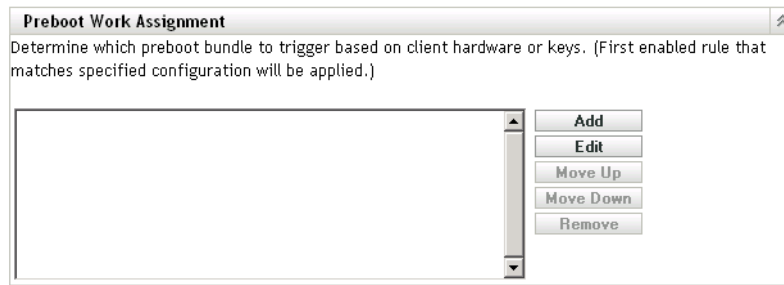
To configure work assignment rules:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings			
Category	Description	Is Configured	
System Variables	Configure system variables.	Yes	
Device Refresh Schedule	Configure the device refresh interval.	No	
Device Inventory	Configure inventory settings.	No	
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes	
Preboot Services	Configure Preboot Services.	Yes	
Remote Management	Enable and configure remote management.	Yes	
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes	
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes	
Platforms	Configuration of the available target platforms.	Yes	

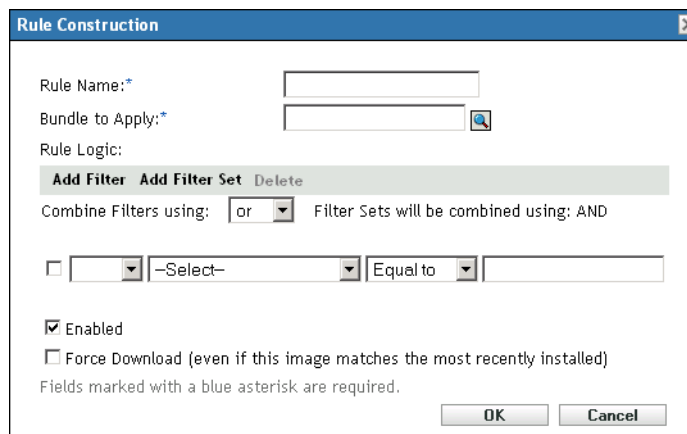
- 2 In this section, click *Preboot Services* to display the configuration sections.

3 Locate the Preboot Work Assignment section:



4 Click *Add* to configure a rule.

The information configured in the Rule Construction dialog box comprises one rule. You can add multiple rules. The rules are used to determine whether there is a device that should have any preboot work done. If so, it only does the effective preboot work assigned to it.



5 In the Rule Construction dialog box, provide a name for the work rule in the *Rule name* field.

This is the name that is displayed in the rules listing on the Preboot Services page in the Preboot Work Assignment section. Make it descriptive enough that you can later remember its purpose.

6 In the *Bundle to apply* field, browse for or specify the bundle where you want to apply this rule.

Each rule can be applied to only one bundle. However, you can apply multiple rules to a bundle.

When a device boots and searches the Preboot Work Assignment section for work, if the device meets a rule's criteria, the rule's applicable bundle is applied to the device.

Because the rules, not the bundles, are listed in the Preboot Work Assignment section, you can apply multiple rules to a given bundle. In that case, such a bundle has multiple chances to be selected for preboot work.

When multiple rules are listed, the first rule to have criteria to match a device causes that rule's assigned bundle to be applied to the device.

If no rules match a device, then the effective bundle is not applied to the device.

7 Review the following to understand how to configure the work rule logic:

Rule Construction

Rule Name:*

Bundle to Apply:*

Rule Logic:

Add Filter **Add Filter Set** **Delete**

Combine Filters using: **and** Filter Sets will be combined using: **OR**

☐ **-Select-** **Equal to** **and**

☐ **-Select-** **Equal to**

OR

☐ **-Select-** **Equal to**

OR

☐ **-Select-** **Equal to** **and**

☐ **-Select-** **Equal to** **and**

☐ **-Select-** **Equal to**

☒ **Enabled**

☐ **Force Download (even if this image matches the most recently installed)**

Fields marked with a blue asterisk are required.

OK **Cancel**

A rule is made up of one or more filters that are used to determine whether a device complies with the rule. The Rule Construction dialog box begins with one empty filter. A device must match the entire filter list of a rule (as determined by the logical operators that are explained below) for the rule to apply to the device.

A filter is a row of fields providing a condition that must be met by a device in order for the bundle to be applied. For example, you can add a filter to specify that the device must have exactly 512 MB of RAM in order to be accepted by the rule, and you can add another filter to specify that the hard drive be at least 20 GB in size. There is no technical limit to the number of filters that you can add in the rule, but there are practical limits, such as:

- Designing a rule that is easy to understand
- Devising the rule so that you do not accidentally create conflicting filters
- Being able to view the dialog box as it grows in size because of the filters that you add

Filters can be added individually or in sets. Each set contains logical operators within the set. The logical operator **OR** is displayed by default for the filters within a set in the *Combine filters using* field, which you can change, and **AND** is displayed in the *Filter sets will be combined using* field, which is display-only. In other words, the logical operator that is used within a set must be opposite the operator that is used between the sets.

You can think of filters and filter sets using algebraic notation parentheses, where filters are contained within parentheses, and sets are separated into a series of parenthetical groups. Logical operators (**AND** and **OR**) separate the filters within a the parentheses, and the operators are used to separate the parentheticals.

For example, “(u AND v AND w) OR (x AND y AND z)” means “match either uvw or xyz.” In the Rule Construction dialog box, this looks like:

u AND
v AND
w
OR
x AND
y AND
z

Filter sets cannot be nested. You can only enter them in series, and the first filter set to match the device is used to validate using the applied bundle to do preboot work on the device. Therefore, the order they are listed does not matter. You are simply looking for a match to cause the bundle to be applied to the device.

TIP: You can easily run a test to see how these logical operators work. Access the Rule Construction dialog box, click both the *Add filter* and *Add filter set* options a few times each to create a few filter sets, then switch between AND and OR in the *Combine filters using* field and observe how the operators change. Click *Cancel* to exit the Rule Construction dialog box when you are finished.

You can set up the conditions for a rule by adding all of the filters and filter sets that you need to identify the type of device you want to match. You typically do not need to set up complex rules. However, because you can apply multiple rules to a bundle, you can further complicate the use of logical operators, because each rule is considered to be an OR condition for the bundle, causing the bundle to be applied if any one of the rules matches the device. Therefore, keep in mind the OR condition of multiple rules for a bundle when designing your rules.

For example, you could create several rules for the bundle with each rule being a long listing of AND conditions to be met. Therefore, each rule becomes a specific set of criteria for a device to meet, causing the bundle to be applied if one is met. Conversely, if you have that same amount of information in one rule (using filter sets for the AND and OR conditions), it might make the dialog box so long that it becomes unmanageable.

To determine whether you need one filter set with multiple filters, multiple filter sets with only one or a few filters per set, multiple filter sets each with multiple filters, or even multiple rules per bundle, remember that the logical operators for filters within a set are the opposite of the operators between the sets, and all rules for a bundle use the OR condition. For example, when selecting the operator in the *Combine filters using* field:

Operator Selected	Within Filter Sets	Between Filter Sets	Multiple Rules Per Bundle
OR	Only one filter in the set needs to apply to the device (OR condition). The first filter that applies is used.	Each filter set must have one filter in it that applies to the device (AND condition).	The first rule that applies is used (OR condition).
AND	All filters within the set must apply to the device (AND condition).	Only one filter in the set must apply to the device (OR condition). The first filter that applies is used.	The first rule that applies is used (OR condition).

Obviously, adding filter sets complicates the use of logical operators, and adding multiple rules to the bundle further complicates it. Therefore, carefully plan how to place your information before using this dialog box.

8 To add or remove filters and filter sets, select from the following:

- **Add filter:** Adds one filter (a row of fields) after the last filter in this dialog box.

Subsequent clicks of the *Add filter* option add those filters to the end of the current set, which is the last listed filter set when there are multiple filters in the set (see **Add Filter Set** below). You cannot insert a new filter between existing filters.

The order of the filters in a set does not matter, and you cannot reorder the filters after you have created them. What matters in this structure is properly grouping the filters with respect to the selected *OR* and *AND* operator options.

- **Add filter set:** Adds the next filter as a filter set with either *AND* or *OR* placed between the filter sets, as dictated by your selection in the *Combine filters using* field.

To create filter sets, first click *Add filter set*, then click *Add filter* as many times as necessary to add filters into that set.

You cannot insert filter sets between existing filter sets.

- **Delete:** Deletes any filters that are selected (see **Check Box** below in **Step 10**).

9 To determine the filter and filter set logic, select *AND* or *OR* from the *Combine filters using* drop-down list.

The logical operator you select here determines which operator is used within the filter sets. The operator for this field applies to multiple sets.

To provide multiple sets for the rule, indicate whether the sets should all be required (select *AND*) or are all optional (keep *OR*). If *OR*, then the values in only one of the sets need to match the device for the rule to apply. If *AND*, then all values in the entire rule must match the device for the rule to apply.

If you only have one filter set (which could contain several filters), *AND* is the default logical operator within the set, because *OR* defaults in the *Combine filters using* field, which you can change.

Filter sets will be combined using is a display-only field. When providing multiple sets for the rule, this field displays the opposite logical operator from the one you select for the *Combine filters using* field.

To require all filters within a filter set, but only one of the filter sets, select *OR* in the *Combine filters using* field. To require all filter sets, but only one of the filters within each set, select *AND* in the *Combine filters using* field.

10 To configure rule filters, fill in the fields:

- **Check box:** Selects filters for deletion.
- **Drop-down list:** If blank, this field means to do as worded in the filter. If you select *NOT*, it means to do the opposite of what the filter says.

For example, if you select *NOT* and the RAM size is configured to be “less than 512 MB,” then the device must have at least 512 MB of RAM for the bundle to be applied. In other words, the filter reads “not less than 512 MB of Ram.” Conversely, if you configured it as “more than 512 MB,” then left the field blank, any computer containing exactly 512 MB of RAM is excluded, which you might not intend. So, be sure that you think the logic through for your filter configurations with respect to whether you use *NOT*.

- **Device component:** A drop-down list provides the various items available for matching on the device in order to determine whether the work rule applies for the bundle. The options are:

BIOS Asset Tag
 BIOS Serial Number
 BIOS Version
 CPU Chipset
 Hard Disk Controller
 Hard Drive Size (in MB)
 IP Address
 MAC Address
 Network Adapter
 RAM (in MB)
 Sound Card
 System Manufacturer
 Video Adapter

If the drop-down list on the left displays NOT, then the work rule is stating that the device should not match the component as described in the next two fields.

- **Relationship to:** This defines the relationship for a filter between the *Device component* field listed above and the value provided in the *Value for the component* field.

The possible options for the *Hard drive size* and *RAM* fields are:

< (less than)
 > (greater than)
 = (equal to)
 >= (greater than or equal to)
 <= (less than or equal to)
 <> (not equal to)

For all other components, the options are:

Contains
 Equal To
 Starts With

If the drop-down list on the left displays NOT, then the work rule is stating that the component does the opposite. For example, does NOT Contain, is NOT Equal To, does NOT Start With, is NOT >, is NOT >=, is NOT =, is NOT <>, and so on.

- **Value for the component:** Enter the information that exactly describes the device component's value that the device must match to accept the rule. For example, 512 could be entered for the *RAM* field value in *Device component* field, meaning the device must have that amount of RAM, or more or less, depending on the selections you make in the other fields in the filter.

IMPORTANT: Be aware of the possibility of creating conflicting filters. For example, if the *RAM (in MB)* field is used in multiple filters, make sure the effective logical operators where each is used make sense for the MB values that you enter. You could have one filter requiring exactly 512 MB of RAM and another accepting a device having at least 512 MB

of RAM. If those filters are both required for the device to match the rule (this is with the AND condition existing between them), you'd have a conflict that causes the filter to fail its purpose.

- 11** Because you can create multiple rules to be listed here, and the information configured in the Rule Construction dialog box comprises one rule, repeat **Step 8** through **Step 10** as necessary.

- 12** To enable this work rule, select the check box for the *Enabled* field.

After you exit this dialog box, you can see whether the work rule is enabled by viewing the work rules listing on the Preboot Services page.

To enable or disable a rule after creating it, you must edit the work rule from the Preboot Services page.

- 13** To force the image to be reapplied to the device, select the check box for the *Force download* field.

By default, ZENworks imaging does not reimage a machine containing the same image. This option allows you to force the image to be reapplied to the device. For example, you might want to refresh all of your lab machines for the next use of the lab.

IMPORTANT: Use this option cautiously, because you can create an endless loop when the option remains selected after an image is applied. If you image a device that remains non-registered after it is imaged, it is reimaged with the same image over and over each time it boots. To prevent this, after you have imaged the applicable devices, deselect this option.

- 14** After exiting the Rule Construction dialog box, you can manipulate the order and existence of the listed rules:

Edit: Opens the Rule Construction dialog box in edit mode.

Move up/down: After adding rules, you can change the order in which they are to be executed. You can only move one rule at a time. This order is important because the first rule that is found in the listing to match the device is used to apply the bundle, and the remainder of the rules are ignored.

Remove: Removes the selected rules.

- 15** Click either *Apply* or *OK* to save the changes.

23.4.5 Configuring the Server Referral List

Referral lists are used to make sure managed devices belonging to other ZENworks Management Zones can access their home zone. For more information, see [Section 22.3.6, “Preboot Referral Lists,” on page 222](#).

To set up referral lists:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings		
Category	Description	Is Configured
System Variables	Configure system variables.	Yes
Device Refresh Schedule	Configure the device refresh interval.	No
Device Inventory	Configure inventory settings.	No
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes
Preboot Services	Configure Preboot Services.	Yes
Remote Management	Enable and configure remote management.	Yes
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes
Platforms	Configuration of the available target platforms.	Yes

- 2 In this section, click *Preboot Services* to display the configuration sections.
- 3 Locate the Server Referral List section:

Server Referral List

List the servers outside the zone that can host preboot operations.

It is sometimes useful to have multiple servers assigned to handle imaging tasks. For example, one server hosting PXE services, while another is used to store image files. Refer to the documentation for further examples and a full description of this feature.

List of Server IP Addresses and DNS Names

Add

Move Up

Move Down

Remove

- 4 Specify the ZENworks Linux Management servers:

List of server IP addresses and DNS names: Specify the DNS name or IP address of a server that can host Preboot operations, then click *Add* to place the server into the referral list.

Move up/Move down: Arranges the order in which the servers are contacted. You can move only one server at a time.

Remove: To remove a server from the list, select the server, then click *Remove*.

- 5 Click either *Apply* or *OK* to save the changes.

- 6 Depending on the ZENworks version of the server, do the following to copy the necessary files from the ZENworks Linux Management imaging server to your `\tftp` directory on the servers in your referral list:

ZENworks Version	Files to Copy	Action
ZENworks 6.5	<code>/svr/tftp/z_auto65.cfg</code> <code>/svr/tftp/pxelinux.0</code>	Copy the files.
ZENworks 7 (running on a NetWare or Windows server)	<code>/svr/tftp/z_auto.cfg</code> ¹ <code>/svr/tftp/pxelinux.0</code>	Copy both of the files, but rename <code>z_auto.cfg</code> to <code>z_auto65.cfg</code> .

