Workstation and Server Imaging

VI

Novell® ZENworks® 7 Desktop Management supports imaging Windows workstations using a Linux, NetWare®, or Windows imaging server. The addition of a Linux imaging server is new in ZENworks 7.

Beginning with ZENworks 7 Desktop Management, imaging support is also provided on a limited basis for the following:

- **Linux and Windows servers:** Imaging Linux and Windows servers is possible with the following exceptions:
  - Software RAID configurations are not supported, but hardware RAID is supported.
  - Volume managers, such as LVM and EVMS, are not supported.
  - A Windows server image intended for deployment to multiple servers must be prepared using the Microsoft sysprep tool so that Windows can properly manage SIDs.

    However, an image of a Windows server that is intended as disaster recovery for a specific server does not require sysprep.

  When imaging servers, you must image them manually one at a time.

- **Linux workstations:** Novell eDirectory™ objects are not created for Linux workstations in Desktop Management. Therefore, you can only manage and image Linux workstations in ConsoleOne® as unimported objects. For workstation object-based automatic imaging of Linux workstations, use ZENworks Linux Management (http://www.novell.com/documentation/zlm72/lm7admin/data/front.html).

Imaging of NetWare servers is not supported. Although you can make and deploy NetWare server images using Desktop Management in certain simple server configurations, Novell does not support these practices. For more information, see TID 10092081 in the Novell Support Knowledgebase (http://support.novell.com/search/kb_index.jsp).

The following sections provide information on the Desktop Management Imaging procedures and features:

Common Imaging Deployment Strategies

<div style="text-align: right">53</div>

The following overview sections present possible approaches to deploying the Imaging component of Novell® ZENworks® 7 Desktop Management for some common enterprise scenarios. Use the following sections to determine which procedures to perform and in what order:

- Section 53.1, "Installing a Standard Image Before Deploying New Workstations," on page 635
- Section 53.2, "Enabling Existing Workstations for Future Reimaging," on page 636
- Section 53.3, "Reimaging Corrupted Workstations," on page 637
- Section 53.4, "Restoring Lab or Classroom Workstations to a Clean State," on page 637

NOTE: The information in this section also applies to ZENworks 7 Desktop Management with Support Pack 1.

53.1 Installing a Standard Image Before Deploying New Workstations

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

1. Create a model workstation of each type that you'll deploy.

2. Create an image of each model workstation on a ZENworks Imaging server. For more information, see Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

   These images should include the Desktop Management Agent, which includes the ZENworks Imaging Windows Agent. ZENworks Desktop Management lets ZENworks work with or without an installation of the Novell Client™ on the workstation. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

3. If you are using Preboot Services, install Desktop Management Preboot Services (PXE Support) on your ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

   or

   If you are using a bootable CD or DVD, or a hard-disk partition, create a boot CD or DVD that points to the ZENworks Imaging server where the model images are stored. For more information, see "Preparing an Imaging Boot Method" on page 641.

4. Create a policy for unregistered workstations that specifies which image to put on a new machine, depending on its hardware. For more information, see Section 58.1, "Defining an Imaging Policy for Unregistered Workstations (Server Policy)," on page 705.

As each new workstation comes in, do the following:

1. If you are using Preboot Services, check to see if the workstation is PXE capable. Enable PXE if it isn't enabled by default. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

2. Physically connect the workstation to the network.

3. If you are using Preboot Services, boot the workstation from the ZENworks Imaging server.

   or

   If you are not using Preboot Services, boot the workstation with the imaging boot CDs or DVDs and consider installing the ZENworks partition to enable auto-imaging without needing to supply the CD or DVD. For more information, see Step 5 on page 703 of Section 57.2, "Enabling a Windows Workstation for Auto-Imaging Operations," on page 702. After you have installed the partition, reboot the workstation from the ZENworks partition.

4. Let the workstation be auto-imaged by the policy.

5. After deploying the machine, register it as a Workstation object in Novell eDirectory™. For more information, see Part III, "Automatic Workstation Import and Removal," on page 125.

53.2 Enabling Existing Workstations for Future Reimaging

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

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

1. Install the ZENworks Imaging Windows Agent on each workstation by distributing an Application object. For more information, see Step 3 on page 703 of Section 57.2, "Enabling a Windows Workstation for Auto-Imaging Operations," on page 702.

2. Register each workstation as a Workstation object in eDirectory. For more information, see Part III, "Automatic Workstation Import and Removal," on page 125.

3. If the workstations are PXE capable, make sure PXE is enabled (see Section 55.1, "Using Preboot Services (PXE)," on page 641) and make sure that Desktop Management Preboot Services (PXE Support) is installed on your ZENworks Imaging server (see Chapter 56, "Using ZENworks Desktop Management Preboot Services," on page 649).

   or

   Prepare imaging CDs or DVDs that users can use when they run into trouble (see "Preparing an Imaging Boot Method" on page 641). These devices could point to a ZENworks Imaging server that contains the same clean images used for new workstations.

4. If a user runs into trouble, use the strategy for reimaging corrupted workstations. For more information, see Section 53.3, "Reimaging Corrupted Workstations," on page 637.

53.3 Reimaging Corrupted Workstations

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

1. Create a policy for registered workstations. Use the same image-selection logic as the policy for new (unregistered) workstations. For more information, see Section 58.2, "Defining an Imaging Policy for Registered Workstations (Workstation Policy)," on page 707.

2. When a workstation needs to be fixed, have the user back up any files to the network that he or she wants to keep.

3. Flag the Workstation object in eDirectory using Novell ConsoleOne® to receive an image the next time it boots. For more information, see Section 59.5, "Performing an Automatic Imaging Creation or Restoration," on page 716.

4. If it's a newer workstation (with a ZENworks partition or PXE-enabled), the user should boot the workstation from the ZENworks partition or ZENworks Imaging server. If you are using Preboot Services, make sure that Desktop Management Preboot Services (PXE Support) is installed on your ZENworks Imaging server. For more information, see Chapter 56, "Using ZENworks Desktop Management Preboot Services," on page 649.

   or

   If it's an older workstation (without a ZENworks partition), the user should boot the workstation with the imaging boot CD or DVD.

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

53.4 Restoring Lab or Classroom Workstations to a Clean State

After each lab session, you can restore every workstation to a clean state, removing any changes or additions made during the session. The following steps assume that the workstations are unregistered (not imported into eDirectory).

1. Create an image of a clean model workstation and store it on a ZENworks Imaging server. For more information, see Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

   These images should include the Desktop Management Agent, which includes the ZENworks Imaging Windows Agent. ZENworks Desktop Management lets ZENworks work with or without an installation of the Novell Client™ on the workstation. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

2. If you are using Preboot Services, make sure that Desktop Management Preboot Services (PXE Support) is installed on your ZENworks Imaging server. For more information, see Chapter 56, "Using ZENworks Desktop Management Preboot Services," on page 649.

3. If you are using Preboot Services and the workstations are PXE capable, make sure that PXE is enabled. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

   or

If you are not using Preboot Services or the ZENworks partition, create an imaging boot CD or DVD that points to the ZENworks Imaging server where the clean image is stored. For more information, see "Preparing an Imaging Boot Method" on page 641.

4. Create a policy for unregistered workstations that specifies the clean image to restore. Choose the option to always force down the same base image. For more information, see Section 58.1, "Defining an Imaging Policy for Unregistered Workstations (Server Policy)," on page 705.

Deploy each lab workstation as follows:

1. Physically connect the workstation to the lab network.

2. If you are using Preboot Services, boot the workstation from the ZENworks Imaging server.

   or

   If you are not using Preboot Services, boot the workstation with the imaging boot CD or DVD and install the ZENworks partition. For more information, see Step 5 on page 703 of Section 57.2, "Enabling a Windows Workstation for Auto-Imaging Operations," on page 702. After you have installed the partition, reboot the workstation from the ZENworks partition.

3. At the end of each lab session, reboot each workstation and let it be auto-imaged by the policy.

Preparing a ZENworks Imaging Server

54

Before you can use Novell® ZENworks® Desktop Management imaging services, you must install the Imaging components. If you have already done a typical Desktop Management installation on the server, the server is ready to act as an imaging server.

For further preparation instructions:

54.1 Imaging Server Prerequisites

Make sure your server meets the requirements specified in "Preparation" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

In addition to the specific hardware requirements for the server, the ZENworks Imaging server must meet the following requirements:

- **A fixed IP address:** When you connect to the ZENworks Imaging server during a workstation imaging operation, you must do so using the fixed IP address or DNS name of the ZENworks Imaging server.

- **Enough space to store workstation images:** Unless you use compression (which is enabled by default) for your workstation images, they are nearly the same size as the data on the workstation hard disk, which could be hundreds of megabytes to several gigabytes.

  Although the System Account should already have Full Control rights to the directory where you store image files, you should make sure that this is the case if you are running the Imaging component on a Microsoft server.

  If you want to store an image locally (on a CD, DVD, hard disk, or Jaz drive) rather than on an ZENworks Imaging server, see Section 61.1, "Using a CD or DVD for Disconnected Imaging Operations," on page 727 and Section 61.2, "Using a Hard Disk or Jaz Drive for Disconnected Imaging Operations," on page 729.

- **Proxy DHCP server (Linux imaging servers only):** 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.

- **Automatic Workstation Import (NetWare and Windows imaging servers only):** If you want to deploy images based on specific workstations, you should also install the Automatic Workstation Import component for ease in managing these deployments.