¹ This file may not contain the same information as `/svr/tftp/z_auto65.cfg`, so that when you rename it with the 65, it may have different content than the file used for ZENworks 6.5 servers. Therefore, for ZENworks 7 do not simply copy the `z_auto65.cfg` file instead of renaming the `z_auto.cfg` file.

No files need to be copied for servers running the following ZENworks versions:

ZENworks 7 (running on a Linux server)
ZENworks 7 Linux Management

23.4.6 Configuring Intel Active Management Technology (AMT)

To set up global Intel AMT enterprise names:

- “Downloading and Installing the iAMT Redirection Drivers” on page 275
- “Provisioning the AMT Devices” on page 276
- “Setting Up the Global Intel AMT Enterprise Names” on page 278

Downloading and Installing the iAMT Redirection Drivers

After a device has had its AMT resources provisioned, those resources can be accessed locally by the ZENworks implementation of AMT. However, to provision a device’s resources, you need the iAMT Redirection Drivers from Intel.

To download and install the device drivers:

- 1 In a Web browser, access [Intel\(R\) PRO/10/100/1000/10GbE Drivers \(http://sourceforge.net/projects/e1000/\)](http://sourceforge.net/projects/e1000/) on the SourceForge Web site.
- 2 Click the green *Download Intel(R) PRO/10/100/1000/10GbE Drivers* option.
- 3 In the *Latest File Releases* section, select the *iAMT Redirection Drivers* option.
- 4 Click the green *Download* option.
- 5 In the *Filename* column under *iAMT Redirection Drivers*, click the *iamt-1.1.8.tar.gz* option (or later version) and save the file to a location on your network.
- 6 Unzip the `.tar.gz` file and decompress the `iamt-1.1.8.tar` (or later version) file.
- 7 To install the drivers, follow the instructions contained in the `Readme` file that is contained in the `.tar` file.

Provisioning the AMT Devices

You can provision your AMT devices in either of two ways:

- “Provisioning in Enterprise Mode” on page 276
- “Provisioning in Small Business Mode” on page 276

Provisioning in Enterprise Mode

If you use another AMT-enabled application that requires the AMT devices to be provisioned in Enterprise mode, do the following:

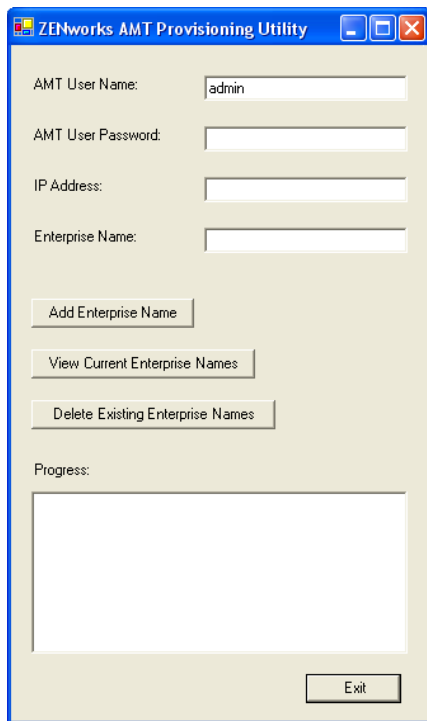
- 1** During the boot process for a device, access the AMT BIOS.
Refer to your device’s documentation for instructions.
- 2** When prompted, enter the device’s AMT administrator username and password.
You are required to change the administrator username and password before you can proceed. See your computer documentation for instructions on changing the password.
- 3** Set the provisioning mode to “Enterprise.”
- 4** Configure the other settings as appropriate.
Refer to your device’s or AMT-enabled application’s documentation for instructions.
- 5** Configure the provisioning server supplied with the application to assign at least one enterprise name to the device.
Refer to your AMT-enabled application’s documentation for instructions.
- 6** Repeat [Step 1](#) through [Step 5](#) for each device to be provisioned with the Enterprise mode.
- 7** To provide the provisioned enterprise names to ZENworks Linux Management, continue with [Section , “Setting Up the Global Intel AMT Enterprise Names,” on page 278.](#)

Provisioning in Small Business Mode

To provision an AMT device in small business mode for use with ZENworks Linux Management, do the following:

- 1** During the boot process for a device, access the AMT BIOS.
Refer to your device’s documentation for instructions.
- 2** When prompted, enter the device’s AMT administrator username and password.
You are required to change the administrator username and password before you can proceed. See your computer documentation for instructions on changing the password.
- 3** Set the provisioning mode to “Small Business.”
- 4** Configure the other settings as appropriate.
Refer to your device’s documentation for instructions.
- 5** If you configured the AMT device to use DHCP mode for IP addressing, you might need to boot the device into an operating system to discover a currently valid IP address.
You can use the ZENworks Linux Management imaging CD or DVD for this, if necessary. Boot from the CD or DVD, select the ZENworks Maintenance Mode, then at the bash prompt enter `ifconfig eth0`. This provides the currently assigned IP address.

- 6 Run `/opt/novell/zenworks/zdm/imaging/winutils/smb-provisioning.exe` on a Windows XP workstation running .NET framework to display the following dialog box:

The image shows a Windows-style dialog box titled "ZENworks AMT Provisioning Utility". It has a standard Windows XP window border with minimize, maximize, and close buttons. The dialog contains several input fields: "AMT User Name:" with the text "admin" entered, "AMT User Password:", "IP Address:", and "Enterprise Name:". Below these fields are three buttons: "Add Enterprise Name", "View Current Enterprise Names", and "Delete Existing Enterprise Names". At the bottom, there is a "Progress:" label above a large empty rectangular box, and an "Exit" button in the bottom right corner.

This must be run on a different device than is being provisioned.

- 7 Fill in the fields:

- 7a Enter the appropriate administrator account and passwords in their respective fields.

This is the same as you entered in [Step 2](#).

- 7b Enter the currently valid IP address for the device.

- 7c Enter an enterprise name.

Intel suggests that the enterprise name be chosen to indicate the device's general location. For example, all the devices in the home office may be given an enterprise name of "Company_HQ," and all devices in field offices may be given enterprise names reflecting their geographical locations.

While it is not required, it is assumed that large numbers of devices will have the same enterprise name. Each AMT device itself may have up to four different enterprise names.

You can use the *View Current Enterprise Names* or the *Delete Existing Enterprise Names* to manage the names in the *Progress* list box.

- 8 Select *Add Enterprise Name*, then click *Exit*.

This adds the defined enterprise name into the *Progress* list box and to the device.

- 9 Repeat [Step 1](#) through [Step 8](#) for each device to be provisioned with the Small Business mode.
- 10 To provide the provisioned enterprise names to ZENworks Linux Management, continue with [Section , "Setting Up the Global Intel AMT Enterprise Names," on page 278](#).

Setting Up the Global Intel AMT Enterprise Names

The Intel AMT functionality allows you to accurately identify devices, even if they have had physical drive replacements. This sets up Preboot Services with persistent device identification by providing ZENworks with nonvolatile memory for storing the unique device identity.

For more information, see [Section 22.3.7, “Intel Active Management Technology \(AMT\),” on page 222](#).

To configure Intel AMT for Preboot Services:

- 1 In the ZENworks Control Center, click the *Configuration* tab, which displays the following Management Zone Settings section:

Management Zone Settings			⌵
Category	Description	Is Configured	
System Variables	Configure system variables.	Yes	
Device Refresh Schedule	Configure the device refresh interval.	No	
Device Inventory	Configure inventory settings.	No	
Local Device Logging	Enable and configure local logging of warnings and errors encountered by managed devices.	Yes	
Preboot Services	Configure Preboot Services.	Yes	
Remote Management	Enable and configure remote management.	Yes	
Centralized Message Logging	Configuration of settings related to logging performed by the central server.	Yes	
Content Replication Schedule	Configuration of the refresh schedule used for replicating content between ZENworks servers.	Yes	
Platforms	Configuration of the available target platforms.	Yes	

- 2 In this section, click *Preboot Services* to display the configuration sections.
- 3 Locate the Intel Active Management Technology (AMT) section:

Intel Active Management Technology (AMT) ⌵

Enter the global AMT Enterprise names.

Name List

Add

Move Up

Move Down

Remove

4 Fill in the fields:

Name list: Enterprise names are given to AMT devices when they are provisioned. This list should contain at least one valid AMT enterprise name for every AMT device in the ZENworks Management Zone. Click *Add* to place each one into the list box.

Move up/Move down: Arranges the order in which the AMT names are listed. You can move only one at a time.

Remove: To remove a name from the list, select the name, then click *Remove*.

5 Click either *Apply* or *OK* to save the changes

23.5 Overriding Preboot Services Defaults

You can determine which Preboot Services Menu displays a configuration to use and whether the menu should be displayed on a device when it boots. By default, the ZENworks Management Zone configuration applies to all folders and devices. You can override this at the folder or device level.

For more information on the Preboot Services Menu options, see [Section 22.3.2, “Preboot Services Menu,” on page 219](#).

The Preboot Services Menu can be customized by editing the `pxemenu.txt` file. For more information, see [Section 23.3.4, “Editing the Preboot Services Menu,” on page 258](#).

To override the default configuration at the folder or device level:

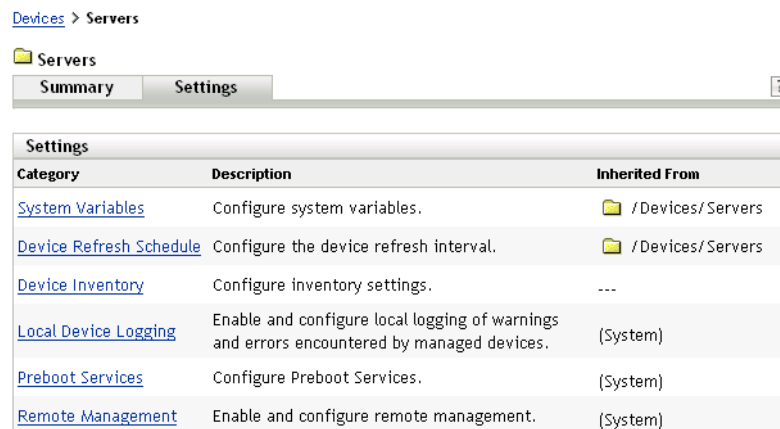
1 In the ZENworks Control Center, click the *Devices* tab to display the Devices page:



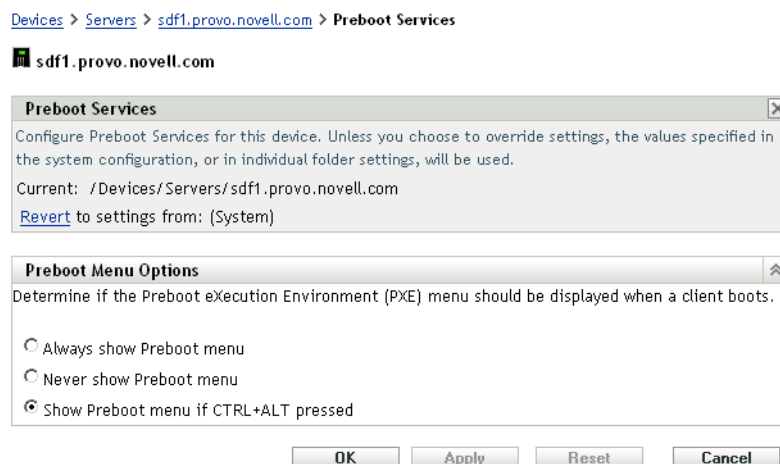
2 Select one of the following on this page:

- The *Details* option next to the *Servers* or *Workstations* folder
- The *Servers* folder, then a server contained in the folder
- The *Workstations* folder, then a workstation contained in the folder

- On the page that is displayed, click the *Settings* tab to display the Settings section options:



- Click *Preboot Services* to display the Preboot Services configuration page:



If you have not previously configured for this folder or device, the following is displayed:

Current: (System) (Override settings)

and the Preboot Menu Options section is disabled for editing. The above text varies depending on whether you are at the folder or device level.

- To configure the settings for the folder or device, click *Override*.

The following is displayed:

Current: /Devices/Servers

Revert to settings from: (System)

and the Preboot Menu Options section is enabled for editing. The above text varies depending on whether you are at the folder or device level.

- Select which option to use:

Always Show Preboot Menu

Never Show Preboot Menu

Show Preboot Menu if CTRL+ALT is Pressed

IMPORTANT: PXE must be enabled on the device for the menu to be displayed.

7 Click *Apply* or *OK*.

OK: Enables the change and exits the page.

Apply: Enables the change and retains focus on the page, so you can click *Revert* to temporarily disable the configuration change.

8 To temporarily disable the change, click *Revert* and the ZENworks Management Zone settings for the menu remain in effect.

23.6 Enabling PXE on Devices

To image a device using Preboot Services, you need to find out if the device is PXE capable, and then make sure that PXE is enabled.

PXE code is typically delivered with newer devices (PC 99 compliant or later) on the NIC.

This section includes the following information:

- [Section 23.6.1, “Enabling PXE on a PXE-Capable Device,” on page 281](#)
- [Section 23.6.2, “Verifying That PXE Is Enabled on a Device,” on page 282](#)

23.6.1 Enabling PXE on a PXE-Capable Device

When PXE is enabled, it can lengthen the time of the boot process slightly, so most NICs have PXE turned off by default. To enable PXE on a PXE-capable device:

1 Access the computer system BIOS and look at the *Boot Sequence* options.

The PXE activation method for a device varies from one manufacturer to another, but generally one of the following methods is used:

- Some BIOSs have a separate entry in the BIOS configuration to enable or disable the PXE functionality. In this case, set either the *PXE boot* setting or the *Network boot* setting to Enabled.
- Some BIOSs extend the entry that allows you to configure boot order. For example, you can specify that the system should try to boot from a diskette before trying to boot from the hard drive. In this case, set the system to try *Network boot* before trying to boot from a diskette or from the hard disk.

2 If PXE is not listed in the *Boot Sequence* options and if the NIC is embedded in the motherboard, look at the Integrated Devices section of the BIOS, which might have an option to enable PXE. PXE might be called by another name, such as MBA (Managed Boot Agent) or Pre-Boot Service.

After enabling PXE in the Integrated Devices section, look at the *Boot Sequence* options and move PXE so that it is first in the boot sequence.

3 Save any changes you have made and exit the system BIOS.

4 Reboot the device.

If the device does not have the network adapter and PXE integrated into the motherboard, it uses the installed NIC management software to prompt you to start PXE configuration during the boot process.

For example, many network adapters that are PXE-aware prompt you to press Control+S during the boot process to allow you to configure the PXE functionality. Other network adapters might prompt you to press Control+Alt+B or another key combination to configure PXE.

If the computer system does not have an integrated NIC, you might need to use NIC management software to configure your NIC to support PXE. Refer to your NIC documentation for support of PXE.

23.6.2 Verifying That PXE Is Enabled on a Device

After you have activated PXE, it becomes available in the Boot section of the BIOS. PXE is correctly enabled on a device when the device attempts to establish a PXE session during the boot process. You can see this happening when the device pauses during the boot process and displays the following on the screen:

```
CLIENT MAC ADDR: 00 E0 29 47 59 64
```

```
DHCP . . .
```

The actual message displayed varies from one manufacturer to another, but you can identify it by the obvious pause in the boot process as the device searches for DHCP.

23.7 Setting Up Devices for Imaging

The following sections cover procedures to prepare devices for imaging. The procedures that are applicable to you depend on your imaging deployment strategy. For more information, see [Section 23.3.2, “Deploying Preboot Services In a Network Environment,” on page 248](#).

If you are using Preboot Services (PXE) as your imaging method, you need to enable PXE on the device. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).

If you are using a ZENworks partition as your imaging method, you need to create the partition on the device. For more information, see [“Creating a ZENworks Partition” on page 244](#).

The following sections contain additional information:

- [Section 23.7.1, “Device Requirements,” on page 282](#)
- [Section 23.7.2, “Enabling a Device for Imaging Operations,” on page 283](#)

23.7.1 Device Requirements

This section gives the requirements for using a network-connected device.

It is possible (but usually not as convenient) to image a device without connecting to the network. Such operations can’t be fully automated.

The following are the requirements for the device:

Table 23-7 *Device Requirements*

Device Must Have	Because
A supported Ethernet card	The device must connect with the imaging server to store or retrieve the images. This connection is made when the device is under the control of the ZENworks Imaging Engine. Therefore, make sure the device has a supported Ethernet card. For more information, see “Supported Ethernet Cards” on page 457 .
Free disk space for a ZENworks partition (optional)	Unless you are using PXE, unattended operations require a ZENworks partition to be installed on the device hard disk, so that the ZENworks Imaging Engine can gain control when booting. The default partition size is 150 MB, and the minimum partition size is 50 MB. This partition is not required if you are performing manual imaging operations using bootable CDs, DVDs, or diskettes. Partition size can be in megabytes of disk space.
Standard hardware architecture	NEC* PC98 architecture is not supported.
PXE enabled	If you are using Preboot Services, PXE must be enabled in the BIOS. For more information, see Section 23.2.1, “Using Preboot Services (PXE),” on page 240 .
Supported imaging partition type	The only supported partition types for imaging are the ReiserFS, Ext2, and Ext3 file systems.

NOTE: ZENworks Linux Management imaging does not support devices running boot managers, such as System Commander. Boot managers create their own information in the MBR and overwrite the ZENworks boot system, which prevents the device from communicating with the imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

23.7.2 Enabling a Device for Imaging Operations

Use one of the following methods to enable a device for auto-imaging operations:

- [“Using PXE” on page 283](#)
- [“Using a ZENworks Partition” on page 283](#)
- [“Using a CD or DVD” on page 284](#)

Using PXE

You can set up a device to be automatically imaged from Preboot bundles by enabling PXE on the device.

For more information, see [Section 23.6.1, “Enabling PXE on a PXE-Capable Device,” on page 281](#).

Using a ZENworks Partition

If you cannot enable PXE on the device, this procedure allows you to perform unattended imaging operations.

For more information, see [“Creating a ZENworks Partition” on page 244](#).

Using a CD or DVD

If you cannot use the PXE or ZENworks partition methods to automate imaging of your devices, you can manually image a device using an imaging CD or DVD.

For information, see [Section 24.3.3, “Setting Up Disconnected Imaging Operations,” on page 312](#).

This section provides instructions on how to use Novell® ZENworks® Linux Management Preboot Services:

- [Section 24.1, “Configuring AutoYaST or Kickstart Installation Script Bundles,” on page 285](#)
- [Section 24.2, “Configuring ZENworks Script Bundles,” on page 293](#)
- [Section 24.3, “Imaging Devices,” on page 296](#)
- [Section 24.4, “Multicasting Images,” on page 317](#)
- [Section 24.5, “Assigning Unassigned Preboot Bundles,” on page 328](#)
- [Section 24.6, “Editing Preboot Services Work,” on page 330](#)

24.1 Configuring AutoYaST or Kickstart Installation Script Bundles

The following sections explain how to create, configure, and assign AutoYaST and kickstart bundles:

- [Section 24.1.1, “Configuring an AutoYaST Bundle,” on page 285](#)
- [Section 24.1.2, “Configuring a Kickstart Bundle,” on page 290](#)

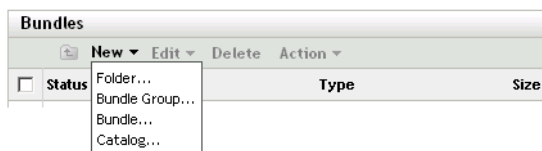
24.1.1 Configuring an AutoYaST Bundle

An AutoYaST bundle contains software for installing SUSE® Linux.

Use this wizard to create a new AutoYaST bundle. Using ZENworks Linux Management, you can install software using a bundle. Software included in a bundle that is assigned directly is considered mandatory; the software is installed on all assigned devices (the bundle is directly assigned to the devices, their groups, or their folders).

To configure an AutoYaST bundle and assign devices to the bundle:

- 1 In the ZENworks Control Center, click the *Bundles* tab to display the Bundles page:



- 2 Click *New > Bundle* to start the Create New Bundle Wizard:

[Bundles](#) > [Create New Bundle](#)

Create New Bundle ?

Step 1: Select Bundle type

Select the type of Bundle you wish to create from the list of options.

New Bundle Type:

☐ RPM Package Bundle

☒ Preboot Bundle

<< Back Next >> Cancel

- 3 In the Create New Bundle Wizard, select *Preboot bundle*, then click *Next* to display the Select Preboot Bundle Type page:

[Bundles](#) > [Create New Bundle](#)

Create New Bundle ?

Step 2: Select Preboot Bundle Type

Select the type of Preboot Bundle you wish to create from the list of options.

Preboot Bundle Type:

- AutoYaST Bundle
- Kickstart Bundle
- ZENworks Image Bundle
- ZENworks Multicast Bundle
- ZENworks Script Bundle

Type Description:

AutoYaST Bundle - Describes the location and access protocol of an AutoYaST script and network install directory for SUSE Linux. This bundle allows you to launch an automated installation of SUSE Linux using Preboot Services.

<< Back Next >> Cancel

- 4 On the Select Preboot Bundle Type page, select *AutoYaST bundle*, then click *Next* to display the Set General Information page:

[Bundles](#) > [Create New Bundle](#)

Create New Bundle ?

Step 3: Set General information

Name:

Folder:

/Bundles

Description:

<< Back Next >> Cancel

- 5 Fill in the fields:

Name: (Required) Although bundles can be identified in ZENworks Control Center by their type of icon, as well as the folder they are listed under, you should develop a naming scheme that differentiates the AutoYaST bundles that are listed together in a folder.

Folder: Browse for the location where you want the AutoYaST bundle to be displayed in ZENworks Control Center. The folder must exist. You cannot specify a non-existent folder, because ZENworks does not create them from this wizard.

Description: Provide a description to help you later recognize the exact purpose of this AutoYaST bundle.

6 Click *Next* to display the Set AutoInstall Attributes page:

Bundles > Create New Bundle

Create New Bundle AutoYaST Bundle ?

Step 4: Set AutoInstall Attributes

Describe how to access the Linux boot files. These files should have been copied to the Preboot TFTP server from the CD.

Linux Kernel File:

(Path should be relative to the default directory of the TFTP daemon.
e.g.: suse/pro9.1/linux)

Initial RAM Drive:

(Path should be relative to the default directory of the TFTP daemon.
e.g.: suse/pro9.1/initrd)

<< Back Next >> Cancel

7 Fill in the fields:

Linux kernel file: The path should be relative to the default directory of the novell-tftp daemon. For example, you might do the following:

1. Copy the kernel file, which might be located at `/boot/loader/linux` on a SLES 9 SP1 bootable CD.
2. Place the copy in a location on your imaging server. For example, `/srv/tftp/autoyast/linux`.
3. In this field, enter the path that is relative to the daemon. For example, `autoyast/linux`.

Initial RAM drive: The path should be relative to the default directory of the novell-tftp daemon. For example, you might do the following:

1. Copy the RAM drive file, which might be located at `/boot/loader/initrd` on a SLES 9 SP1 bootable CD.
2. Place the copy in a location on your imaging server. For example, `/srv/tftp/autoyast/initrd`.
3. In this field, enter the path that is relative to the daemon. For example, `autoyast/initrd`.

- 8 Click *Next* to display the next Set AutoInstall Attributes page:

[Bundles](#) > Create New Bundle

Create New Bundle AutoYaST Bundle ?

Step 5: Set AutoInstall Attributes

Protocol and IP address (or DNS name) required to access the network install directory:

NFS

Path to network install directory (relative to protocol):

(Path should be relative to the default directory of the selected protocol daemon. e.g.: suse/pro9.1)

<< Back Next >> Cancel

- 9 Fill in the fields:

Protocol and IP address (or DNS name) required to access the network installation directory: Select *NFS*, *FTP*, *HTTP*, or *TFTP* from the drop-down list, then specify the IP address or DNS name of the device containing the network installation directory..

Path to the network installation directory (relative to protocol): The path should be relative to the default directory of the selected protocol daemon.

For example, if you specify the HTTP protocol, enter *myserver.provo.novell.com* as the DNS name, and specify the path as */installs/scripts/myscript.cfg*, then the URL to the installation directory is *http://myserver.provo.novell.com/installs/scripts/myscript.cfg*, where */installs/scripts/myscript.cfg* is relative to the protocol and server ID.

- 10 Click *Next* to display the next Set AutoInstall Attributes page:

[Bundles](#) > Create New Bundle

Create New Bundle AutoYaST Bundle ?

Step 6: Set AutoInstall Attributes

Protocol and IP address (or DNS name) required to access the script:

NFS

AutoYaST Script name and path (Relative to protocol default directory):

(e.g.: autoyast.xml)

Additional Kernel Parameters:

<< Back Next >> Cancel

- 11 Fill in the fields:

Protocol and IP address required to access the script: Select *NFS*, *FTP*, *HTTP*, or *TFTP* from the drop-down list, then specify the IP address or DNS name of the device containing the script.

AutoYaST script name and path (relative to the protocol default directory): The path should be relative to the default directory of the selected protocol daemon.

For example, if you select the HTTP protocol, enter *myserver.provo.novell.com* as the DNS name, and enter the path and filename as */scripts/autoyast.xml*, then the URL to the installation directory is *http://myserver.provo.novell.com/scripts/autoyast.xml*, where */scripts/autoyast.xml* is relative to the protocol and server ID.

Additional kernel parameters: Specify additional kernel parameters. These are not Preboot Services or ZENworks parameters. They are parameters that your Linux kernel needs. For more information, see your Linux documentation.

12 Click *Next* to display the Summary page:

[Bundles](#) > Create New Bundle

Create New Bundle	AutoYaST Bundle	?
Step 7: Summary		

Review the following information, and click 'Finish' to create the new Image Bundle.

Name:	AutoYaST Bundle
Preboot Bundle Type:	AutoYaST Bundle
Folder:	Bundles
Description:	AutoYaST Bundle
Linux Kernel File:	suse/pro9.1/linux
Initial RAM Drive:	suse/pro9.1/initrd
Install Directory:	NFS
	192.68.1.203
	suse/pro9.1
Protocol and IP address:	NFS
	192.68.1.203
AutoYaST Script name and path:	autoyast.xml
Additional Kernel Parameters:	

<< Back Next >> Finish Cancel

13 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Next: Allows you to perform the following tasks before creating the bundle:

- Specify device assignments for this bundle
- Specify groups for this bundle

Continue with [Section 24.5, “Assigning Unassigned Preboot Bundles,”](#) on page 328 to assign the bundle and complete the wizard.

Finish: Creates the AutoYaST bundle as configured per the settings listed on this Summary page.

This bundle is not assigned to any device or group after it is created, unless you click *Next* instead of *Finish* to make that assignment.

When any device assigned to the AutoYaST bundle boots, the bundle’s SUSE Linux installation work is performed on the device.

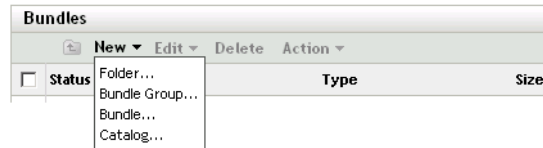
24.1.2 Configuring a Kickstart Bundle

A kickstart bundle contains software for installing Red Hat Linux.

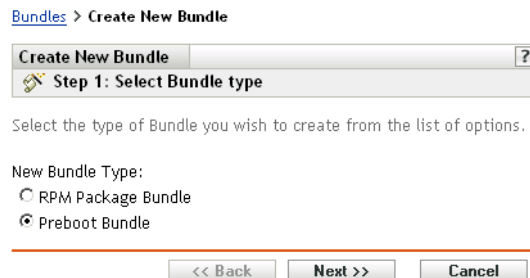
Using ZENworks Linux Management, you can install software using a bundle. Software included in a bundle that is assigned directly is considered mandatory; the software is installed on all assigned devices (the bundle is directly assigned to the devices, their groups, or their folders).

To configure a kickstart bundle and assign devices to the bundle:

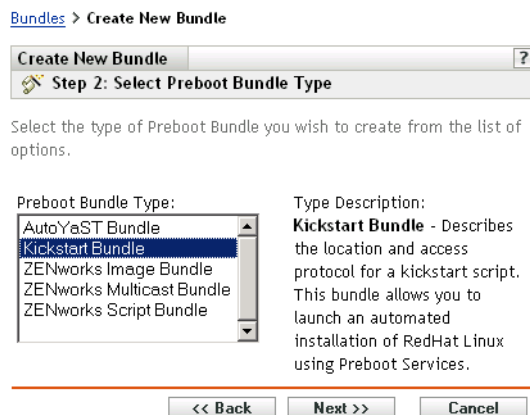
- 1 In the ZENworks Control Center, click the *Bundles* tab.



- 2 Click *New > Bundle* to start the Create New Bundle Wizard:



- 3 In the Create New Bundle Wizard, select *Preboot bundle*, then click *Next*.




- 4 On the Select Preboot Bundle Type page, select *Kickstart bundle*, then click *Next* to display the Set General Information page:

Bundles > Create New Bundle

Create New Bundle ?

Step 3: Set General information

Name:

Folder:
 

Description:

<< Back Next >> Cancel

- 5 Fill in the fields:

Name: (Required) Although bundles can be identified in ZENworks Control Center by their type of icon, as well as the folder they are listed under, you should develop a naming scheme that differentiates the kickstart bundles that are listed together in a folder.

Folder: Browse for the location where you want the kickstart bundle displayed in ZENworks Control Center. The folder must exist. You cannot specify a non-existent folder, because ZENworks does not create them from this wizard.

Description: Provide a description to help you later recognize the exact purpose of this kickstart bundle.

- 6 Click *Next* to display Set AutoInstall Attributes page:

Bundles > Create New Bundle

Create New Bundle kickstart Bundle ?

Step 4: Set AutoInstall Attributes

Describe how to access the Linux boot files. These files should have been copied to the Preboot TFTP server from the CD.

Linux Kernel File:

*(Path should be relative to the default directory of the TFTP daemon.
e.g.: redhat/8.0/vmlinuz)*

Initial RAM Drive:

*(Path should be relative to the default directory of the TFTP daemon.
e.g.: redhat/8.0/initrd.img)*

<< Back Next >> Cancel

7 Fill in the fields:

Linux kernel file: The path should be relative to the default directory of the novell-tftp daemon. For example, you might do the following:

1. Copy the kernel file, which might be located at `/isolinux/vmlinuz` on a Red Hat Enterprise Linux 4 bootable CD.
2. Place the copy in a location on your imaging server. For example, `/srv/tftp/kickstart/vmlinuz`.
3. In this field, enter the path that is relative to the daemon. For example, `kickstart/vmlinuz`.

Initial RAM drive: The path should be relative to the default directory of the novell-tftp daemon. For example, you might do the following:

1. Copy the RAM drive file, which might be located at `/isolinux/initrd.img` on a Red Hat Enterprise Linux 4 bootable CD.
2. Place the copy in a location on your imaging server. For example, `/srv/tftp/kickstart/initrd.img`.
3. In this field, enter the path that is relative to the daemon. For example, `kickstart/initrd.img`.