If you do not install Automatic Workstation Import, see for further instructions.

54.2 Preparing an Imaging Server Where Automatic Workstation Import Is Not Installed

If you did not install the Automatic Workstation Import and Imaging components during installation of Desktop Management, use the following steps to install the necessary components:

1 Run the Desktop Management installation program (`winsetup.exe`) either on your server (Windows 2000/2003) or from a Windows workstation with a drive mapped to your server (NetWare®).

2 When prompted for the Novell eDirectory™ tree to install to, choose the tree that your server is in.

3 When prompted for the components to install, click *Automatic Workstation Import and Imaging*.

4 When prompted for the import/removal role, click *Import*.

5 If you are installing Preboot Services (PXE), select it when prompted.

6 When the installation is done, restart your server.

Preparing an Imaging Boot Method

55

The Novell® ZENworks® Desktop Management ZENworks Imaging Engine that performs the actual imaging of a workstation is a Linux application. Therefore, the workstation must be temporarily booted to Linux while the imaging is performed.

Unless you use Preboot Services, you need to prepare a boot device that has the Linux kernel, Desktop Management Workstation ZENworks Imaging Engine, and network drivers installed.

The following sections contain additional information:

55.1 Using Preboot Services (PXE)

Preboot Execution Environment (PXE) is an industry-standard protocol that allows a workstation to boot up and execute a program from the network before the workstation operating system starts. PXE uses DHCP (Dynamic Host Configuration Protocol) and TFTP (Trivial File Transfer Protocol). The PXE environment is loaded from either the NIC in flash memory or read-only memory, or in the same memory as the system BIOS.

Desktop Management Preboot Services uses PXE to find out if there is imaging work specified for a workstation and to provide the workstation with the files necessary to boot to the Desktop Management imaging environment.

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

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

For information about the requirements and installation of Preboot Services, see the *Novell ZENworks 7 Desktop Management Installation Guide*. For information about deployment and administration of Preboot Services, see Chapter 56, "Using ZENworks Desktop Management Preboot Services," on page 649.

55.1.1 If You Have Previously Installed a ZENworks partition

An existing partition is not updated when a ZENworks support pack is applied.

If you decide to use Preboot Services but have previously installed a ZENworks partition on the workstation, you can disable or delete the partition.

You can disable (and enable) the ZENworks partition when you boot to Linux using any imaging boot device or method.

You can delete the ZENworks partition only when you boot the workstation from an imaging boot method other than the ZENworks partition.

For more information on disabling or deleting a partition, see Step 9 in "Creating a Workstation Image Object" on page 714.

IMPORTANT: After you have deleted the ZENworks partition, you need to make sure that the image you put on the workstation was made on a workstation without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation fails to boot. In addition, if you remove the ZENworks partition from a Windows NT, Windows 2000, or Windows XP machine, Windows is not able to boot. You should only remove the ZENworks partition if you are going to restore an image to the workstation.

55.2 Preparing Imaging Boot CDs or DVDs

If you have software for burning CDs or DVDs, you can create an imaging boot CD or DVD for imaging operations. You have two options:

- Section 55.2.1, "Creating a Boot CD or DVD with Additional Files," on page 642
- Section 55.2.2, "Creating a Boot CD or DVD without Additional Files," on page 643

For information on how to use the CD or DVD to perform disconnected imaging operations, see "Setting Up Disconnected Imaging Operations" on page 727.

55.2.1 Creating a Boot CD or DVD with Additional Files

This section describes how to create an imaging CD or DVD that contains more than the files provided in the `bootcd.iso` image.

This method allows you to include the `settings.txt` file on the boot CD or DVD to provide the required imaging parameters. For more information on the `settings.txt` file, see Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766.

This method also allows you to add other files and drivers that you need to do the imaging.

To create an imaging boot CD or DVD that includes `settings.txt` and other files:

1 Copy the `bootcd.iso` file to a temporary location.

The `bootcd.iso` file is located in the `\public\zenworks\imaging` directory in your Desktop Management installation (on the ZENworks Imaging server).

2 In an ISO editor, open the temporary copy of the `bootcd.iso` file.

If you experience ISO corruption after adding files into the ISO, such as a checksum error, switch to a more reliable ISO editor. Also, some ISO editors do not work very well with DVDs.

3 Using the temporary `bootcd.iso` file, copy the `settings.txt` file to the root of the `bootcd.iso` image.

The `settings.txt` file is located in the `\public\zenworks\imaging` directory in your Desktop Management installation (on the ZENworks Imaging server).

4 Copy any other files or drivers that you want included on the CD or DVD to the `/addfiles` directory in the temporary `bootcd.iso` image.

Any files or subdirectories that you add under the `/addfiles` directory are placed at the root of the client when booting the CD or DVD.

IMPORTANT: When booting from the CD or DVD, the imaging engine is read into RAM. Because the imaging engine uses some of the RAM that exists on the client device, the combined size of any files that you add under the `/addfiles` directory cannot exceed amount of remaining RAM.

---

5 Save the updated `bootcd.iso` image file to its temporary location.

6 Use your software for burning CDs or DVDs to burn the updated `bootcd.iso` image onto the CD or DVD.

7 Boot the device to be imaged from your newly created imaging boot CD or DVD.

Booting from a SCSI CD-ROM device is currently not supported.

55.2.2 Creating a Boot CD or DVD without Additional Files

If you do not want to include the `settings.txt` file or any other files or drivers in the imaging boot CD or DVD, you can simply create the imaging boot CD or DVD from the `bootcd.iso` image provided with ZENworks.

However, you will need to provide the `settings.txt` file on a floppy diskette to provide the required imaging parameters. For more information on the `settings.txt` file, see Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766.

To create an imaging boot CD or DVD that contains only the `bootcd.iso` image:

1 Copy the `settings.txt` file containing the settings you want for the imaging boot process onto a floppy diskette.

This file is located in the `\public\zenworks\imaging` directory in your Desktop Management installation (on the ZENworks Imaging server).

2 Use your software for burning CDs or DVDs to burn the `bootcd.iso` image onto the CD or DVD.

The `bootcd.iso` file is located in the `\public\zenworks\imaging` directory in your Desktop Management installation (on the ZENworks Imaging server).

3 Boot the device to be imaged from your newly created imaging boot CD or DVD.

You will be prompted for the diskette that contains the `settings.txt` file.

Booting from a SCSI CD-ROM device is currently not supported.

55.3 Using the ZENworks Imaging Boot Disk Creator

The ZENworks Imaging Floppy Boot Disk Creator allows you to do the following:

55.3.1 Starting the ZENworks Imaging Boot Disk Creator

1 To start the boot disk creator as a standalone Windows utility, map a drive to the appropriate ZENworks Imaging server:

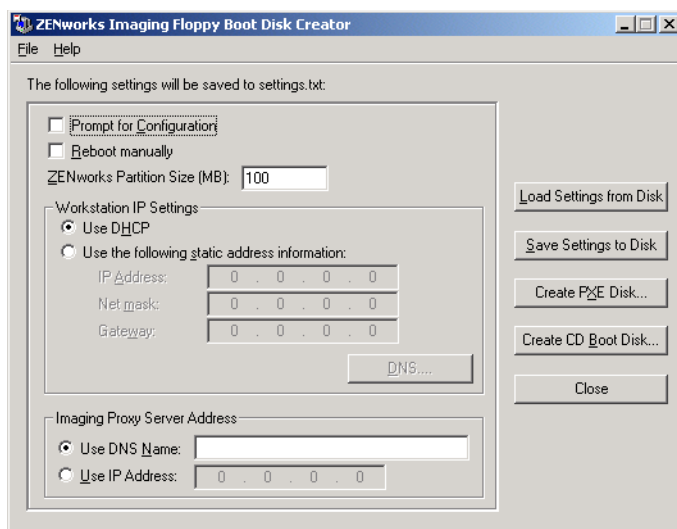**Linux:** `/opt/novell/zenworks/zdm/winutils`

NetWare: `sys:public\zenworks\imaging`

then double-click the `zimgboot.exe` file contained in that location. (There are no command line parameters.)

or

To start the utility from ConsoleOne from the server, click *Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette*.

The following dialog is displayed:

2 Continue with the appropriate section:

TIP: If the Imaging Boot Disk Creator fills up too much of your screen, change your screen resolution to a setting greater than 800 X 600.

For details on these and other configuration options, see the context-sensitive help (click the *Help* menu or press F1) in the utility. The configuration settings you make in the utility are saved to the `settings.txt` file. You can edit this file later if needed. For details on the format of this file, see Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766.

55.3.2 Preparing a CD Boot Diskette

The CD boot diskette is easy to prepare. One diskette is required. The `zimgboot.exe` utility is used to create the diskette, which is used to enable devices that cannot normally boot a CD or DVD to do so.

To create a CD boot diskette:

1 Format one high-density diskette, or use a preformatted blank diskette.

2 Start the ZENworks Imaging Boot Disk Creator (see "Starting the ZENworks Imaging Boot Disk Creator" on page 644).

3 Insert the formatted blank diskette, click *Create CD Boot Disk*, then click *OK*.

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

Use this diskette to boot workstations that cannot be booted using a CD or DVD. The diskette boots the workstation, enabling access to the imaging CD or DVD.

55.3.3 Configuring the Settings.txt File

The `settings.txt` file is required for imaging workstations. A default copy is provided with Desktop Management, so you can create and configure a version for an imaging session.

To configure a `settings.txt` file for imaging:

1 Format one high-density diskette, or use a preformatted blank diskette.

2 Start the ZENworks Imaging Boot Disk Creator (see "Starting the ZENworks Imaging Boot Disk Creator" on page 644).

3 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. You can modify the `settings.txt` file, as instructed in subsequent steps.

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

The default copy shipped with Desktop Management is located in the `\zenworks\imaging` directory on your ZENworks Imaging server.

5 (Required) In the ZENworks Imaging Floppy Boot Disk Creator dialog box, got to the Imaging Proxy Server Address section, then specify either the fixed IP address or the full DNS name of your ZENworks Imaging server.

6 (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 specific settings, or see Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766.

7 Click *Save Settings to Disk*.

8 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.

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

55.3.4 Creating a PXE Disk

You can use the Boot Disk Creator to create a PXE boot diskette that allows you to use PXE on a workstation that is not PXE-enabled.

1 Format one high-density diskette, or use a preformatted blank diskette.

2 Start the ZENworks Imaging Boot Disk Creator (see "Starting the ZENworks Imaging Boot Disk Creator" on page 644).

3 Insert the formatted blank diskette, then click *Create PXE Disk* to launch PXE-on-Disk.

For more information, see Section 56.7, "Using the Desktop Management Preboot Services PXE-on-Disk Utility," on page 687.

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

55.4 Creating an Imaging Hard-Disk Partition

If you want to set up a workstation 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 big enough, you can even store an image of the workstation's hard disk, which can be useful if the workstation becomes misconfigured or corrupted when the network connection is lost.

WARNING: Installing the ZENworks partition destroys all data on that hard drive.

To create a ZENworks partition:

1 Create an imaging CD or DVD (see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642)

2 Take an image of the workstation as instructed in Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

IMPORTANT: Do this even if you have taken an image of the workstation previously. This ensures that the new image captures the changes you made in the preceding steps.

3 After the image is created, reboot the workstation with the imaging boot method, type `install` at the boot prompt, then press Enter.

This starts the process of creating the ZENworks partition in the first partition slot. It also destroys all existing partitions, even if slot 1 is empty and available. By default, the ZENworks partition size is 150 MB.

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

4 (Optional) After the ZENworks partition is created and the bash prompt is displayed, type `img dump`, then press Enter.

This displays a list of the partition slots on the workstation. Unless you are upgrading your ZENworks partition, each partition slot should be empty and none should be active. The ZENworks partition is hidden from the list, so the number of partition slots in the list should be one less than before.

or

Type `img` to display a menu, select *Dump*, then select *No Geometry*.

5 At the bash prompt, restore the image you took in Step 2.

Use the `img restorep` command or select *Restore an Image*, then select *Proxy Image* from the menu as instructed in Step 6 of Section 60.2, "Manually Putting an Image on a Workstation," on page 722.

6 (Optional) After the image is restored and the bash prompt is displayed, use the `img dump` command to redisplay the list of the partition slots on the workstation.

or

Type `img` to display a menu, select *Dump*, then select *No Geometry*.

You should now see information about the Windows partitions that are restored and activated. There should still be one less partition slot than before because the ZENworks partition is still hidden (and will continue to be).

7 At the bash prompt, type `grub.s`, then press Enter.

8 When the bash prompt is displayed, reboot the workstation.

The workstation should boot to Windows. If the bash prompt is displayed, enter the `grub.s` command again and reboot a second time.

Using ZENworks Desktop Management Preboot Services

56

This section provides information about using Novell® ZENworks® Desktop Management Preboot Services on your network.

There are three methods that you can use for imaging: Preboot Services, a bootable CD or DVD, or a Linux hard-disk partition. For more information, see "Preparing an Imaging Boot Method" on page 641.

Because Preboot services offers the greatest flexibility and options, we recommend using it.

- Section 56.1, "Understanding Desktop Management Preboot Services," on page 649
- Section 56.2, "Installing and Setting Up Desktop Management Preboot Services," on page 660
- Section 56.3, "Checking the Preboot Services Server Setup," on page 660
- Section 56.4, "Deploying Desktop Management Preboot Services in a Routed or Subneted Network Environment," on page 665
- Section 56.5, "Enabling PXE on a Workstation," on page 678
- Section 56.6, "Administering Desktop Management Preboot Services," on page 680
- Section 56.7, "Using the Desktop Management Preboot Services PXE-on-Disk Utility," on page 687
- Section 56.8, "Editing the Desktop Management Preboot Services Menu," on page 691

56.1 Understanding Desktop Management Preboot Services

This section contains the following information to help you to understand ZENworks Desktop Management Preboot Services:

- Section 56.1.1, "About Desktop Management Preboot Services," on page 649
- Section 56.1.2, "A Typical Preboot Services Operation," on page 650
- Section 56.1.3, "Illustrating the Preboot Services Processes for Linux Imaging Servers," on page 650
- Section 56.1.4, "Illustrating the Preboot Services Processes for NetWare and Windows Imaging Servers," on page 657

56.1.1 About Desktop Management Preboot Services

PXE (Preboot Execution Environment) is an industry-standard protocol that allows a workstation to boot up and execute a program from the network before the workstation operating system starts. PXE uses DHCP (Dynamic Host Configuration Protocol) and TFTP (Trivial File Transfer Protocol). The PXE environment is loaded from either the NIC in flash memory or read-only memory, or in the same memory as the system BIOS.

Desktop Management Preboot Services uses PXE to find out if there is imaging work specified for a workstation and to provide the workstation with the files necessary to boot to the Desktop Management imaging environment.

By using Preboot Services, you can put an image on a workstation even if the workstation's hard disk is blank. You do not need to use a ZENworks Desktop Management imaging boot CD or DVD, or a Desktop Management imaging hard-disk (Linux) partition on the workstation.

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

 ◆ Install the Desktop Management Imaging and Preboot Services (PXE Support) components on your ZENworks Imaging server.

 ◆ Enable PXE on the workstation.

 ◆ Have a standard DHCP server, either on your ZENworks Imaging server or on another network server.

For information about requirements, installing Desktop Management and Preboot Services on your ZENworks Imaging server, enabling PXE on a workstation, and configuring your DHCP server, see Section 56.2, "Installing and Setting Up Desktop Management Preboot Services," on page 660.

56.1.2 A Typical Preboot Services Operation

When a PXE-enabled workstation starts to boot up, it sends a DHCP discovery request to determine the IP address of the ZENworks Imaging server. The DHCP server responds with an IP address for the client to use, and the Proxy DHCP server responds with the IP addresses of the Transaction server, TFTP, and MTFTP (Multicast TFTP) servers, as well as the filename of the Preboot Services client.

The PXE workstation then downloads the Preboot Services client (`dinic.sys`) using either TFTP or MTFTP.

After the Preboot Services client is downloaded and executed, the workstation checks the Preboot Services Transaction server to see if there is any imaging work to do. If there is imaging work to do, it downloads the Desktop Management Workstation Imaging environment (`/srv/tftp/boot/linux` and `linld.com`) from the server so that the workstation can be booted to Linux and any imaging tasks can be performed. If there are no imaging tasks to perform, these files are not downloaded and the workstation 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 Services Menu (if enabled for the device)
  Preboot Services bootable CD or DVD
  ZENworks partition

For more information, see Chapter 60, "Performing Manual Imaging Operations," on page 719.

56.1.3 Illustrating the Preboot Services Processes for Linux Imaging Servers

The following illustrations show the interaction between a Preboot Services (PXE) device and a ZENworks Imaging server, starting when the PXE device is turned on and begins to boot, and

ending when imaging work begins on that device. The information assumes that the devices and imaging servers are in the same network segment.

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 subsequent phases are the same:

Phase 1a: Standard DHCP and Novell Proxy DHCP Configured on Separate Servers

For this example, the DHCP server and the ZENworks Imaging server are two separate servers on the network.

Figure 56-1 *DHCP Configuration on Separate Servers*
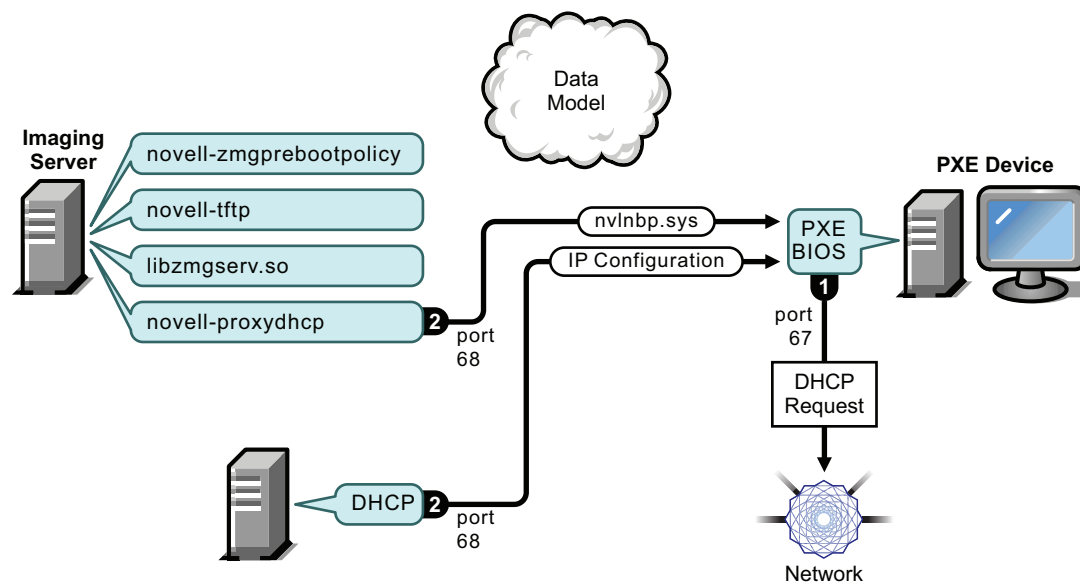
Processes:

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 (`nvlnbp.sys`) and the IP address of the TFTP daemon where it can be found.