8 Click *Next* to display the next Set AutoInstall Attributes page:

Bundles > Create New Bundle

Create New Bundle kickstart Bundle ?

Step 5: Set AutoInstall Attributes

Protocol and IP address (or DNS name) required to access the configuration file:

NFS

Path to the kickstart configuration file (relative to the protocol default directory):

(e.g.: config/ks.cfg)

Additional Kernel Parameters:

<< Back Next >> Cancel

9 Fill in the fields:

Protocol and IP address required to access the script: Select *NFS* or *HTTP* from the drop-down list, then specify the IP address or DNS name of the device containing the script.

Kickstart script name and path (relative to the protocol default directory): The path should be relative to the default directory of the selected protocol daemon.

For example, if you select the HTTP protocol, enter *myserver.provo.novell.com* as the DNS name, and enter the path and filename as */config/ks.cfg*, then the URL to the installation directory is *http://myserver.provo.novell.com/config/ks.cfg*, where */config/ks.cfg* is relative to the protocol and server ID.

Additional kernel parameters: Specify additional kernel parameters. These are not Preboot Services or ZENworks parameters. They are parameters that your Linux kernel needs. For more information, see your Linux documentation.

10 Click *Next* to display the Summary page:

Bundles > Create New Bundle

Create New Bundle kickstart Bundle ?

Step 6: Summary

Review the following information, and click 'Finish' to create the new Image Bundle.

Name:	kickstart Bundle
Preboot Bundle Type:	Kickstart Bundle
Folder:	Bundles
Description:	Kickstart Bundle
Linux Kernel File:	redhat/8.0/vmlinuz
Initial RAM Drive:	redhat/8.0/initrd.img
Protocol and IP address:	NFS
	192.68.1.203
Kickstart Configuration File:	config/ks.cfg
Additional Kernel Parameters:	

<< Back Next >> Finish Cancel

11 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Next: Click to perform the following tasks before creating the bundle:

- Specify device assignments for this bundle
- Specify groups for this bundle

Continue with [Section 24.5, “Assigning Unassigned Preboot Bundles,”](#) on page 328 to assign the bundle and complete the wizard.

Finish: Creates the kickstart bundle as configured per the settings listed on this Summary page.

This bundle is not assigned to any device or group after it is created, unless you click *Next* instead of *Finish* to make that assignment.

When any device assigned to the kickstart bundle boots, the bundle’s Red Hat installation work is performed on the device.

24.2 Configuring ZENworks Script Bundles

A ZENworks Script bundle can contain any ZENworks script.

Using ZENworks Linux Management, you can install software using a bundle. Software included in a bundle that is assigned directly is considered mandatory; the software is installed on all assigned devices (the bundle is directly assigned to the devices, their groups, or their folders).

To configure a ZENworks Script bundle and assign devices to the bundle:

1 In the ZENworks Control Center, click the *Bundles* tab.

Bundles

New Edit Delete Action

Status	Type	Size
<input type="checkbox"/>		

Folder...
Bundle Group...
Bundle...
Catalog...

- 2 Click *New > Bundle* to start the Create New Bundle Wizard:

Bundles > Create New Bundle

Create New Bundle ?

Step 1: Select Bundle type

Select the type of Bundle you wish to create from the list of options.

New Bundle Type:

☐ RPM Package Bundle

☒ Preboot Bundle

<< Back Next >> Cancel

- 3 In the Create New Bundle Wizard, select *Preboot bundle*, then click *Next*.

Bundles > Create New Bundle

Create New Bundle ?

Step 2: Select Preboot Bundle Type

Select the type of Preboot Bundle you wish to create from the list of options.

Preboot Bundle Type:

- AutoYaST Bundle
- Kickstart Bundle
- ZENworks Image Bundle
- ZENworks Multicast Bundle
- ZENworks Script Bundle**

Type Description:

ZENworks Script Bundle -
Allows you to write a custom Linux bash script that will be executed on preboot computers in Linux. This allows fine control over ZENworks imaging operations as well as almost any linux-based task imaginable.

<< Back Next >> Cancel

- 4 On the Select Preboot Bundle Type page, select *ZENworks Script bundle*, then click *Next* to display the Set General Information page:

Bundles > Create New Bundle

Create New Bundle ?

Step 3: Set General information

Name:

Folder:

/Bundles

Description:

<< Back Next >> Cancel

- 5 Fill in the fields:

Name: (Required) Although bundles can be identified in ZENworks Control Center by their type of icon, as well as the folder they are listed under, you should develop a naming scheme that differentiates the ZENworks Script bundles that are listed together in a folder.

Folder: Browse for the location where you want the ZENworks Script bundle displayed in ZENworks Control Center. The folder must exist. You cannot specify a non-existent folder, because ZENworks does not create them from this wizard.

Description: Provide a description to help you later recognize the exact purpose of this ZENworks Script bundle.

6 Click *Next* to display the Preboot Bundle Creation page:

Bundles > Create New Bundle

Create New Bundle ZENworks Script Bundle ?

Step 4: Preboot Bundle Creation

Configure the preboot information

Script Text:

#!/bin/sh

<< Back Next >> Cancel

7 Fill in the fields:

Script text: Specify the text of the ZENworks script. The script is restricted to doing preboot work prior to the device booting.

For information on using this bundle to perform scripted imaging, see [“Imaging a Device Using a Script” on page 302](#).

8 Click *Next* to display the Summary page:

Bundles > Create New Bundle

Create New Bundle ZENworks Script Bundle ?

Step 5: Summary

Review the following information, and click 'Finish' to create the new Image Bundle.

Name: ZENworks Script Bundle

Preboot Bundle Type: ZENworks Script Bundle

Folder: Bundles

Description: ZENworks Script Bundle

Script Text: #!/bin/sh

<< Back Next >> Finish Cancel

9 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Next: Click to perform the following tasks before creating the bundle:

- Specify device assignments for this bundle
- Specify groups for this bundle

Continue with [Section 24.5, “Assigning Unassigned Preboot Bundles,” on page 328](#) to assign the bundle and complete the wizard.

Finish: Creates the ZENworks Script bundle as configured per the settings listed on this Summary page.

This bundle is not assigned to any device or group after it is created, unless you click *Next* instead of *Finish* to make that assignment.

When a device assigned to the ZENworks Script bundle boots, the bundle's work is performed on the device before its operating system starts.

24.3 Imaging Devices

Preboot Services provides tools for creating and compressing images of device hard disks, as well as images of specific add-on applications or file sets. ZENworks Linux Management also provides tools for customizing such images and for making images available to auto-imaging operations.

You can take images of devices, reimage them with those images, and image other devices with the images. In ZENworks 7 Linux Management, the available devices are servers and workstations.

ZENworks Linux Management imaging supports devices that physically connect to the network that meet the minimum requirements for devices. ZENworks Linux Management imaging does not support imaging operations (creating or restoring images) using wireless connectivity.

NOTE: ZENworks Linux Management imaging does not support devices running boot managers, such as System Commander. Boot managers create their own information in the MBR and overwrite the ZENworks boot system, which prevents the device from communicating with the imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

Some imaging tasks can be performed manually on a device, some in the ZENworks Control Center, and some in both:

- [Section 24.3.1, “Imaging Using the ZENworks Control Center,” on page 296](#)
- [Section 24.3.2, “Performing Manual Imaging Tasks,” on page 302](#)
- [Section 24.3.3, “Setting Up Disconnected Imaging Operations,” on page 312](#)

24.3.1 Imaging Using the ZENworks Control Center

The following imaging tasks are available in the ZENworks Control Center:

- [“Taking a Base Image of a Device” on page 296](#)
- [“Configuring the ZENworks Image Bundle for Automatic Imaging” on page 299](#)
- [“Imaging a Device Using a Script” on page 302](#)

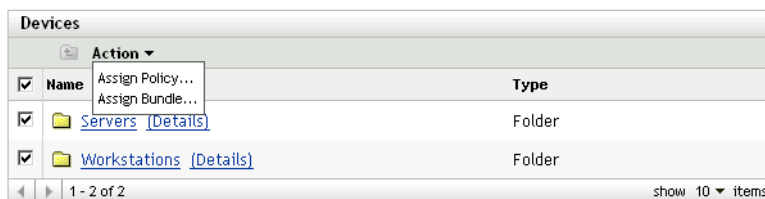
Taking a Base Image of a Device

A *base* image is an image of all partitions and data on a source device's hard disks. Normally, such an image is prepared with the intent to completely replace the contents of a target device's hard disks.

You can take an image of an existing device and use to image a similar device, or as a backup image for reimaging the device.

To take a base image of a device:

- 1 In the ZENworks Control Center, click the *Devices* tab.



- 2 Click *Servers* or *Workstations*, then select the check box next to a device.

This selects the device for taking the image.

- 3 Click *Actions* > *Take image*.

You can also select the check box next to *Servers* or *Workstations* to start this wizard, then click *Actions* > *Take image*. If you do so, you are asked to select a device from the group. Then the File Information page is displayed.

- 4 Click *Next* to display the File Information page:


[Devices](#) > [Servers](#) > Take an Image

Take an Image sdf1.provo.novell.com ?

Step 1: File Information

Specify the server, path, and compression options for the new image file:

Server and File Path:*



☒ Use compression:

- ☒ Balanced
- ☐ Optimize for speed
- ☐ Optimize for space

☐ Create an image bundle

Fields marked with a blue asterisk are required.

- 5 Fill in the fields:

Server and file path: (Required) Browse for the object, DNS name, or IP address of the server where the image file is to be stored, then specify the path to the storage location. This must be a server where ZENworks Linux Management is installed.

Images can take up a large amount of disk space. Make sure your imaging server has the disk space available before selecting it.

Use compression: Compression is required. Choose one of the following:

- **Balanced:** Automatically balances compression between an average of the reimaging speed and the available disk space for the image file.
- **Optimize for speed:** Optimizes the compression to allow for the fastest reimaging time. Use this option if CPU speed is an issue.
- **Optimize for space:** Optimizes the compression to minimize the image file's size to conserve disk space. This can cause reimaging to take longer.

Create an image bundle: If you select this option, another wizard page is displayed (see [Step 6](#)) where you can configure the new bundle. Otherwise, the Summary is your next wizard page (skip to [Step 9](#)).

- 6 If you selected to create an image bundle, the New Image Bundle page is displayed:

Devices > Servers > Take an Image

Take an Image sdf1.provo.novell.com

Step 2: New Image Bundle

Specify a name and a description for the new image bundle.

Name:

Destination Folder: /Bundles

Description:

<< Back Next >> Cancel

- 7 Fill in the fields:

Name: Specify a unique name for the bundle, because many other bundle names might be listed in its folder.

Destination folder: Specify a folder where you want to list the new bundle. This is a location in ZENworks Control Center, not a file location on a device.

Description: Enter information to help you later recognize the purpose and scope of this image bundle. For example, “Image taken after Linux OS was installed, but before GroupWise was installed.”

- 8 Click *Next* to display the Summary page:

Devices > Servers > Take an Image

Take an Image sdf1.provo.novell.com

Step 3: Image File and Bundle Summary

Review the information and click 'Finish' to submit this task to the device and create the new image bundle. The image will be taken the next time the device is rebooted and checks for preboot work.

Device:	/Devices/Servers/sdf1.provo.novell.com
Server and File Path:	192.68.1.203 : /images/image.zmg
Use compression:	Balanced
Name:	Image Bundle 2
Description:	ZENworks Image Bundle #2
Location:	Bundles

<< Back Finish Cancel

- 9 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Finish: Click to take the image. If you completed [Step 7](#), the image is assigned to the bundle when it is created.

This base image can be used in [Step 8 on page 300](#) under “Configuring the ZENworks Image Bundle for Automatic Imaging” on page 299.

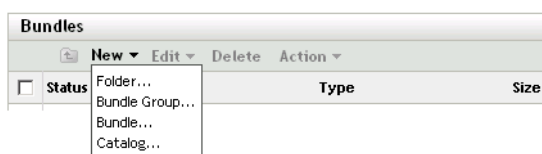
To create an add-on image for use in [Step 8 on page 300](#), see “Creating an Add-On Image” on page 307.

Configuring the ZENworks Image Bundle for Automatic Imaging

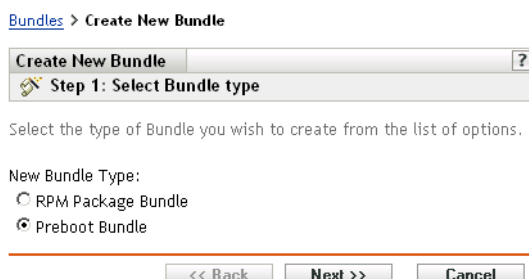
Using ZENworks Linux Management, you can install software using a bundle. Software included in a bundle that is assigned directly is considered mandatory; the software is installed on all assigned devices (the bundle is directly assigned to the devices, their groups, or their folders).

To configure a ZENworks Image bundle and assign devices to the bundle:

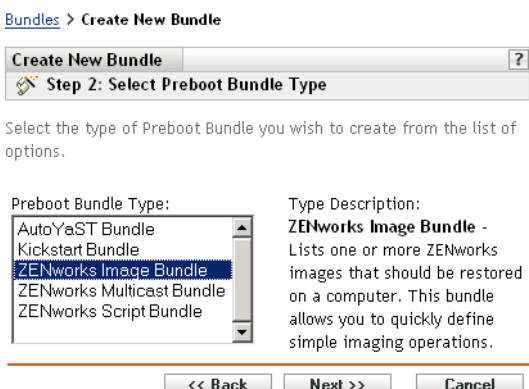
- 1 In the ZENworks Control Center, click the *Bundles* tab.



- 2 Click *New > Bundle* to start the Create New Bundle Wizard:



- 3 In the Create New Bundle Wizard, select *Preboot bundle*, then click *Next*.



- 4 On the Select Preboot Bundle Type page, select *ZENworks Image bundle*.

5 Click *Next* to display the Set General Information page:

The screenshot shows the 'Create New Bundle' wizard at Step 3: Set General information. The breadcrumb path is 'Bundles > Create New Bundle'. The window title is 'Create New Bundle' with a help icon. The step indicator shows a wizard icon and 'Step 3: Set General information'. There are three input fields: 'Name:' with an empty text box, 'Folder:' with a text box containing '/Bundles' and a browse icon, and 'Description:' with a larger empty text box. At the bottom, there are three buttons: '<< Back', 'Next >>', and 'Cancel'.

6 Fill in the fields:

Name: (Required) Although bundles can be identified in ZENworks Control Center by their type of icon, as well as the folder they are listed under, you should develop a naming scheme that differentiates the ZENworks Image bundles that are listed together in a folder.

Folder: Browse for the location where you want the ZENworks Image bundle displayed in ZENworks Control Center. The folder must exist. You cannot specify a non-existent folder, because ZENworks does not create them from this wizard.

Description: Provide a description to help you later recognize the exact purpose of this ZENworks Image bundle.

7 Click *Next* to display the Bundle Configuration page:

The screenshot shows the 'Create New Bundle' wizard at Step 4: Preboot Bundle Creation. The breadcrumb path is 'Bundles > Create New Bundle'. The window title is 'Create New Bundle ZENworks Image Bundle' with a help icon. The step indicator shows a wizard icon and 'Step 4: Preboot Bundle Creation'. Below the step indicator, it says 'Configure the preboot information'. There is a 'Base Image File:' label above a text box with a browse icon and a 'Clear' button. Below that is an 'Add-On Image Files:' label above a list box. To the right of the list box are five buttons: 'Add', 'Edit', 'Move Up', 'Move Down', and 'Remove'. At the bottom left, there is a 'File Set:' label and a dropdown menu showing '1'. At the bottom, there are three buttons: '<< Back', 'Next >>', and 'Cancel'.