3. Continue with .

Phase 1b, Part A: Standard DHCP and Novell Proxy DHCP Configured on the Same Server

For this example, the DHCP server and the ZENworks Imaging server are configured on the same server on the network. See for the second part of this example.

Figure 56-2   *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.

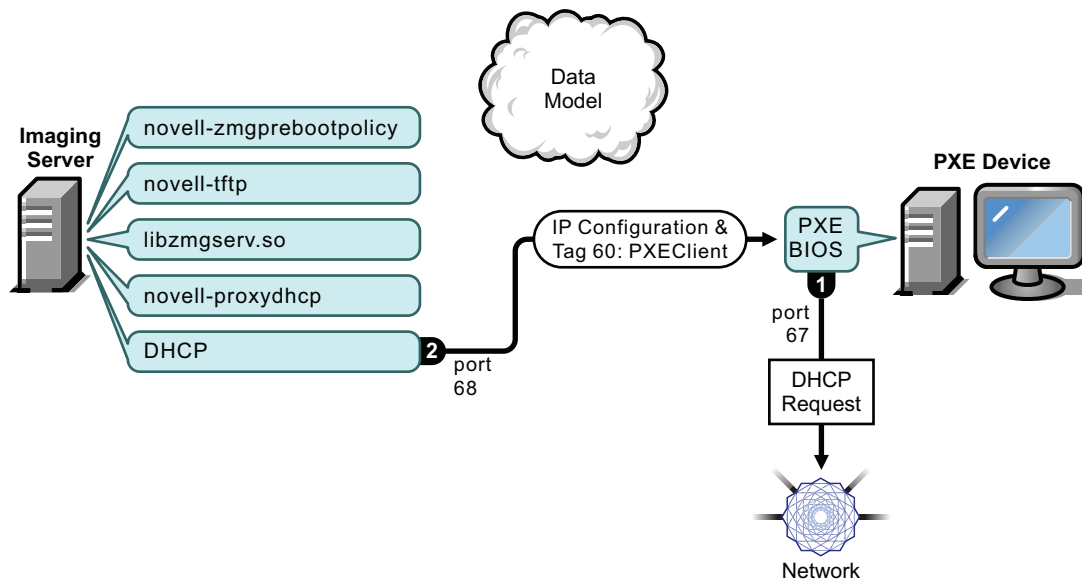## Phase 1b, Part B: Standard DHCP and Novell Proxy DHCP Configured on the Same Server

Figure 56-3   *DHCP Configuration on the Same Server, Part B*
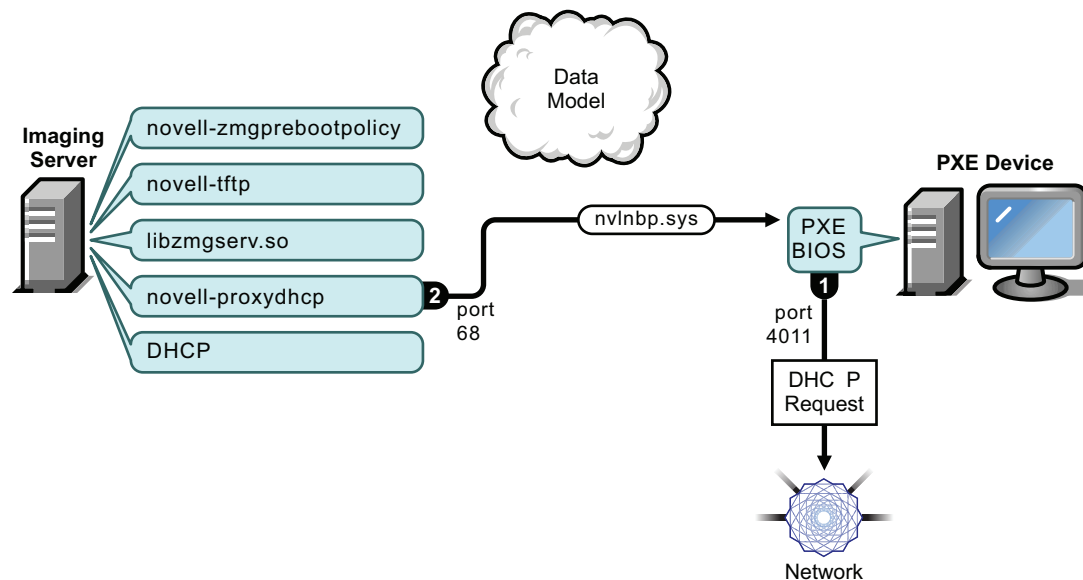
Processes:

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 .

Phase 2

Figure 56-4   *Phase 2 of the Preboot Services Process*
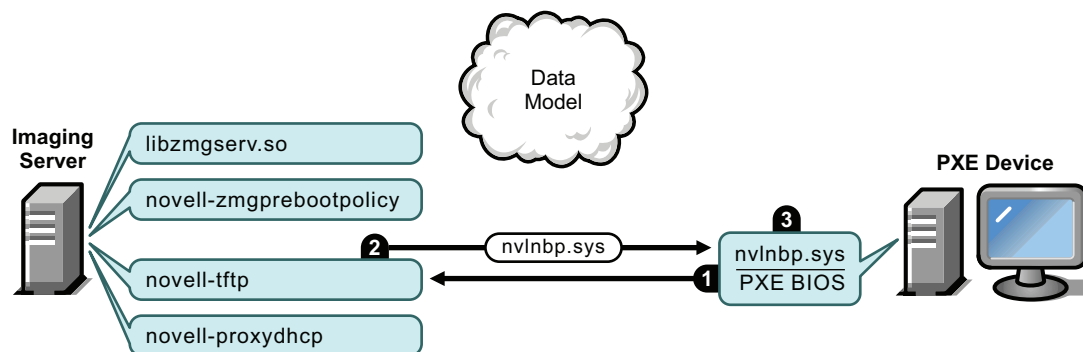
Processes:

1. The PXE BIOS requests nvlnbp.sys from the TFTP server.

2. The TFTP server sends nvlnbp.sys to the PXE device.

3. The PXE device loads nvlnbp.sys into memory.

Phase 3

Figure 56-5   Phase 3 of the Preboot Services Process
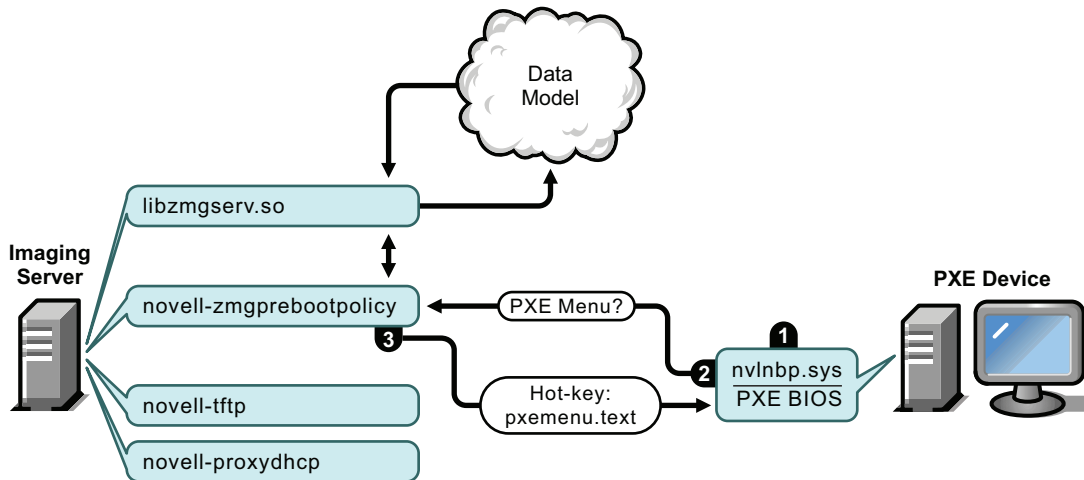
Processes:

1. Hardware detection is performed by `nvlnbp.sys` and it reads the image-safe data.

2. `Nvlnbp.sys` requests the Preboot Services Menu configuration from the Data Model via the novell-zmgprebootpolicy daemon.

3. The novell-zmgprebootpolicy daemon returns the Preboot Services Menu configuration. In this case, the menu described in `pxemenu.txt` is displayed when a user presses the hot key.