8 Fill in the fields:

Base image file: This is an image file existing on an imaging server. You must provide the full path and filename here. The image filename must end in .zmg. For information on creating a base image, see [“Taking a Base Image of a Device” on page 296](#).

Add-on image files: These are existing image files that you can add onto the device after it is reimaged with the base image file. You must provide the full paths and filenames here. The

image filename must end in `.zmg`. For information on creating an add-on image, see “[Creating an Add-On Image](#)” on page 307.

File set: File sets are assigned to the current ZENworks Image bundle using this *File set* field. File sets are defined on the imaging server from the base image using the **Image Explorer** utility, which can be run on a Windows machine from a Linux server running Samba. The Image Explorer utility is located at `/opt/novel/zenworks/zdm/imaging/winutils/ImgExp.exe` on the Linux server.

When you define a file set using Image Explorer, you specify files and directories to be excluded from the image. Thus, a file set is a subset of the original image that excludes the files you select in Image Explorer. A separate image file is not created for the file set; instead, a file set contains internal attributes representing the excluded information. Therefore, even though a file set does not exist as a separate, physical image file, it is accessed as though it is, placing the image on the receiving device, minus the excluded files.

For example, `devicelimage.zmg` is the image file on your imaging server. You use Image Explorer to determine which data to exclude and assign this to a file set number, such as 2. When a device assigned to this ZENworks Image bundle boots, it is imaged with the smaller version (file set 2) of `devicelimage.zmg`.

File sets provide an advantage because you can create a base image and modify it slightly for various devices, instead of creating separate, somewhat different base images for each device. However, because file sets only concern excluded files, if you add files to the base image using Image Explorer, all file sets will include those additional files. If you don’t want them included in a file set, you must use Image Explorer to exclude these new files from that file set.

There are a maximum of 10 file sets. Each of the ten file set numbers represents the original base image, until you use Image Explorer and assign the results to a file set number.

IMPORTANT: If you create 10 different file sets, the original image can be lost. If you want to maintain the original image’s information, do not use Image Explorer to assign exclusions to file set 1, which is the default file set if you don’t select a file set when using this wizard.

Add: Accesses the Server and Path Information dialog box:

- **Server object, IP, or DNS:** The identity of the imaging server where the Novell ZENworks Linux Management Imaging Agent (**novell-zislnx**) is installed and running, and where the base image file is stored.
- **File path on server:** The full path to the base image file.

9 Click *Next* to display the Summary page:

Create New Bundle ZENworks Image Bundle ?

Step 5: Summary

Review the following information, and click 'Finish' to create the new Image Bundle.

Name:	ZENworks Image Bundle
Preboot Bundle Type:	ZENworks Image Bundle
Folder:	Bundles
Description:	ZENworks Image Bundle
Base Image File:	192.68.1.203 : /images/image.zmg
Add-On Image Files:	
File Set:	1

<< Back Next >> Finish Cancel

10 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Next: Click to perform the following tasks before creating the bundle:

- Specify device assignments for this bundle
- Specify groups for this bundle

Continue with [Section 24.5, “Assigning Unassigned Preboot Bundles,” on page 328](#) to assign the bundle and complete the wizard.

Finish: Creates the ZENworks Script bundle as configured per the settings listed on this Summary page.

This bundle is not assigned to any device or group after it is created, unless you click *Next* instead of *Finish* to make that assignment.

When a device assigned to the ZENworks Image bundle boots, the bundle’s work is performed on the device before its operating system starts.

Imaging a Device Using a Script

You can perform scripted imaging using the ZENworks Script bundle. Any imaging commands can be entered for the script.

For example, if you want to mount a DVD and restore an image from it, you could enter something similar to the following in the *Script text* field in the Create New Preboot Bundle Wizard when defining a ZENworks Script bundle:

```
echo "Please insert the DVD containing the image into the drive."  
mount /dev/cdrom /mnt/cdrom  
img r1 /mnt/cdrom/myimagefile.zmg  
umount /mnt/cdrom  
eject /dev/cdrom
```

This example is a combination of automatic and manual tasks, where you define the bundle in the ZENworks Control Center, assign it to the device, then when the device boots, it runs the bundle’s script, prompting you to insert the DVD containing an image into the device’s DVD drive. The script then runs the commands to restore the image on the device and ejects the DVD when finished.

For information on creating a ZENworks Script bundle, see [Section 24.2, “Configuring ZENworks Script Bundles,” on page 293](#).

24.3.2 Performing Manual Imaging Tasks

The following manual imaging tasks are available:

- [“Manually Taking an Image of a Device” on page 303](#)
- [“Using Image Explorer to Customize an Image” on page 306](#)
- [“Creating an Add-On Image” on page 307](#)
- [“Manually Putting an Image on a Device” on page 307](#)
- [“Making an Image Available for Automatic Imaging” on page 310](#)

These instructions assume that you have already prepared the imaging server (see [Section 23.1, “Preparing a Preboot Services Server,” on page 239](#)), prepared devices for imaging (see [Section](#)

23.7, “Setting Up Devices for Imaging,” on page 282), and set up imaging defaults (Section 23.4, “Configuring Preboot Services Defaults,” on page 260).

ZENworks Linux Management imaging supports devices that physically connect to the network and that meet the minimum requirements for devices. ZENworks Linux Management imaging does not support imaging operations (creating or restoring images) using wireless connectivity.

Manually Taking an Image of a Device

This section explains how to take an image of a device by booting from an imaging method and entering a particular imaging command. The image is stored on your imaging server.

If you want to store an image locally rather than on an imaging server, see “Using a CD or DVD for Disconnected Imaging Operations” on page 312 and “Using a Hard Disk for Disconnected Imaging Operations” on page 314.

Ensure that your imaging server has enough disk space for the image. Otherwise, you receive a “Failed to write to proxy” error.

The following sections contain additional information:

- “Manually Taking an Image of a Device Using the Bash Prompt” on page 303
- “Manually Taking an Image of a Device Using the ZENworks Imaging Engine Menu” on page 305

Manually Taking an Image of a Device Using the Bash Prompt

1 Boot the device using one of the following methods:

- If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see Section 23.2.1, “Using Preboot Services (PXE),” on page 240.
- Boot the device using an imaging boot CD or DVD. For more information, see Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240.
- Boot the device from the ZENworks partition. For more information, see “Creating a ZENworks Partition” on page 244.

2 Enter `manual` at the boot prompt.

or

Select *Start ZENworks imaging maintenance* from the Preboot Services Menu.

3 (Optional) At the bash prompt, type `img dump`, then press Enter.

This displays a list of the partition slots on the device. For your reference, note the number and type of partitions and which one is active.

4 Enter a command at the bash prompt using one of the following formats:

- To create an image and store it on the imaging server, enter:

```
img makep serverIPaddr_or_DNSname //uncpath/newimg.zmg  
[comp=comp level]
```

The `makep` parameter stands for “make on proxy,” which creates an image and stores it on the imaging (proxy) server.

The IP address or DNS name should be that of your imaging server.

The UNC path specifies the location and filename where the new image is to be stored.

The directories in the path must exist. You can use the following characters in the path and filename:

- Letters: a through z (uppercase and lowercase)
- Numbers
- Special Characters: \$ % ' - _ @ { } ~ ` ! # ()

comp level is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as *Optimize for speed* and is used by default if you do not specify this parameter. 6 is the same as *Balanced*. 9 is the same as *Optimize for space*. (*Optimize for speed* takes the least amount of time but creates the largest image file. *Optimize for space* creates the smallest image file but might take a significant amount of time. *Balanced* is a compromise between compression time and image file size.)

For example:

```
img makep 137.65.95.127 //xyz_srv/sys/imgs/cpqnt.zmg comp=6
```

- To create an image and store it locally, enter:

```
img makel filepath [comp=comp level]
```

The makel parameter stands for “make locally,” which creates an image and stores it on a local hard disk.

NOTE: Unless you mount a drive before using makel, the image is created in RAM and is lost during a reboot of the device.

filepath is the image filename, including the .zmg extension and the complete path from the root of the partition.

The directories in the path must exist. You can use the following characters in the path and filename:

- Letters: a through z (uppercase and lowercase)
- Numbers
- Special Characters: \$ % ' - _ @ { } ~ ` ! # ()

comp level is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as *Optimize for speed* and is used by default if you do not specify this parameter. 6 is the same as *Balanced*. 9 is the same as *Optimize for space*. (*Optimize for speed* takes the least amount of time but creates the largest image file. *Optimize for space* creates the smallest image file but might take a significant amount of time. *Balanced* is a compromise between compression time and image file size.)

For example:

```
img makel /imgs/dellnt.zmg comp=6
```

IMPORTANT: Make sure to use *forward slashes* in the UNC path as shown above. Backslashes are not recognized by Linux. However, you can use backslashes and enclose the entire UNC path in quotes. The path you specify must exist on your imaging server.

For more information on the parameters you can use and usage examples, see [Section C.3, “Make Mode \(img make\),” on page 427](#).

Depending on the amount of data on the hard disk, the image might take several minutes to create. If the screen goes blank, just press any key. (Linux enters a screen-saving mode after a few minutes.)

- 5 After the image is created and the bash prompt is displayed, remove any diskette from the drive and reboot the device.
- 6 (Optional) Verify that the image file was created on your imaging server. You might also want to check its size.

Manually Taking an Image of a Device Using the ZENworks Imaging Engine Menu

- 1 Boot the device using one of the following methods:
 - If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
 - Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
 - Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).
- 2 Enter `manual` at the boot prompt.
or
Select *Start ZENworks imaging maintenance* from the Preboot Services Menu.
- 3 Enter `img` to display the ZENworks Imaging Engine menu.
- 4 (Optional) Click *System information > Drive information* to display a list of the partition slots on the device.

For your reference, note the number and type of partitions and which one is active.
- 5 Click *Imaging > Make image*.
- 6 In the Make Image Wizard window, specify the destination where the image is stored (Local or Server), then click *Next*.

The directories in the path must exist. You can use the following characters in the path and filename:
 - Letters: a through z (uppercase and lowercase)
 - Numbers
 - Special Characters: \$ % ' - _ @ { } ~ ` ! # ()
- 7 Browse to and specify the path to the image archive.
- 8 Select the partitions that you want to include in the image.
- 9 Select a compression option:
None: No compression is used.
Speed: Takes the least amount of time to compress but creates the largest compressed image file. This option is used by default when an image is created.
Balanced: Represents a compromise between compression time and image file size.
Size: Creates the smallest image file but takes longer to compress.
- 10 Click *Next*.

11 (Optional) Fill in the fields:

Author: The name of the person creating this image.

Computer: The name of the computer being imaged.

Image description: A description of the image.

Comments: Any additional comments about the image.

12 Click *Next*.

Depending on the amount of data on the hard disk, the image might take several minutes to create. If the screen goes blank, just press any key. (Linux enters a screen-saving mode after a few minutes.)

13 After the image is created, exit from the ZENworks Imaging Engine menu, remove any diskette from the drive, then reboot the device.

14 (Optional) Verify that the image file was created on your imaging server. You might also want to check its size.

Using Image Explorer to Customize an Image

After you have created a base or add-on image as explained in the previous sections, you can customize it with the Image Explorer utility. Specifically, you can:

- **Compress the image:** You can compress an image (including images created by previous versions of ZENworks Linux Management) to 40-60% of the original file size, if you have not done so already during the imaging process. There are three compression options. *Optimize for speed* takes the least amount of time but creates the largest compressed image file. *Optimize for space* creates the smallest image file but might take a significant amount of time. *Balanced* is a compromise between compression time and image file size. This option is used by default when an image is created.

ZENworks Linux Management provides the following compression methods:

- **Compress:** Use this option to compress an image file that you currently have open in Image Explorer. For more information, see [“Compressing an Open Image” on page 404](#).
- **QuickCompress:** Use this option to compress an image file without waiting for the file to fully load into Image Explorer. For more information, see [“Compressing Any Image without Waiting for the File to Fully Load into Image Explorer” on page 405](#).
- **Split the image:** You can specify a device image file that you want to split into separate files so that the entire image can be spanned across several CDs or DVDs. Splitting a device image is helpful for putting down or restoring images in a disconnected environment. For more information, see [Section B.1.15, “Splitting an Image,” on page 405](#).
- **Resize a partition in an image:** For base images, you can edit the value in the *Original size* text box to allow you to change how big the ZENworks Imaging Engine makes the partition when the image is restored. For more information, see [Section B.1.16, “Resizing a Partition in an Image,” on page 406](#).
- **Purge deleted files:** Excluded or hidden files and folders can be completely removed from an open image. This saves space in the image if you no longer want to include the files. For more information, see [Section B.1.5, “Excluding a File or Folder from a File Set in the Open Image,” on page 403](#).

- **Exclude individual files and folders from the image:** In doing this, you create subsets of the image by specifying which of ten possible file sets to exclude a given file or folder from. This exists merely as internal attributes of the same image archive. For more information, see [Section B.1.7, “Purging Files and Folders Marked for Deletion from the Open Image,” on page 403.](#)

IMPORTANT: Do not exclude BPB files from a base image or the device won’t be able to boot the new operating system after receiving the image.

- **Add files and folders to the image:** By default, any file or folder you add is included in all file sets. To change this, you must explicitly exclude the file or folder from one or more file sets. For more information, see [Section B.1.3, “Adding a File or Folder to an Open Image,” on page 402.](#)

For information on starting Image Explorer, see [Section B.1, “Image Explorer \(ImgExp.exe\),” on page 401.](#)

Creating an Add-On Image

An *add-on* image is an archived collection of files to be applied to an existing installation on a target device. This is sometimes referred to as an application overlay. The existing partitions and files on the target device are left intact, except for any files that the add-on image might update.

An add-on image typically corresponds to an application or utility, or simply to a set of data files or configuration settings.

To create an add-on image:

- 1 Run the Image Explorer utility, which is located on the Linux imaging server at:

```
/opt/novell/zenworks/zdm/imaging/winutils/ImgExp.exe
```

- 2 Drag files and folders from an existing device into a new image archive.

For more information, see [Section B.1, “Image Explorer \(ImgExp.exe\),” on page 401.](#)

- 3 Save this image with the `.zmg` extension in the same directory on the imaging server where you store base images.

Generally, an add-on image created in this manner doesn’t require any post-processing on the target device. It is simply a set of files that are copied to the appropriate locations on the hard disk, much like what happens when you unzip an archive. For more information, see [“Using Image Explorer to Customize an Image” on page 306.](#)

This add-on image can be used in [Step 8 on page 300](#) under [“Configuring the ZENworks Image Bundle for Automatic Imaging” on page 299.](#)

Manually Putting an Image on a Device

The section explains how to put an image on the device by booting from an imaging method and entering a particular imaging command. The image is retrieved from your imaging server.

Ensure that the device receiving a new image has enough disk space for the image. Otherwise, you receive a “Failed to write to proxy” error.

The following sections contain additional information:

- “Manually Putting an Image on a Device Using the Bash Prompt” on page 308
- “Manually Putting an Image on a Device Using the ZENworks Imaging Engine Menu” on page 309

Manually Putting an Image on a Device Using the Bash Prompt

- 1 If you haven’t already done so, create the image to put on the device, as instructed in “Manually Taking an Image of a Device” on page 303.

Make sure that the image is of the same type of device (same hardware configuration) and is stored on your imaging server. You can use a previous image of the same device.

IMPORTANT: If you are putting an image on a device without a ZENworks partition, make sure the image was made on a device without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the device fails to boot.

- 2 (Optional) Boot the device from a Windows startup disk and run FDISK to remove all partitions from the hard disk.

Running FDISK is not required, but it is recommended for purposes of comparing workstation or server partitions before and after the imaging operation.

- 3 Boot the device using one of the following methods:

- If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
- Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
- Boot the device from the ZENworks partition. For more information, see “[Creating a ZENworks Partition](#)” on page 244.

- 4 Enter `manual` at the boot prompt.

This step is not the same as in the previous step’s manual processes.

- 5 (Optional) At the bash prompt, type `img dump`, then press Enter to display a list of the partition slots on the device.

For your reference, note the number and type of partitions and which one is active. If you removed all partitions using FDISK, each slot should be empty and none should be active.

- 6 Enter a command at the bash prompt using one of the following formats:

- To restore an image from the imaging server and put it down on a device, enter:

```
img restorep serverIPaddr_or_DNSname //uncpath/newimg.zmg
```

The `restorep` parameter stands for “restore from proxy,” which retrieves an image from the imaging (proxy) server and puts it on this device. The IP address or DNS name should be that of your imaging server, and the UNC path specifies the location and filename where the image is to be retrieved from.

For example:

```
img restorep 137.65.95.127 //xyz_srv/sys/imgs/cpqnt.zmg
```

- To retrieve an image from a local device and put it down on a device:

```
img restorel filepath
```

The `restorel` parameter stands for “restore from local,” which retrieves an image from a local device and puts it on this device. *Filepath* represents the filename of the image to retrieve, including the `.zmg` extension and the complete path from the root of the partition.

IMPORTANT: Make sure to use *forward slashes* in the UNC path as shown above. Backslashes aren’t recognized by Linux. However, you can use backslashes and enclose the entire UNC path in quotes. The server portion of the path must be the name of your imaging server.

If you want to manually restore an image from a folder that uses extended or double-byte characters in its name, you should perform an automatic image restoration. For more information, see [Section 22.5.2, “Creating, Installing, and Restoring Standard Images,” on page 233](#) or [Section 22.5.4, “Restoring Lab Devices to a Clean State,” on page 234](#).

For more information on the parameters you can use and usage examples, see [Section C.4, “Restore Mode \(img restore\),” on page 429](#).

Depending on the size of the image, it might take several minutes to put the image down. Images usually take slightly longer to put down than they do to take.

- 7 (Optional) After the image is put down and the bash prompt is displayed, type `img dump`, then press Enter.

As before, this displays a list of the partition slots on the device. You should now see information about the new partitions that are created and activated by the image that you just put down.

- 8 At the bash prompt, type `lilo.s`, then press Enter.
- 9 Remove any diskette from the drive and reboot the device.
- 10 Verify that the device boots to the operating system that was installed by the new image.

Manually Putting an Image on a Device Using the ZENworks Imaging Engine Menu

- 1 If you haven’t already done so, create the image to put on the device, as instructed in [“Manually Taking an Image of a Device” on page 303](#).

Make sure that the image is of the same type of device (same hardware configuration) and is stored on your imaging server. You can use a previous image of the same device.

IMPORTANT: If you are putting an image on a device without a ZENworks partition, make sure the image was made on a device without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the device fails to boot.

-
- 2 (Optional) Boot the device from a Windows startup disk and run FDISK to remove all partitions from the hard disk.

Running FDISK is not required, but it is recommended for purposes of comparing the workstation or server partitions before and after the imaging operation.

- 3 Boot the device using one of the following methods:

- If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
- Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).

- Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244.](#)
- 4 Enter `manual` at the boot prompt.
or
Select *Start ZENworks imaging maintenance* from the Preboot Services Menu.
 - 5 Enter `img` to display the ZENworks Imaging Engine menu.
 - 6 (Optional) Click *System information > Drive information* to display a list of the partition slots on the device.

For your reference, note the number and type of partitions and which one is active. If you removed all partitions using FDISK, each slot should be empty and none should be active.
 - 7 Click *Imaging > Restore image*.
 - 8 In the Restore Image Wizard window, specify the source location of the image (Local or Server), then click *Next*.
 - 9 Browse to and specify the path to the image archive.
 - 10 (Optional) Specify a file set.
 - 11 (Optional) Specify any advanced options, such as *sfileset* or *apartition:ppartition*.

For details on this and other related `img` command parameters, see [“ZENworks Imaging Engine Commands” on page 425.](#)
 - 12 Click *Next*.

Depending on the size of the image, it might take several minutes to put the image down. Images usually take slightly longer to put down than they do to take.
 - 13 (Optional) Click *System information > Drive information* to display a list of the partition slots on the device.

As before, this displays a list of the partition slots on the device. You should now see information about the new partitions that are created and activated by the image that you just put down.
 - 14 Exit the ZENworks Imaging Engine menu.
 - 15 Run `lilo.s` from the bash prompt.
 - 16 Remove any diskette from the drive and reboot the device.
 - 17 Verify that the device boots to the operating system that was installed by the new image.

Making an Image Available for Automatic Imaging

When you boot a device from an imaging method and allow the boot process to proceed in auto-imaging mode, the imaging operation that is performed on the device is determined by default Preboot Services settings that you define in the ZENworks Control Center.

Creating a Preboot Services bundle also allows you to combine a base image and one or more add-on images into a single entity that can be put down on target devices. You can specify a standard image file to put down, or you can create a script to further customize your imaging operation. You can also specify that a particular file set of an image be used.

The sections that follow give instructions for performing these tasks:

- “Creating a Base Image” on page 311
- “Associating an Add-On Image with a Base Image” on page 311
- “Using a File Set of an Image” on page 312

Creating a Base Image

- 1 Create the base image using one of the following methods:
 - **ZENworks Control Center:** See “Taking a Base Image of a Device” on page 296.
 - **Manually from a bash prompt:** See “Manually Taking an Image of a Device” on page 303.
- 2 After the base image is created, perform one of the following procedures in the ZENworks Control Center:
 - If you created the image using a Preboot bundle, assign the bundle to the devices to be imaged:
 - 1) In the ZENworks Control Center, click *Bundles*, click the bundle containing the base image that you want to associate the add-on images with, then click *Details*.
 - 2) In the Assignments section, click *Add* to start the Assign Bundle wizard.
 - 3) Click *Add* to open the Select Objects dialog box.
 - 4) Select the devices or groups containing devices, then click *OK*.
 - 5) Click *Next* to display the Summary page, then click *Finish* > *OK* to assign the devices to the bundle and exit the wizard.
 - If you created the image manually, assign the image to a Preboot Image bundle, then assign that bundle to the devices to be imaged:
 - 1) Follow the instructions in “Configuring the ZENworks Image Bundle for Automatic Imaging” on page 299.
 - 2) In **Step 10 on page 302**, click *Next* to assign the bundle to the devices.

The next time these devices boot, they are imaged from this Preboot bundle.

Associating an Add-On Image with a Base Image

- 1 Create the add-on image to associate with the base image. For more information, see “Creating an Add-On Image” on page 307.
- 2 Copy the add-on image file to a ZENworks Linux Management imaging server that is accessible as a server object in your eDirectory tree.

You might want to copy your add-on images to the same location as the base image.
- 3 In the ZENworks Control Center, click *Bundles*, click the bundle containing the base image that you want to associate the add-on images with, then click *Details*.
- 4 For the Add-On Image Files section, click *Add*.
- 5 Browse for and select an add-on image.

You can associate more than one add-on image with a base image. Repeat this step for each add-on image.

6 Click *Apply*.

When a device boots that is assigned to this bundle, the add-on images are put down after the base image in the order listed on this page.

Using a File Set of an Image

As explained in [“Using Image Explorer to Customize an Image” on page 306](#), you can exclude individual files and folders from any of 10 possible file sets of an image.

Table 24-1 *Image File Set Usages*

Type of imaging operation	How to specify the file set to use
Automatic (Preboot Services based on default settings)	<p>In the Multicast Wizard in the ZENworks Control Center, specify the number of the file set in the <i>File set</i> field. You must create the file set using the Image Explorer utility. For more information, see Section B.1, “Image Explorer (ImgExp.exe),” on page 401.</p> <p>You can create multiple Preboot bundles that point to the same base image, but to different file sets of that image.</p>
Manual (command line or menu)	<p>Use the <i>s</i> parameter on the <code>img restore</code> command. For example, to specify file set number 3:</p> <pre>img restore1 dellnt4.zmg s3</pre> <p>or</p> <p>You can enter <code>img</code> at the bash prompt to display a menu, select <i>Restore an image</i>, then select <i>Local image</i>. Specify <i>sfileset</i> (for example, <i>s3</i>) in the <i>Advanced parameters</i> field.</p> <p>For details, see “ZENworks Imaging Engine Commands” on page 425.</p>

24.3.3 Setting Up Disconnected Imaging Operations

Disconnected imaging operations are inherently manual. To perform a disconnected imaging operation on a device, you must have a storage device to hold the image to be created or put down, and that storage device must be locally accessible to the ZENworks Imaging Engine (in Linux) when you boot the device from the imaging boot media.

The following sections explain how to set up and perform disconnected operations:

- [“Using a CD or DVD for Disconnected Imaging Operations” on page 312](#)
- [“Using a Hard Disk for Disconnected Imaging Operations” on page 314](#)

Using a CD or DVD for Disconnected Imaging Operations

Using ZENworks Linux Management, you can use CDs and DVDs only as the storage medium for an image to put down, not for an image to be created.

You can put down an image from a bootable or non-bootable imaging CD or DVD using either the bash prompt or using the ZENworks Imaging Engine menu.

The following sections contain additional information:

- [“Putting Down an Image Using the Bash Prompt” on page 313](#)
- [“Putting Down an Image Using the ZENworks Imaging Engine Menu” on page 313](#)

Putting Down an Image Using the Bash Prompt

- 1 Use your CD- or DVD-burning software to burn the source image onto a CD or DVD.
- 2 Boot the device using one of the following methods:
 - If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
 - Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
 - Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).
- 3 Enter `manual` from the boot prompt.
- 4 Insert the CD or DVD that contains the source image.
- 5 At the Linux prompt, enter `cdrom.s` to mount the CD or DVD.
This mounts the CD or DVD to `/mnt/cdrom`.
- 6 Enter a command using the following format:

```
img restore1 /mnt/cdrom/path/image_name.zmg
```

where *path* and *image_name* are the path and filename of the image relative to the root of the CD or DVD.
- 7 When the imaging is done, remove the imaging boot media (if applicable) and do the following to boot the device with the new image:
 - 7a At the Linux prompt, type `lilo.s`, then press Enter.
 - 7b Press Ctrl+Alt+Delete.
If the device doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

Putting Down an Image Using the ZENworks Imaging Engine Menu

- 1 Use your CD- or DVD-burning software to burn the source image onto a CD or DVD.
- 2 Boot the device using one of the following methods:
 - If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
 - Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
 - Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).
- 3 Enter `manual` from the boot prompt.
- 4 Insert the CD or DVD that contains the source image.
- 5 At the Linux prompt, enter `cdrom.s` to mount the CD or DVD.
This mounts the CD or DVD to `/mnt/cdrom`.

- 6 Enter `img` to display the ZENworks Imaging Engine menu.
- 7 Click *Imaging*, then click *Restore image*.
- 8 Click *Local*, then click *Next*.
- 9 Browse to and specify the path to the image archive.
- 10 (Optional) Specify a file set.
- 11 (Optional) Specify any advanced options, such as `sfileset` or `apartition:ppartition`.
For details on this and other related `img` parameters, see “ZENworks Imaging Engine Commands” on page 425.
- 12 Click *Next*.
Depending on the size of the image, it might take several minutes to put the image down. Images usually take slightly longer to put down than they do to take.
- 13 When the imaging is done, remove the imaging boot media (if applicable) and do the following to boot the device with the new image:
 - 13a At the Linux prompt, type `lilo.s`, then press Enter.
 - 13b Press Ctrl+Alt+Delete.
If the device doesn’t boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

Using a Hard Disk for Disconnected Imaging Operations

When you boot a device from a ZENworks Linux Management imaging boot media, you can create an image on, or put down an image from, any primary partition on an IDE or SCSI hard drive. You can also use the local ZENworks partition if one is installed. Any target partition must have sufficient space.

When you create an image, the partition where you store the image is itself excluded from the image. When you put down an image, the source partition is not altered.

You can create or put down an image on a hard disk using either the bash prompt or using the ZENworks Imaging Engine menu.

The following sections contain the instructions:

- “Creating an Image Using the Bash Prompt” on page 314
- “Creating an Image Using the ZENworks Imaging Engine Menu” on page 315
- “Putting Down an Image Using the Bash Prompt” on page 316
- “Putting Down an Image Using the ZENworks Imaging Engine Menu” on page 317

Creating an Image Using the Bash Prompt

- 1 Boot the device using one of the following methods:
 - If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
 - Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
 - Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).

- 2 Enter `manual` from the boot prompt.
- 3 At the Linux prompt, enter `img dump` to view the available partitions.

Note the number of the partition where you will store the new image.

- 4 Enter a command using the following format:

```
img make1[pNumber] /path/image.zmg [comp=comp_level]
```

where *pNumber* is the number of the partition to store the image in, and *comp_level* is the amount of compression used when creating the image. Specify any number from 0-9. 0 means no compression. 1 is the same as *Optimize for speed*. 6 is the same as *Balanced* and is used by default if you do not specify this parameter. 9 is the same as *Optimize for space*. (*Optimize for speed* takes the least amount of time but creates the largest image file. *Optimize for space* creates the smallest image file but might take a significant amount of time. *Balanced* is a compromise between compression time and image file size.) *Path* and *image* are the path and filename of the new image relative to the partition root. If you omit the partition number, the local ZENworks partition is used.

For details on other related `img` command parameters, see “ZENworks Imaging Engine Commands” on page 425.

Creating an Image Using the ZENworks Imaging Engine Menu

- 1 Boot the device using one of the following methods:
 - If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
 - Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
 - Boot the device from the ZENworks partition. For more information, see “Creating a ZENworks Partition” on page 244.

- 2 Enter `manual` from the boot prompt.
- 3 Enter `img` to display the ZENworks Imaging Engine menu.
- 4 (Optional) Click *System information > Drive information* to display a list of the partition slots on the device.

For your information, note the number of the partition where you will store the new image.

- 5 Click *Imaging > Make image*.
- 6 In the Make Image Wizard window, click *Local > Next*.
- 7 Browse to and specify the path to the image archive.
- 8 Select the partitions that you want to include in the image.
- 9 Select a compression option.

None: No compression is used.

Speed: Takes the least amount of time to compress but creates the largest compressed image file. This option is used by default when an image is created.

Balanced: Represents a compromise between compression time and image file size.

Size: Creates the smallest image file but takes longer to compress.

- 10 Click *Next*.

11 (Optional) Fill in the fields:

Author: The name of the person creating this image.

Computer: The name of the computer being imaged.

Image description: A description of the image.

Comments: Any additional comments about the image.

12 Click *Next*.

Depending on the amount of data on the hard disk, the image might take several minutes to create.

13 After the image is created, exit from the ZENworks Imaging Engine menu, remove any diskette from the drive, then reboot the device.