Phase 4

Figure 56-6   Phase 4 of the Preboot Services Process
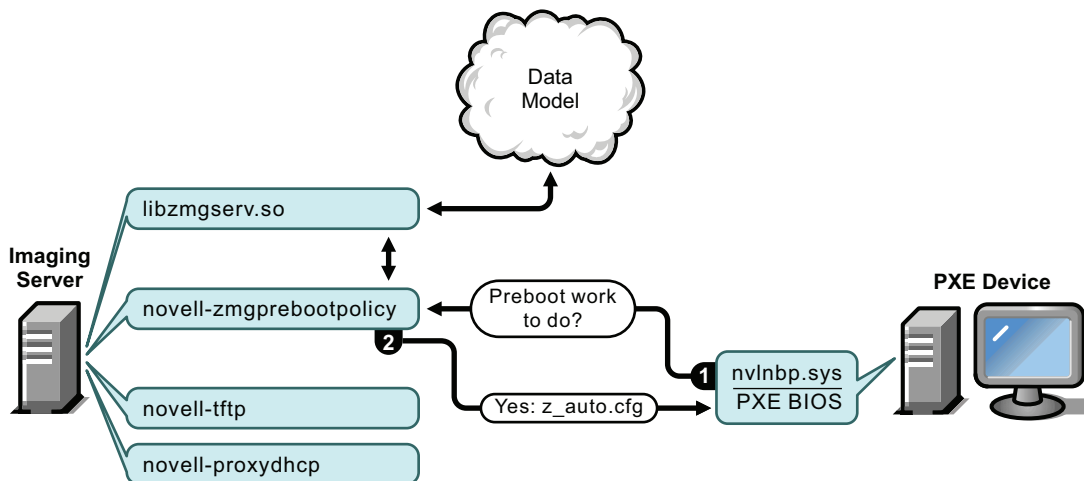
Processes:

1. Assuming no Preboot Services 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 56-7 *Phase 5 of the Preboot Services Process*
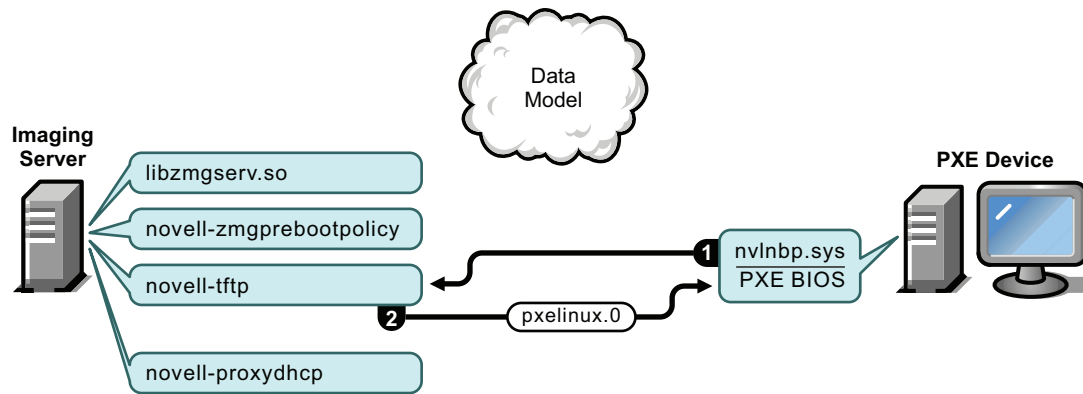
Processes:

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

Phase 6

Figure 56-8 *Phase 6 of the Preboot Services Process*
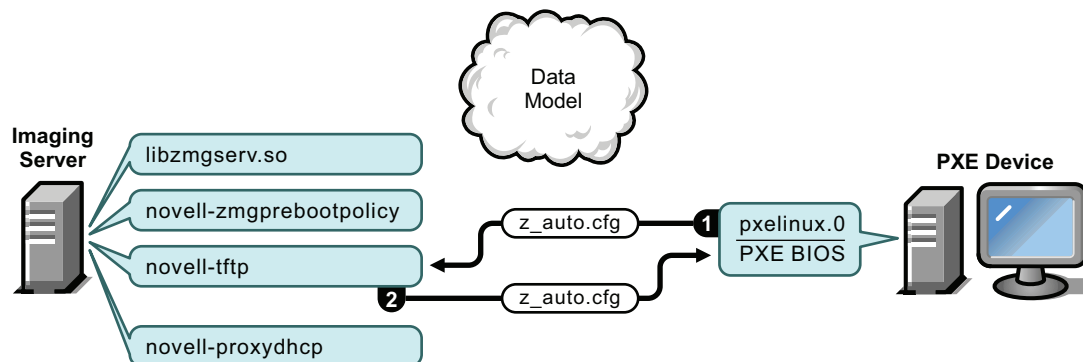
Processes:

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 56-9 *Phase 7 of the Preboot Services Process*
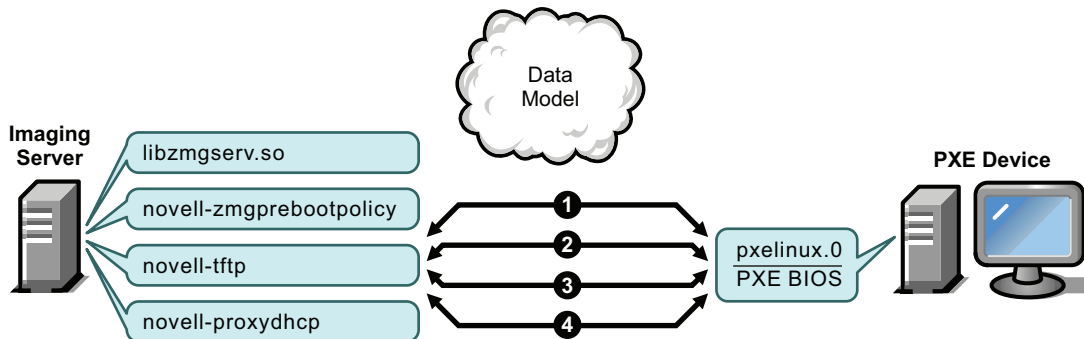
Processes:

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 56-10 *Phase 8 of the Preboot Services Process*
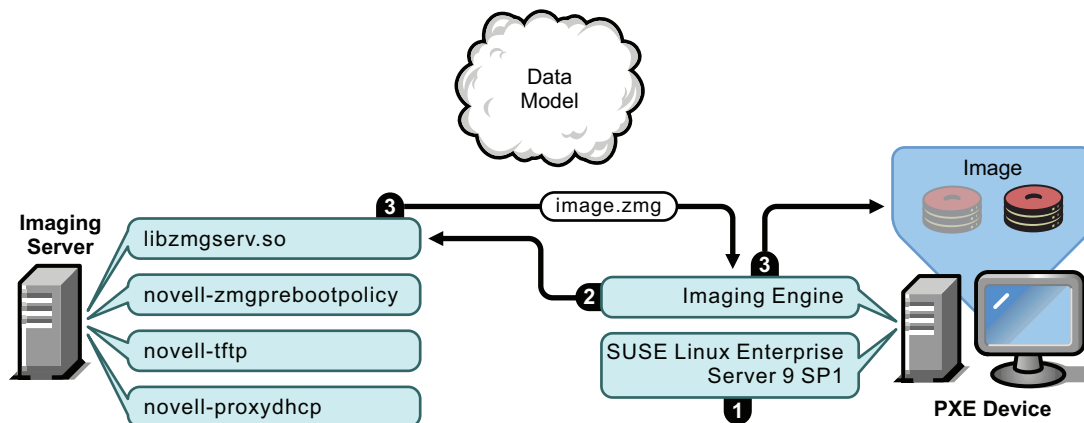
Processes:

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, then performs the work.
3. The image is laid down on the device and it automatically reboots.

56.1.4 Illustrating the Preboot Services Processes for NetWare and Windows Imaging Servers

The following diagrams show the interaction between a Preboot Services (PXE) client workstation and a ZENworks Imaging server, starting when the PXE client workstation is turned on and begins to boot up, and ending when imaging work begins on that workstation.

Three diagrams are used to show one complete process. The first diagram shows steps 1-5, the second diagram shows steps 6-11, and the third diagram shows steps 12-19. Each number corresponds to explanatory text in a table following the diagram.

In this example, the DHCP server and the ZENworks Imaging server are two separate servers on the network, although it is possible to run both from the same server with some additional configuration. This example also assumes that the client workstation and the servers are in the same segment.

- "Diagram 1 (Steps 1-5)" on page 657
- "Diagram 2 (Steps 6-11)" on page 658
- "Diagram 3 (Steps 12-19)" on page 659

Diagram 1 (Steps 1-5)

Figure 56-11 *Preboot Services Processes, Diagram 1 (Steps 1-5)*
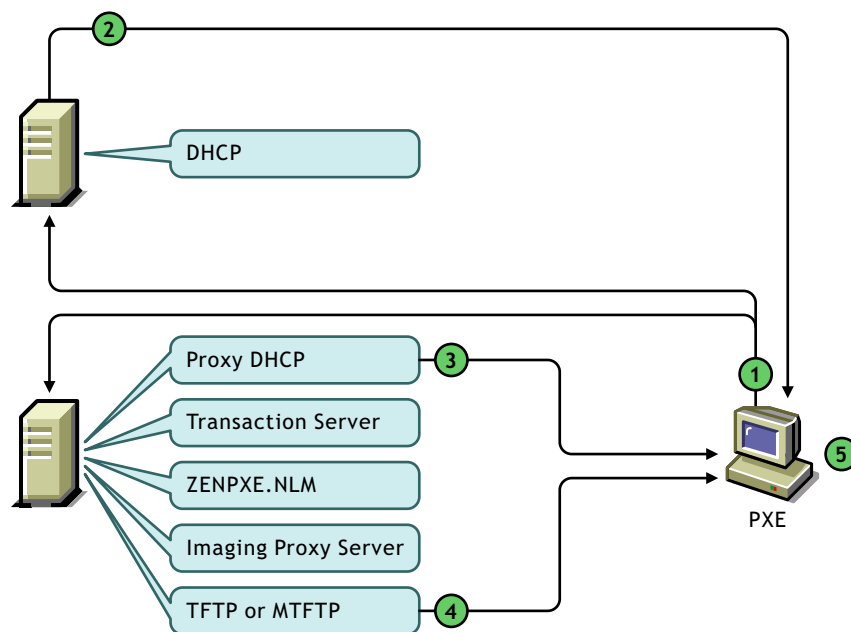
Table 56-1 *Preboot Services Processes, Steps 1-5*

Step	Explanation
1	The workstation is turned on and begins to boot up. PXE (triggered by the BIOS, network interface card, or PXE-on-Disk boot diskette) sends a DHCP request to the network. The DHCP request includes PXE extensions.

Step	Explanation
2	The DHCP server responds with an IP address for the workstation to use. This step might occur before or after Step 3.
3	The Proxy DHCP server responds with the IP addresses of the Preboot Services Transaction server, Preboot Services TFTP and MTFTP servers, and with the name of the Preboot Services client (`dinic.sys`). The Preboot Services client includes a preboot component that makes the workstation available on the network before the operating system has loaded. This component ensures that the workstation can contact the Transaction server (in Step 7) even when there is no operating system installed on the workstation.
4	Using TFTP or MTFTP, the Preboot Services client (`dinic.sys`) is downloaded to the PXE client workstation. TFTP is used by default because it speeds the workstation's boot process; however, you can change the configuration to use MTFTP. For more information, see Section 56.2, "Installing and Setting Up Desktop Management Preboot Services," on page 660. If a PXE-on-Disk boot diskette was used in Step 1, the Preboot Services client does not need to be downloaded, and this step does not occur.
5	The Preboot Services client is loaded on the PXE client workstation.

Diagram 2 (Steps 6-11)

Figure 56-12 *Preboot Services Processes, Diagram 2 (Steps 6-11)*
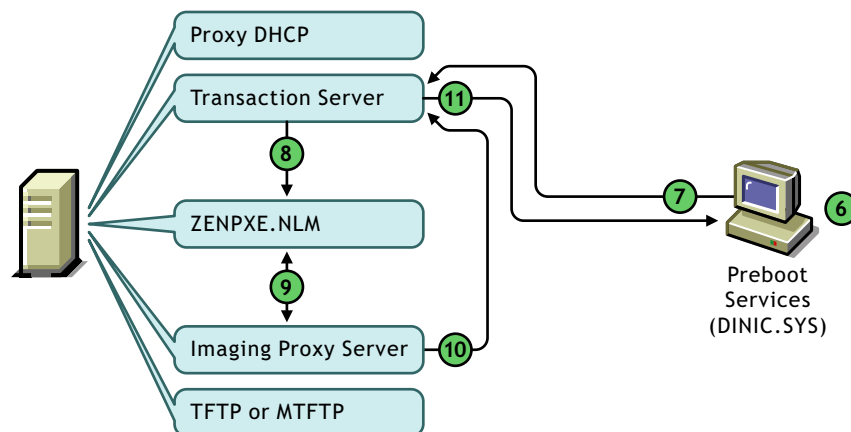
Table 56-2 *Preboot Services Processes, Steps 6-11*

Step	Explanation
6	The Preboot Services client reads the image-safe data and discovers the hardware on the workstation.
7	The Preboot Services client connects to the Transaction server and authenticates with the server. The Preboot Services client sends information about the workstation to the Transaction server with a request to find out if the PXE menu should be displayed on this workstation.

Step	Explanation
8	The Transaction server checks with `zenpxe.nlm` to see if the PXE menu should be displayed on this workstation.
9	`Zenpxe.nlm` checks with the Imaging Proxy Server to find out if the PXE menu should be displayed on this workstation. The Imaging Proxy Server checks the PXE menu setting in the workstation object, workstation policy, or server policy that applies to this workstation. The possible settings include do not display, always display, or display only when a specific keystroke is pressed at the workstation when booting.
10	The Imaging Proxy Server sends information about the PXE menu setting to the Transaction server.
11	The Transaction server sends information about the PXE menu setting to the Preboot Services client.

Diagram 3 (Steps 12-19)

Figure 56-13 *Preboot Services Processes, Diagram 3 (Steps 12-19)*
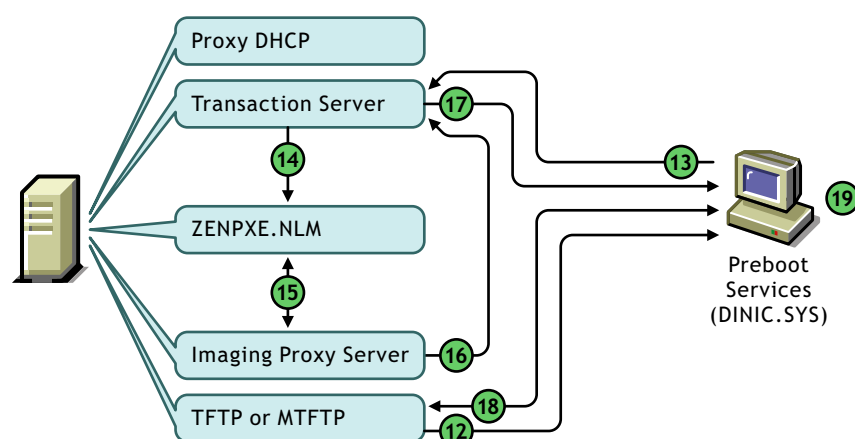
Table 56-3 *Preboot Services Processes, Steps 12-19*

Step	Explanation
12	If the PXE menu should be displayed on the workstation, it is sent via TFTP or MTFTP to the workstation and is displayed. A user can make selections from the PXE menu. If the user selects to continue in automatic or diagnostic mode, the Preboot Services process continues with Step 13. If the user makes any other selection, the Preboot Services process does not continue. If the PXE menu should not be displayed (or if the user is required to press a specific keystroke but does not), the Preboot Services process skips this step and continues with Step 13.
13	The Preboot Services client sends a request to the Transaction server to see if there is any imaging work specified for this workstation.
14	The Transaction server checks with `zenpxe.nlm` to see if there is any imaging work specified for this workstation.

Step	Explanation
15	`Zenpxe.nlm` checks with the Imaging Proxy Server to see if there is any imaging work specified for this workstation. The Imaging Proxy Server performs a limited check of attributes, multicast sessions, and imaging rules. (A more detailed check for imaging work is performed by the ZENworks Imaging Engine after the workstation is booted to Linux.)
16	The Imaging Proxy Server sends information about any imaging work specified for this workstation to the Transaction server.
17	The Transaction server sends information about any imaging work specified for this workstation to the Preboot Services client.
18	The Preboot Services client contacts the TFTP server and downloads the files necessary to boot to the Desktop Management Workstation Imaging (Linux) environment (`/srv/tftp/boot/linux` and `linld.com`).
19	The workstation boots to the Desktop Management Imaging environment and proceeds with the imaging work.

56.2 Installing and Setting Up Desktop Management Preboot Services

For information about the hardware requirements for the Preboot Services server, see "Preboot Services Subinstallation Hardware Requirements" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

For information about the requirements for workstations using Preboot Services, see "User Workstation Hardware Requirements" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

For information about installing and setting up Desktop Management Preboot Services, see "Desktop Management Server Installation Procedure" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

56.3 Checking the Preboot Services Server Setup

This section provides information on how to check the configuration of Desktop Management Preboot Services after it is installed, and how to set up standard DHCP and Proxy DHCP services on the same server.

- Section 56.3.1, "Overview of Preboot Services Components," on page 661
- Section 56.3.2, "Checking Imaging Server Setup," on page 662
- Section 56.3.3, "Setting up Standard DHCP and Proxy DHCP Services on the Same Server," on page 663

56.3.1 Overview of Preboot Services Components

The Preboot Services components are different for the supported imaging servers:

- "Preboot Services Components for Linux Imaging Servers" on page 661
- "Preboot Services Components for NetWare and Windows Imaging Servers" on page 661

Preboot Services Components for Linux Imaging Servers

The following components are installed as part of Preboot Services:

Table 56-4 *Preboot Service Components*

Daemon	Description
libzmgserv.so	This library file is used by eDirectory to provide imaging services to the 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 (nvlnbp.sys) to use.
novell-tftp	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, initrd, and nvlnbp.sys. A PXE device uses this server to download the bootstrap program (nvlnbp.sys).
novell-zmgprebootpolicy	The PXE devices use the novell-zmgprebootpolicy daemon to check if there are any images associated with the device.

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

For more information on these daemons, see Section 63.6, "Imaging Server (Imgserv.nlm or .dll or .dlm, or Linux Daemons)," on page 768.

Preboot Services Components for NetWare and Windows Imaging Servers

The following components are installed as part of Preboot Services:

- "Proxy DHCP Server" on page 662
- "TFTP/MTFTP Server" on page 662
- "Transaction Server" on page 662

Proxy DHCP Server

The Preboot Services Proxy DHCP server runs alongside a standard DHCP server to inform Preboot Services clients of the IP address of the TFTP, MTFTP, and Transaction servers. The Proxy DHCP server also responds to PXE clients to indicate which boot server (TFTP or MTFTP) to use.