14 (Optional) Verify that the image file was created. You might also want to check its size.

Putting Down an Image Using the Bash Prompt

1 Boot the device using one of the following methods:

- If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
- Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
- Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).

2 Enter `manual` from the boot prompt.

3 (Optional) At the Linux prompt, enter `img dump` to view the available partitions.

For your information, note the number of the partition where the source image is stored.

4 Enter a command using the following format:

```
img restore1[pNumber] /path/image.zmg
```

where *pNumber* is the number of the partition where the source image is stored, and *path* and *image* are the image path and filename relative to the partition root. If you omit the partition number, the local ZENworks partition is used.

For details on other related `img` command parameters, see [“ZENworks Imaging Engine Commands” on page 425](#).

5 When the imaging is done, remove the imaging boot media (if applicable) and do the following to boot the device with the new image:

5a At the Linux prompt, type `lilo.s`, then press Enter.

5b Press Ctrl+Alt+Delete.

If the device doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

Putting Down an Image Using the ZENworks Imaging Engine Menu

1 Boot the device using one of the following methods:

- If the device is PXE-enabled, boot it from the Preboot Services imaging server. For more information, see [Section 23.2.1, “Using Preboot Services \(PXE\),” on page 240](#).
- Boot the device using an imaging boot CD or DVD. For more information, see [Section 23.2.2, “Preparing Imaging Boot CDs or DVDs,” on page 240](#).
- Boot the device from the ZENworks partition. For more information, see [“Creating a ZENworks Partition” on page 244](#).

2 Enter `manual` from the boot prompt.

3 Enter `img` to display the ZENworks Imaging Engine menu.

4 (Optional) Click *System information > Drive information* to display a list of the partition slots on the device.

For your reference, note the number of the partition where the source image is stored.

5 Click *Imaging > Restore image*.

6 Click *Local > Next*.

7 Browse to and specify the path to the image archive.

8 (Optional) Specify a file set.

9 (Optional) Specify any advanced options, such as `sfileset` or `apartition:ppartition`.

For details on this and other related `img` command parameters, see [“ZENworks Imaging Engine Commands” on page 425](#).

10 Click *Next*.

Depending on the size of the image, it might take several minutes to put the image down. Images usually take slightly longer to put down than they do to take. If the screen goes blank, just press any key. (Linux enters a screen-saving mode after a few minutes.)

11 When the imaging is done, remove the imaging boot media (if applicable) and do the following to boot the device with the new image:

11a At the Linux prompt, type `lilo.s`, then press Enter.

11b Press Ctrl+Alt+Delete.

If the device doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

24.4 Multicasting Images

ZENworks Linux Management's Preboot Services includes a multicasting capability for its imaging software. You can perform multicasting of images either in the ZENworks Control Center or manually:

- [Section 24.4.1, “Multicasting in the ZENworks Control Center,” on page 318](#)
- [Section 24.4.2, “Multicasting Manually,” on page 323](#)

24.4.1 Multicasting in the ZENworks Control Center

- “Configuring Multicast Bundles” on page 318
- “Enabling a Multicast Session” on page 322

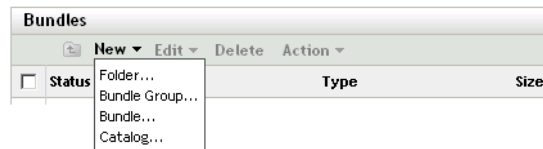
Configuring Multicast Bundles

With Preboot Services, multicasting is an automated procedure. As described in “Automatic Multicasting Example” on page 237, you simply define a Multicast bundle and assign it to the devices. The multicast session starts when the trigger event that you configured occurs.

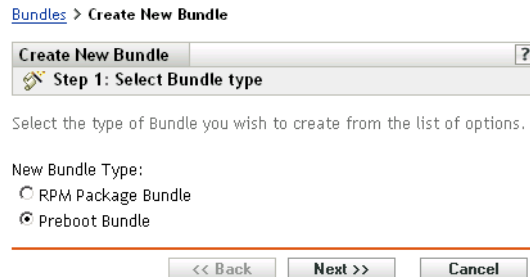
Using ZENworks Linux Management, you can install software using a bundle. Software included in a bundle that is assigned directly is considered mandatory; the software is installed on all assigned devices (the bundle is directly assigned to the devices, their groups, or their folders).

To configure a Multicast bundle and assign devices to the bundle:

- 1 In the ZENworks Control Center, click the *Bundles* tab.



- 2 Click *New > Bundle* to start the Create New Bundle Wizard:



- 3 In the Create New Bundle Wizard, select *Preboot bundle*, then click *Next* to display the Select Preboot Bundle Type page:

Bundles > Create New Bundle

Create New Bundle ?

Step 2: Select Preboot Bundle Type

Select the type of Preboot Bundle you wish to create from the list of options.

Preboot Bundle Type:	Type Description:
AutoYaST Bundle	
Kickstart Bundle	
ZENworks Image Bundle	
ZENworks Multicast Bundle	ZENworks Multicast Bundle - Specifies an image that should be sent using the multicast protocol. This bundle allows you to send an image to a large number of computers in a single operation. It is ideal for labs, classrooms and staging areas.
ZENworks Script Bundle	

<< Back Next >> Cancel


- 4 Select *ZENworks Multicast bundle*, then click *Next* to display the Set General Information page:

Bundles > Create New Bundle

Create New Bundle ?

Step 3: Set General information

Name:

Folder:
 

Description:

<< Back Next >> Cancel

- 5 Fill in the fields:

Name: (Required) Although bundles can be identified in ZENworks Control Center by their type of icon, as well as the folder they are listed under, you should develop a naming scheme that differentiates the ZENworks Multicast bundles that are listed together in a folder.

Folder: Browse for the location where you want the ZENworks Multicast bundle displayed in ZENworks Control Center. The folder must exist. You cannot specify a non-existent folder, because ZENworks does not create them from this wizard.

Description: Provide a description to help you later recognize the exact purpose of this ZENworks Multicast bundle.

If you are using subsets of an image, be sure to indicate which file set this bundle is configured for.

6 Click *Next* to display the Master Image Source page:

Bundles > Create New Bundle

Create New Bundle ZENworks Multicast Bundle ?

Step 4: Master Image Source:

Enter information for the multicast image source:

Master Image Source:

File Path: *

File Set:

1

Fields marked with a blue asterisk are required.

<< Back Next >> Cancel

7 Fill in the fields:

ZENworks Multicast bundles use an image that is taken previously from a device and is stored on an imaging server. The image is sent to multiple devices at one time to reimage them, rather than sent one time for each device, thus saving on network bandwidth usage. For example, if you have 10 devices in the multicast session and the image is 3 GB in size, your network experiences 3 GB of network traffic to image all 10 devices. Without multicasting, the network experiences 30 GB of network traffic.

For multicasting to work properly, all routers and switches on the network must have their multicast features configured. Otherwise, multicast packets might not be routed properly.

File path: The location on the imaging server where the image file to be used by the ZENworks Multicast bundle is stored.

File set: File sets are assigned to the current ZENworks Image bundle using this *File set* field. File sets are defined on the imaging server from the base image using the **Image Explorer** utility, which can be run on a Windows machine from a Linux server running Samba. The Image Explorer utility is located at `/opt/novel/zenworks/zdm/imaging/winutils/ImgExp.exe` on the Linux server.

When you define a file set using Image Explorer, you specify files and directories to be excluded from the image. Thus, a file set is a subset of the original image that excludes the files you select in Image Explorer. A separate image file is not created for the file set; instead, a file set contains internal attributes representing the excluded information. Therefore, even though a file set does not exist as a separate, physical image file, it is accessed as though it is, placing the image on the receiving device, minus the excluded files.

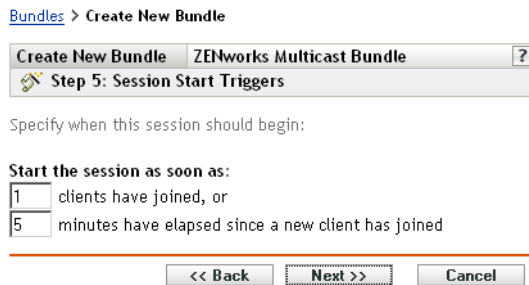
For example, `device1image.zmg` is the image file on your imaging server. You use Image Explorer to determine which data to exclude and assign this to a file set number, such as 2. When a device assigned to this ZENworks Image bundle boots, it is imaged with the smaller version (file set 2) of `device1image.zmg`.

The advantage file sets provide is that you can create a base image and modify it slightly for various devices, instead of creating separate, somewhat different base images for each device. However, because file sets only concern excluded files, if you add files to the base image using Image Explorer, all file sets will include those additional files. If you don't want them included in a file set, you must use Image Explorer to exclude these new files from that file set.

There are a maximum of 10 file sets. Each of the ten file set numbers represents the original base image, until you use Image Explorer and assign the results to a file set number.

IMPORTANT: If you create 10 different file sets, then the original image can be lost. If you want to maintain the original image's information, do not use Image Explorer to assign exclusions to file set 1, which is the default file set if you do not select a file set when using this wizard.

8 Click *Next* to display the Session Start Triggers page:



Bundles > Create New Bundle

Create New Bundle ZENworks Multicast Bundle ?

Step 5: Session Start Triggers

Specify when this session should begin:

Start the session as soon as:

1 clients have joined, or

5 minutes have elapsed since a new client has joined

<< Back Next >> Cancel

9 Fill in the fields:

There are two triggers that you can use to determine when to start the ZENworks Multicast session. The first trigger to be realized starts the session.

A session consists of all clients (devices) that are assigned to the ZENworks Multicast bundle that are booting (joining), but must wait for a start trigger to trip. Therefore, the boot processes for the devices can be held up until one of the triggers is realized, even for as long as you specify in an elapsed time or number of clients entry.

After a session has started, other devices booting that are assigned to this bundle do not become part of this session, but become part of the next session when it triggers.

Start the session as soon as: You have two choices:

- ____ clients have joined

This trigger, if met first, limits the session to the number of clients that you specify. The default is 1.

- ____ minutes have elapsed since a new client has joined

This trigger, if met first, causes the session to start, regardless of the number of clients that have joined, except that at least one client must have joined (otherwise there is no device to multicast to).

A “new client” means that it is the first device to boot that starts this round of waiting for a trigger to be realized. The default is 5.

These triggers are useful if you want economy of scale in multiple clients joining, but don't want to stall the session too long from starting.

10 Click *Next* to display the Summary page:

Bundles > Create New Bundle

Create New Bundle ZENworks Multicast Bundle ?

Step 6: Summary

Review the following information and click 'Finish' to create the new multicast session:

Session Name: ZENworks Multicast Bundle

Preboot Bundle Type: ZENworks Multicast Bundle

Description: ZENworks Multicast Bundle

Master Image Source: 192.68.1.203 : / images/ image.zmg

Session Start Trigger(s): - When 1 clients have joined
- When 5 minutes have elapsed

File Set: 1

<< Back Next >> Finish Cancel

11 Review the configuration, then click one of the following:

Back: Allows you to make changes after reviewing the summary.

Next: Click to perform the following tasks before creating the bundle:

- Specify device assignments for this bundle
- Specify groups for this bundle

Continue with [Section 24.5, “Assigning Unassigned Preboot Bundles,” on page 328](#) to assign the bundle and complete the wizard.

Finish: Creates the Multicast bundle as configured per the settings listed on this Summary page.

This bundle is not assigned to any device or group after it is created, unless you click *Next* instead of *Finish* to make that assignment.

When the Multicast bundle’s trigger event occurs (configured in [Step 9](#)), the Multicast session begins.

Enabling a Multicast Session

A wizard allows you to cause each device assigned to the ZENworks Multicast bundle to be enabled for receiving the bundle when it reboots, even if the configuration for the device is to “do nothing” (see [Step 5](#) through [Step 7](#) in [Section 24.6, “Editing Preboot Services Work,” on page 330](#)).

The wizard does not assign a bundle to any device, nor make it the effective bundle for any device. It only sets up a device to do ZENworks Multicast Bundle work for its effective bundle the next time it boots.

To enable a ZENworks Multicast bundle:

1 In the ZENworks Control Center, click the *Bundles* tab to display the Bundles page:

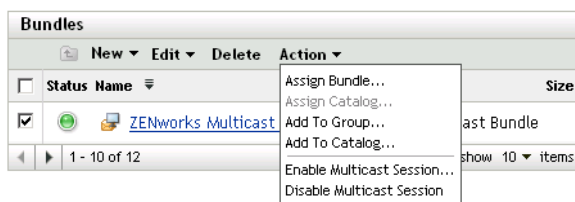
Bundles

New Edit Delete Action

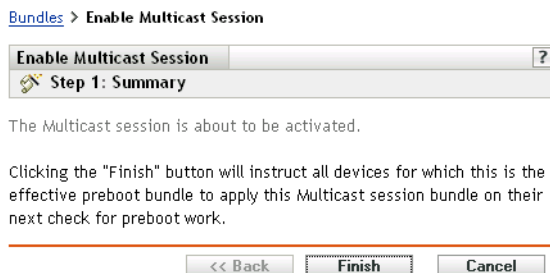
<input type="checkbox"/>	Status	Name	Type	Size
<input checked="" type="checkbox"/>		ZENworks Multicast Bundle	ZENworks Multicast Bundle	

1 - 10 of 12 show 10 items

- 2 Select the check box next to a *ZENworks Multicast bundle*.



- 3 Click *Actions > Enable multicast session* to start the Enable Multicast Session wizard:



- 4 Click *Finish* to enable multicasting for the selected device.
- 5 Click *OK* to the message displayed that indicates multicasting is successfully enabled.
The next time a device assigned to the multicast bundle boots, it can become part of that multicast session. For more information, see [Section 24.4, "Multicasting Images," on page 317](#).

24.4.2 Multicasting Manually

If you want to perform a manual multicast session, you need to start the multicast session from the ZENworks imaging server and physically visit each participating device. Performing a manual multicast session is particularly useful in a lab environment in which a small number of devices participate.

The following sections contain step-by-step information about performing a manual multicast session. To perform a manual multicast session, you must perform the steps in both of the following sections; however, the order in which you perform these tasks does not matter.