TFTP/MTFTP Server

The Preboot Services TFTP/MTFTP server is used by the Preboot Services client to request files that are needed to perform imaging tasks. The TFTP server also provides a central repository for these imaging files (`/srv/tftp/boot/linux` and `linld.com`).

A PXE client uses this server to download the Preboot Services client.

TFTP is used by default because it speeds up the workstation's boot process; however, you can change the configuration to use MTFTP.

Transaction Server

The Preboot Services client connects to the Transaction server to check if there are any imaging actions that need to be performed on the workstation.

56.3.2 Checking Imaging Server Setup

The methods for checking the setup on ZENworks Imaging servers depends on the server's platform:

Checking the Setup on a Linux Server

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

Table 56-5 *Preboot Services Daemons*

Service	Command to Check Its Status
novell-tftp	`/etc/init.d/novell-tftp status`
novell-zmgprebootpolicy	`/etc/init.d/novell-zmgprebootpolicy status`

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

The status of the `libzmgserv.so` file cannot be checked.

If the Preboot Services components are installed to a Linux server that is also a standard DHCP server, see "Linux DHCP Server" on page 664.

Checking the Setup on a NetWare Server

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

- `pmap.nlm`
- `tftp.nlm`
- `pdhcp.nlm`
- `dts.nlm`

You can use the `pxestart.ncf` file to start Preboot Services with a single command.

You can use the `pxestop.ncf` file to stop Preboot Services with a single command.

You should not need to change the default configuration of these services unless the default multicast IP is already in use in your environment or you moved any of the PXE-installed files from their default directories.

For information about configuring these services, see "Configuring Preboot Services Servers in NetWare" on page 681.

If the Preboot Services components are installed to a NetWare® 6.*x* server that is also a standard DHCP server, see "NetWare 6.x DHCP Server" on page 664.

Checking the Setup on a Windows Server

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

- Proxy DHCP Server
- MTFTP Server
- TFTP Server
- Transaction Server

You should not need to change the default configuration of these services unless the default multicast IP is already in use in your environment or you moved any of the PXE-installed files from their default directories.

For information about configuring these services, see "Server Configurations" on page 666.

If the 2000/XP/2003 server where the Preboot Services components are installed is also a DHCP server, see "Windows 2000 Advanced Server" on page 665.

56.3.3 Setting up Standard DHCP and Proxy DHCP Services on the Same Server

When you have standard DHCP and Proxy DHCP services on the same server, do the following according to the server's platform:

- "Linux DHCP Server" on page 664
- "NetWare 6.x DHCP Server" on page 664
- "Windows 2000 Advanced Server" on page 665

Linux DHCP Server

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.

NetWare 6.*x* DHCP Server

Use the following steps to set up standard DHCP and Proxy DHCP Services on the same NetWare 6.*x* DHCP server.

IMPORTANT: Installing and running the Proxy DHCP server on a NetWare 5.*x* server that is already running a standard DHCP server is not supported because the DHCP protocol on NetWare 5.1 does not deliver option 60.

If you are running a NetWare 5.1 server but have upgraded the DHCP service to NetWare 6.*x*, follow through . If you are running a NetWare 6.*x* server, begin at .

1 Install the DNS-DHCP client from NetWare 6.*x*.

2 Copy `dhcpsrvr.nlm`, `dnipinst.nlm`, and `nddprefs.dat` from the `sys:\system` directory on the server to a backup location.

3 Copy `dhcpsrvr.nlm`, `dnipinst.nlm`, and `nddprefs.dat` from the `sys\system` directory on the NetWare 6.*x* CD to the `sys\system` directory on the server.

4 Using the DNS-DHCP console, export the DNS and DHCP records.

Note the Novell eDirectory™ locations of the DNS-DHCP locator and group objects and the DNS zone objects.

5 At the system console, enter `load DNIPINST -R` to remove DNS-DHCP and related schema extensions.

6 At the system console, enter `load DNIPINST` to install the updated DNS-DHCP and schema extensions.

7 Using the DNS-DHCP console, import the DNS and DHCP records.

8 Using the DNS-DHCP console, click *Global Preferences* on the toolbar, then click the *Global DHCP Options* tab.

or

Using the DNS-DHCP console, click the subnet in the left panel, then click the *Other DHCP Options* tab.

9 Click *Modify*.

10 Select *Option 60* under *Available DHCP Options*, then click *Add*.

11 Type PXEClient in the *Vendor Class Identifier* text box, then click *OK* twice.

12 If this server is also a DNS server, enter load NAMED at the system console.

13 At the system console, enter load DHCPSRVR.

14 Using a text editor, make the following changes to sys\system\pdhcp.ini:

Set *USE_DHCP_Port* to 0.

Make sure *USE_BINL_PORT* is set to 1.

15 Unload and reload pdhcp.nlm.

Windows 2000 Advanced Server

Use the following steps to set up standard DHCP and Proxy DHCP Services on the same Windows 2000 Advanced Server:

1 At the command prompt, enter netsh.

2 At the netsh prompt, enter dhcp server.

3 At the dhcp server prompt, enter the following:

add optiondef 60 ClassID STRING 0 PXEClient

4 Add the definition type in the DHCP setup menus.

56.4 Deploying Desktop Management Preboot Services in a Routed or Subneted 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 Desktop Management Preboot Services (PXE) in a single segment is a relatively simple process that only requires configuring the ZENworks Imaging server. However, Preboot Services deployment in a routed environment is far more complex and might require configuration of both the ZENworks Imaging server and the network switches and routers that lie between the server and the PXE workstations.

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 needs to be carried out 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:

56.4.1 Server Configurations

Server configurations depend on the server's platform:

Linux 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 and Library File:** The three Preboot Services daemons (novell-tftp, novell-proxydhcp, and novell-zmgprebootpolicy) and the `libzmgserv.so` library file are all installed on the ZENworks Imaging server when you install ZENworks Desktop 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:

It is seldom necessary to make changes to the default configuration of these services. However, if you need more detailed configuration information, see Section 56.6.1, "Configuring Preboot Services Servers in Linux," on page 680.

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 "WAN/VLAN Environment" on page 670.

The libzmgserv.so Library File

The `libzmgserv.so` library file is used by eDirectory to provide imaging services to the devices.

This includes sending and receiving image files, discovering assigned imaging tasks from eDirectory, 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 eDirectory (the `libzmgserv.so` library file) on behalf of PXE devices.

NetWare or Windows Server Configuration

The Preboot Services environment requires a standard DHCP server, Proxy DHCP server, TFTP or MTFTP boot server, and a Transaction server to function correctly. With the exception of the standard DHCP server, these are installed when you install Desktop Management Preboot Services.

The following sections give general information about these services:

- "DHCP Server" on page 667
- "Proxy DHCP Server" on page 668
- "TFTP and MTFTP Servers" on page 668
- "Transaction Server" on page 668

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 Servers in Windows" on page 683 or "Configuring Preboot Services Servers in NetWare" on page 681.

DHCP Server

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

If Preboot Services (specifically the Proxy DHCP server) 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 "Windows 2000 Advanced Server" on page 665 and "NetWare 6.x DHCP Server" on page 664.

IMPORTANT: Installing and running the Proxy DHCP server on a NetWare 5.*x* server that is already running a standard DHCP server is not supported; you can, however, upgrade the DHCP server.

Proxy DHCP Server

The Preboot Services Proxy DHCP server runs alongside a standard DHCP server to inform PXE clients of the IP address of the TFTP server, MTFTP server, and Transaction server. The Proxy DHCP server also responds to PXE clients to indicate which boot server (TFTP or MTFTP) to use.

It is seldom necessary to make any changes to the default configuration.

If you don't want to run the Proxy DHCP server on the same server as the Transaction server or TFTP server, you can change the Proxy DHCP settings to direct PXE workstations to a different server.

IMPORTANT: Installing and running the Proxy DHCP server on a NetWare 5.*x* server that is already running a standard DHCP server is not supported.

TFTP and MTFTP Servers

The Preboot Services TFTP and MTFTP servers are used by the Preboot Services client to request files that are needed to perform imaging tasks. The TFTP server also provides a central repository for these files.

A PXE client uses one of these servers to download the Preboot Services client.

By default, TFTP is used because it speeds the workstation's boot process; however, you can change the configuration to use MTFTP. For more information, see "Configuring Preboot Services Servers in Windows" on page 683 or "Configuring Preboot Services Servers in NetWare" on page 681.

Transaction Server

The Preboot Services client connects to the Transaction server to check if there are any imaging actions that need to be performed on the workstation.

It is seldom necessary to make any changes to the default configuration.

You can change the UDP port that the Transaction server uses for communicating with the Preboot Services client (by default it is UDP Port 18753). You should do this only if the Transaction server is conflicting with another service running on the server. For more information, see Section 56.2, "Installing and Setting Up Desktop Management Preboot Services," on page 660.

56.4.2 Network Configuration

The configuration required to run Preboot Services in your network depends on your network setup. You can configure Preboot Services using any of the following network setups:

- LAN environment with Preboot Services and DHCP running on separate servers
- LAN environment with Preboot Services and DHCP running on the same server
- WAN/VLAN environment with Preboot Services and DHCP running on separate servers
- WAN/VLAN environment with Preboot Services and DHCP running on the same server

This section covers the following topics:

- "General Network Design Considerations" on page 669
- "LAN Environment" on page 669

General Network Design Considerations

Design your network so that Preboot Services clients can effectively connect to the Transaction server as well as to the TFTP or MTFTP servers. Make sure you consider the number of Preboot Services clients to be installed on the network and the bandwidth available to service these clients. To understand how the clients and servers need to interact during the Preboot Services process, see "Illustrating the Preboot Services Processes for NetWare and Windows Imaging Servers" on page 657.