- ["Initiating a Multicast Session from the ZENworks Imaging Server" on page 323](#)
- ["Initiating a Multicast Session from Each Client" on page 325](#)

Initiating a Multicast Session from the ZENworks Imaging Server

On the ZENworks Linux Management imaging server, do the following to initiate the multicast session:

- 1 In the shell console, enter the following command to make sure the imaging software is running:

```
/etc/init.d/novell-pbserv -status
```

If it is not running, then enter:

```
/etc/init.d/novell-pbserv -start
```

- 2** In the shell console, enter the following command to enable a multicast session:

```
/opt/novell/zenworks/preboot/bin/novell-zmgmcast -mcast arguments
```

where *arguments* represents the following that you can append to the command line:

Argument	Description
<i>session_name</i>	(Required) The session name is any string that uniquely identifies this multicast session from other multicast sessions that might be in progress on the network.
<i>-p path</i>	(Required) The path to the image to be multicast, which is located on the imaging server. This must be the full path.
<i>-i IP_address</i>	(Optional) The IP address of the imaging server.
<i>-f file_set_number</i>	<p>(Optional) File sets are assigned to the current ZENworks Image bundle using this information. File sets are defined on the imaging server from the base image using the Image Explorer utility, which can be run on a Windows machine from a Linux server running Samba. The Image Explorer utility is located at <code>/opt/novel/zenworks/zdm/imaging/winutils/ImgExp.exe</code> on the Linux server.</p> <p>When you define a file set using Image Explorer, you specify files and directories to be excluded from the image. Thus, a file set is a subset of the original image that excludes the files you select in Image Explorer. A separate image file is not created for the file set; instead, a file set contains internal attributes representing the excluded information. Therefore, even though a file set does not exist as a separate, physical image file, it is accessed as though it is, placing the image on the receiving device, minus the excluded files.</p> <p>For example, <code>device1image.zmg</code> is the image file on your imaging server. You use Image Explorer to determine which data to exclude and assign this to a file set number, such as 2. When a device assigned to this ZENworks Image bundle boots, it is imaged with the smaller version (file set 2) of <code>device1image.zmg</code>.</p> <p>File sets provide an advantage because you can create a base image and modify it slightly for various devices, instead of creating separate, somewhat different base images for each device. However, because file sets only concern excluded files, if you add files to the base image using Image Explorer, all file sets include those additional files. If you don't want them included in a file set, you must use Image Explorer to exclude these new files from that file set.</p> <p>There are a maximum of 10 file sets. Each of the ten file set numbers represents the original base image, until you use Image Explorer and assign the results to a file set number.</p> <p>IMPORTANT: If you create 10 different file sets, then the original image can be lost. If you want to maintain the original image's information, do not use Image Explorer to assign exclusions to file set 1, which is the default file set if you don't select a file set when using this wizard.</p>
<i>-t time_wait</i>	(Optional) If not enough devices have booted to fulfill the Client Count requirement, the multicast session begins if a participating device boots and a certain amount of time passes without another participating device booting. Specify this amount of time. The default is 5 minutes.

Argument	Description
<code>-c client_count</code>	(Optional) The number of participating devices you want to have booted before the multicast session begins. If you do not specify a number, the default is 1.

IMPORTANT: The image is sent to and put down on each participating device only after you initiate the multicast session from each participating client.

- 3** To view the status of the multicast session, enter:

```
/opt/novell/zenworks/preboot/bin/novell-zmgmcast -status -i
proxy_IP_address
```

The `-i` argument is optional.

- 4** To view the list of multicast sessions, enter:

```
/opt/novell/zenworks/preboot/bin/novell-zmgmcast -list -i
proxy_IP_address
```

The `-i` argument is optional.

- 5** To stop a multicast session, enter:

```
/opt/novell/zenworks/preboot/bin/novell-zmgmcast -stop
session_name -i proxy_IP_address
```

The `session_name` is required and the `-i` argument is optional.

- 6** Continue with [“Initiating a Multicast Session from Each Client” on page 325](#).

Initiating a Multicast Session from Each Client

You can use the bash prompt or the ZENworks Imaging Engine menu to perform the multicast session as you physically visit each device.

The following sections contain additional information:

- [“Using the Bash Prompt to Perform the Multicast Session” on page 325](#)
- [“Using the ZENworks Imaging Engine Menu to Perform the Multicast Session” on page 326](#)

Using the Bash Prompt to Perform the Multicast Session

- 1** (Optional) Install the Novell ZENworks Linux Management Imaging Agent (`novell-zislnx`) on each of the participating devices.

If you do not install the Imaging Agent on each participating device, the devices have duplicate network identities. For more information, see [“Limitations of Multicasting Images” on page 236](#).

- 2** Create an imaging boot CD or DVD for each person who will assist with the multicast session, or enable PXE on the participating devices.

If you don’t know how to do this, see [Section 23.2, “Setting Up the Preboot Services Methods,” on page 240](#).

- 3** At each device, including the master device (unless you are starting the multicast session from the imaging server), access a Linux prompt by using the imaging boot CD or DVD, or if it is PXE-enabled, boot it.

- 4** Enter `manual` at the boot prompt.

- 5 To identify each participating device in the multicast session, enter the following command at the bash prompt of every device:

```
img session session_name
```

where *session_name* is any string that uniquely identifies this multicast session from other multicast sessions that might be in progress on the network. Use the same session name on each of the participating devices in this multicast session. You can specify any multicast session, including one that originates from the imaging server (as long as you specify the session name used by the imaging server).

Example: `img session mcast01`

The `img session` command can take other parameters that allow you to designate the master device and the imaging start time beforehand. See “ZENworks Imaging Engine Commands” on page 425 for details.

- 6 (Conditional) If you have not already done so, start the multicast session from the master device or from the imaging server.

Master device: To start the multicast session from the master device, after all of the other devices have registered as participants, click *Start session*.

If you start the session from the master device, the session master must be a device. If you start the session from the imaging server, the session master must be an imaging server using a previously saved image file.

The ZENworks Imaging Engine begins creating the image of the master device and the image is sent to and put down on each participating device. Any problems are reported and displayed on the master device.

Imaging server: To start the multicast session from the imaging server, follow the steps under “Initiating a Multicast Session from the ZENworks Imaging Server” on page 323.

- 7 At each participating device, when the imaging is done, do the following to boot the device with the new operating system:

7a At the Linux prompt, type `lilo.s`, then press Enter.

7b Press Ctrl+Alt+Delete.

If the device doesn’t boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

Using the ZENworks Imaging Engine Menu to Perform the Multicast Session

- 1 (Optional) Install the Novell ZENworks Linux Management Imaging Agent (`novell-zislnx`) on each of the participating devices.

If you do not install the Imaging Agent on each participating device, the devices have duplicate network identities. For more information, see “Limitations of Multicasting Images” on page 236.

- 2 Create an imaging boot CD or DVD for each person who will assist with the multicast session, or enable PXE on the participating devices.

If you don’t know how to do this, see Section 23.2, “Setting Up the Preboot Services Methods,” on page 240.

- 3 At each device, including the master device (unless you are starting the multicast session from the imaging server), access a Linux prompt by using the imaging boot CD or DVD, or if it is PXE-enabled, boot it.

- 4 Enter `manual` at the boot prompt.

or

Select *Start ZENworks Imaging Maintenance* from the Preboot Services Menu.

- 5 To identify each participating device in the multicast session, type `img` at the bash prompt to display the ZENworks Imaging Engine screen.
- 6 Click *Imaging*, then click *Multicast session* (or on the task bar, click *F7 Multicast*) to start the Multicast Wizard.
- 7 Enter a session name.

The session name is any string that uniquely identifies this multicast session from other multicast sessions that might be in progress on the network. Use the same session name on each of the participating devices in this multicast session. You can specify any multicast session, including one that originates from the imaging server (as long as you specify the session name used by the imaging server).

- 8 Select a *Session role* option:

Master: Select this option if this is the session master.

Client: Select this option if this is a participating device.

- 9 (Optional) If you chose Master in **Step 8**, click *Specify additional options*, click *Next*, then fill in the fields:

Compression level: Specify the compression level you want to use for this multicast session:

- **None:** No data compression is used. Data is sent immediately across the network to participating devices. You might use this option if the master device has a slow CPU; the amount of time to compress the data is eliminated and the data is immediately sent across the network. However, this option creates more network traffic than if you selected one of the other compression levels (*Speed*, *Balanced*, or *Size*).
- **Speed:** Takes the least amount of time to compress the data before the data is sent across the network to participating devices. You might use this option if the master device has a slow CPU; the amount of time to compress the data is reduced before the data is sent across the network. With this option, however, the multicast session creates more network traffic than if you selected either the *Balanced* or *Size* compression level.
- **Balanced:** Represents a compromise between data compression and the amount of network traffic that the multicast session creates.
- **Size:** Takes the most amount of time to compress the data before sending it across the network to participating devices. You might use this option if the master device has a fast CPU. Using this option requires the most CPU resources to compress the data but creates less network traffic to transfer the data to the participating devices.

Automated session: Click *Enabled* to specify the number of participating devices (clients) that must register before starting the automated multicast session and to specify the amount of time, in minutes, that can expire without the number of participating devices to register before starting the automated multicast session. If you do not click the *Enabled* check box, you must manually start the multicast session.

- 10 Click *Next*, then click *Start session*.

You can cancel the session by clicking *Abort session* > *Yes* > *OK* > *Close*.

- 11 At each participating device, when the imaging is done, do the following to boot the device with the new operating system:

- 11a At the Linux prompt, type `lilo.s`, then press Enter.

- 11b Press Ctrl+Alt+Delete.

If the device doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter `lilo.s` again and reboot the device a second time.

24.5 Assigning Unassigned Preboot Bundles

- 1 If you click *Next* on the Summary page of a wizard, or if you access this page through the *Devices* or *Bundles* tabs, the Bundle Assignments page is displayed:

[Bundles](#) > [Create New Bundle](#)

Create New Bundle

Script Bundle X

?

Step 6: Bundle Assignments

Specify the assignments for this bundle:

Add	Remove
<input type="checkbox"/>	Name
	In Folder

No items selected, click add to select items

<< Back

Next >>

Cancel

The wizard's step number depends on where you access the wizard from. The examples in these instructions are based on accessing this wizard when creating a ZENworks Script bundle.

- 2 Click *Add* to display the Select Assignments dialog box:

Select Assignments

Look in:
/Devices

Item name:
*

Items of type:
All Types

Name	Type
Servers	Folder
Workstations	Folder

2 Items

Selected:

Remove	Name	Folder
--------	------	--------

0 Items Selected

Select All

Remove All

OK

Cancel

- 3 Browse for and select the devices that you want to be assigned to this bundle, then click *OK*.
You can select individual devices, or the *Servers* or *Workstations* folders containing such devices, or mixtures of folders and devices.

4 Click *Next* to display the Bundle Groups page:

[Bundles](#) > Create New Bundle

Create New Bundle

Script Bundle X

?

Step 7: Bundle Groups

Specify the groups for this bundle:

Add Remove

<input type="checkbox"/> Name	In Folder
No items selected, click add to select items	

<< Back

Next >>

Cancel

This is optional. You can click *Next* to display the Summary page without assigning a bundle group. In this case, skip to [Step 8](#).

5 Click *Add* to display the Select Groups dialog box:

Select Groups

×

Look in:
/Bundles

Item name:
*

Items of type:
All Types

Name	Type
Workstation	Folder
Bundle Group	Bundle Group

1 - 5 of 5 show 10 Items

Selected:

Remove	Name	Folder
--------	------	--------

0 Items Selected

Select All

Remove All

OK

Cancel

6 Browse for and select the groups that you want to be assigned to this bundle, then click *OK*.
You can select individual groups, including browsing the folders containing groups.

7 Click *Next* to display the Summary page:

[Bundles](#) > [Create New Bundle](#)

Create New Bundle

Script Bundle X

?

Step 8: Summary

Review the following information, and click 'Finish' to create the new Image Bundle.

Name: Script Bundle X
Preboot Bundle Type: ZENworks Script Bundle
Folder: Bundles
Description: Created to screen dump assignments pages
Script Text: `#!/bin/sh`

Assignments: /Devices/Servers/sdf1.provo.novell.com
Schedule:
Groups: /Bundles/Bundle Group

<< Back

Finish

Cancel

8 Review the configuration, then click one of the following:

Back: If necessary, use this to make changes before finishing.

Finish: Click to create the bundle and assign the devices or groups to the bundle when it is created.

24.6 Editing Preboot Services Work

The Edit Preboot Work page allows you to view all images that are recently applied to the selected device, and the image that is currently assigned (known as its “effective” image).

To edit a server’s or workstation’s Preboot Services work:

1 In the ZENworks Control Center, click the *Devices* tab to display the Devices page:



- 2 Click *Servers* or *Workstations*, then select a device to display the page with the Preboot Work section:

Preboot Work	Advanced				
Scheduled Work:	Apply Preboot bundle				
Bundle to Apply:					
Bundle:	ImageBundle				
Folder:	Bundles				
Description:					
Applied Image Files: <i>Image files most recently applied to this device</i>					
<table border="1"><thead><tr><th>Type</th><th>Name</th></tr></thead><tbody><tr><td colspan="2">No items available.</td></tr></tbody></table>		Type	Name	No items available.	
Type	Name				
No items available.					

- 3 In the Preboot Work section, click *Advanced*.

This starts the Edit Preboot Work Wizard:

[Devices](#) > [Servers](#) > [sdf1.provo.novell.com](#) > Edit Preboot Work

Edit Preboot Work ? ✕

This snapshot displays the preboot work this device is scheduled to perform on next boot, the bundle that will be used if a bundle is to be applied, and which image files were last applied to this device.

Preboot Work							
Scheduled Work:	Do nothing ▼						
Applied Image Files: <i>The following image files are those most recently applied to this device</i>							
<table border="1"><thead><tr><th>Type</th><th>Name</th><th>Location</th></tr></thead><tbody><tr><td colspan="3">No items available.</td></tr></tbody></table>		Type	Name	Location	No items available.		
Type	Name	Location					
No items available.							

OK Cancel

- 4 In the Preboot Work section, select one of the following from the drop-down list for the *Scheduled work* field:

Do nothing: Continue with **Step 5**.

Apply Preboot bundle: Continue with **Step 6**.

Take an image: Continue with **Step 7**.

- 5 If you select *Do nothing*, skip to step **Step 8**.

The Applied Image Files section displays the image files most recently applied to this device.

[Devices](#) > [Servers](#) > [sdf1.provo.novell.com](#) > [Edit Preboot Work](#)

?

✕

Edit Preboot Work

This snapshot displays the preboot work this device is scheduled to perform on next boot, the bundle that will be used if a bundle is to be applied, and which image files were last applied to this device.


Preboot Work

Scheduled Work:

Apply Preboot bundle ▾

Bundle to Apply:

Bundle:

ImageBundle ▾ 

Folder:

Bundles

Description:

Applied Image Files:

The following image files are those most recently applied to this device

Type	Name	Location
No items available.		

OK

Cancel

- 6 If you select *Apply Preboot bundle*, fill in the field under Bundle to Apply, then skip to **Step 8**:

Bundle: Select or specify the bundle. Its bundle name, folder, and description are displayed.

The *Bundle* field displays the currently effective bundle. You can select the bundle to apply from the drop-down list, which changes the effective bundle for the device.

The next time the device boots, or when you manually apply a Preboot bundle (such as from a ZENworks imaging CD or DVD), the selected bundle is applied.

[Devices](#) > [Servers](#) > [sdf1.provo.novell.com](#) > [Edit Preboot Work](#)

?

✕

Edit Preboot Work


This snapshot displays the preboot work this device is scheduled to perform on next boot, the bundle that will be used if a bundle is to be applied, and which image files were last applied to this device.

Preboot Work

Scheduled Work:

Take image ▾

Server and Path of new image file:*



Clear

☒ Use compression:

☒ Optimize for speed

☐ Balanced

☐ Optimize for space

Fields marked with a blue asterisk are required.

Applied Image Files:

The following image files are those most recently applied to this device

Type	Name	Location
No items available.		

OK

Cancel

7 If you select *Take an image*, fill in the fields, then skip to step **Step 8**:

The image is taken the next time the device boots, or when you manually apply a Preboot bundle, such as from a ZENworks imaging CD or DVD.

Server and path of new image file: Browse for or enter the full path to where you want the image file saved.

Image compression options: Select one:

- **Balanced:** Automatically balances compression between an average of the reimaging speed and the available disk space for the image file.
- **Optimize for speed:** Optimizes the compression to allow for the fastest reimaging time. Use this option if CPU speed is an issue.
- **Optimize for space:** Optimizes the compression to minimize the image file's size to conserve disk space. This can cause reimaging to take longer.

8 Click *OK* to exit the wizard.

Your changes should be displayed in the Preboot Work section for the device.