TFTP servers should be installed so that Preboot Services clients have access to a TFTP server within their LAN. The bulk of network traffic generated by Preboot Services is between the Preboot Services clients and the TFTP server. A good design ensures that a client does not need to connect to its TFTP server through a slow WAN link.

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

LAN Environment

The following sections provide information about setting up Preboot Services in a LAN environment:

LAN Environment With Preboot Services and DHCP Running on Separate Servers

Table 56-6 *DHCP Running on Separate Servers in LAN Environment*

Information	Details for This Setup
Scope	Only PXE workstations in the LAN connect to the Preboot Services server.
Example of Usage	A small school workstation lab that is using Imaging to prepare the workstations between classes.
Advantages	- Easiest installation and setup. - No network configuration is required. - No DHCP server configuration is required.
Disadvantages	Limited use, because a single-LAN environment only exists in small lab-type networks.

LAN Environment With Preboot Services and DHCP Running on the Same Server

Table 56-7 *DHCP Running on the Same Server in LAN Environment*

Information	Details for This Setup
Scope	Only PXE workstations in the LAN connect to the Preboot Services server.
Example of Usage	A small school workstation lab with only one server that is using Imaging to prepare the workstations between classes.
Configuration Required	Because Preboot Services and DHCP are running on the same server, option tag 60 is set on the DHCP server.
	For information on setting this tag, see "Windows 2000 Advanced Server" on page 665 and "NetWare 6.x DHCP Server" on page 664.
Advantages	◆ Easy installation and setup. ◆ No network configuration is required.
Disadvantages	◆ DHCP server configuration is required (option tag 60). ◆ Limited use, because a single-LAN environment only exists in small lab-type networks.

Configuring LAN Environments for Preboot Services

If you have Preboot Services and DHCP running on separate servers, no network configuration is required.

If you have Preboot Services and DHCP 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.

WAN/VLAN Environment

In a WAN, the PXE workstation is usually separated from the Proxy DHCP and DHCP servers by one or more routers. The PXE workstation 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 workstation 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. Workstations 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

workstations in each subnet to the DHCP server, allowing the DHCP server to respond to workstations in that subnet.

The following sections provide information about setting up Preboot Services in a WAN/VLAN environment:

WAN or VLAN Environment With Preboot Services and DHCP Running on Separate Servers

Table 56-8 *DHCP Running on Separate Servers in WAN/VLAN Environment*

Information	Details for This Setup
Scope	PXE workstations over the entire WAN/VLAN connect to the Preboot Services server.
Example of Usage	Any corporate or mid-size network that has the network divided into multiple subnets, but is running only one DHCP server.
Configuration Required	A DHCP relay agent or IP helper is configured on the router or switch serving the subnet that the PXE workstation belongs to. The helper is configured to forward all DHCP broadcasts that are detected in the subnet to the DHCP and Proxy DHCP servers.
	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.
Advantages	◆ Common network setup.
	◆ Multiple Preboot Services servers can be installed so that each server provides service only for certain subnets. If multiple Preboot Services are installed, the Proxy DHCP server must be configured so it supplies the IP address of the central Transaction server.
	With this solution, the PXE workstation receives a response from a Proxy DHCP server located on its subnet, but the workstation is redirected to a single central Transaction server to check for imaging work to do.
	For information about changing the Proxy DHCP configuration, see Section 56.2, "Installing and Setting Up Desktop Management Preboot Services," on page 660.
Disadvantages	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.
Detailed Setup Information	"Configuring a WAN/VLAN With Preboot Services and DHCP Running on Separate Servers" on page 675

IMPORTANT: For Linux imaging servers only, 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.

WAN or VLAN Environment With Preboot Services and DHCP Running on the Same Server

Table 56-9 *DHCP Running on the Same Server in WAN/VLAN Environment*

Information	Details for This Setup
Scope	PXE workstations over the entire WAN/VLAN connect to the Preboot Services server.
Example of Usage	Any corporate or mid-size network that has the network divided into multiple subnets, but is running only one DHCP server.
Configuration Required	◆ The routers or switches have been configured with IP helpers to forward network traffic to the DHCP server. ◆ Because Preboot Services and DHCP are running on the same server, option tag 60 is set on the DHCP server. For information on setting this tag, see "Windows 2000 Advanced Server" on page 665 and "NetWare 6.x DHCP Server" on page 664.
Advantages	No network equipment (routers/switches) needs to be configured to forward network traffic to the Proxy DHCP server.
Disadvantages	◆ DHCP server configuration required (option tag 60). ◆ Only one Preboot Services 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).
Detailed Setup Information	"Configuring a WAN/VLAN With Preboot Services and DHCP Running on the Same Server" on page 672

IMPORTANT: For Linux imaging servers only, 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 the Same Server

If the switch is acting as a firewall and limiting the type of traffic on the network, it might be necessary to open certain UDP ports in the firewall. For a list of UDP ports used by Desktop Management Preboot Services, see Section 56.4.3, "Configuring Filters on Switches and Routers," on page 677.

This section includes the following topics:

◆ "Implementation" on page 673
◆ "Installing the Proxy DHCP Server and the TFTP Server on the DHCP Server" on page 674

Implementation

The Desktop Management installation provides for a complete installation of the Preboot Services and Imaging components. If you want to install all of Imaging and Preboot Services on the DHCP server, then run the standard installation on the server.

However, you might want to run the Preboot Services components (Proxy DHCP and TFTP services) on the DHCP server and the Imaging and Transaction Server components on another server.

If you want to configure the system like this, you need to do so manually by following the steps below.

1 Install Desktop Management Preboot Services on a server.

2 Test to make sure that the server is set up correctly.

   2a Connect the server to a LAN with a PXE workstation in the same LAN.

   2b Assign imaging work to the workstation through a server or workstation policy in Novell ConsoleOne®.

   2c Boot the workstation.

   2d Verify that it picks up the imaging work correctly.

3 Stop the Desktop Management Proxy DHCP service on the server.

For Windows, go to the Services panel and stop the Proxy DHCP Service. Set the service to *Disabled* so that it does not start the next time the server is started.

For NetWare, enter `unload pdhcp` at the server console to unload the Proxy DHCP service. Edit the `zfdstart.ncf` file and comment out the line that loads the Proxy DHCP service to prevent it from loading the next time the server is started.

4 If the Proxy DHCP service was running on the same server that was running DHCP, delete option tag 60 from the DHCP server that you added during the installation.

5 Install the Proxy DHCP service and TFTP service on the server that is running DHCP services.

For instructions on how to do this, see .

6 Configure option tag 60 on the DHCP server and set the tag to the text string "PXEClient."

For instructions on how to do this, see and .

7 Configure the Proxy DHCP service to redirect PXE workstations to the Preboot Services server that you set up in .

For Windows, run the Proxy DHCP service configuration application and set the *VSP IP* to the IP address of the server that you set up in .

For NetWare, open `pdhcp.ini` and change the TRANSACTION_SERVER_IP entry to the IP address of the server that you set up in .

8 Start the Proxy DHCP service that has just been installed on the server running DHCP services.

For Windows, start the service in the Service Control Manager.

For NetWare, enter `load pdhcp` at the server console.

PXE workstations in all VLANs that are supported by the DHCP server are able to pick up work through PXE.

Installing the Proxy DHCP Server and the TFTP Server on the DHCP Server

This section includes the following topics:

- Installing and Configuring Proxy DHCP and TFTP Servers on a NetWare Server
- Installing and Configuring Proxy DHCP and TFTP Servers on a Windows Server

Installing and Configuring Proxy DHCP and TFTP Servers on a NetWare Server

1 Copy the following files to `sys:\system` on the destination server. These files can be obtained either from your working ZENworks Imaging server, or from the *ZENworks Desktop Management Program* CD.

```
pdhcp.nlm
pdhcp.ini
tftp.nlm
tftp.ini
```

2 Copy all of the files from the `sys:\tftp` directory to a directory with the same name on the destination server.

3 Edit the `tftp.ini` file. Make sure that the ReadPath is the same as the path where you copied the TFTP files in Step 2.

4 If you want the services to start automatically, edit the `autoexec.ncf` file and add the following lines:

```
Load tftp
Load pdhcp
```

5 Start the services on the server by entering the following lines at the server console:

```
Load tftp
Load pdhcp
```

Installing and Configuring Proxy DHCP and TFTP Servers on a Windows Server

1 Stop all Desktop Management Preboot Services on the server where you installed Preboot Services.

To do this, open the Service Control Manager (*Control Panel > Administrative Tools > Services*), and stop the Preboot Transaction Server, Preboot Port Mapper, Proxy DHCP Service, and Preboot TFTP/MTFTP Service.

2 Copy the entire subdirectory where you installed Desktop Management Preboot Services to the destination server. Typically, this subdirectory is `\program files\zen_preboot_services`.

3 Using the Service Control Manager, restart the services on the original server that you stopped in Step 1.

4 On the destination server, perform the following steps. You need to be logged in to the server with administrator rights.

This example assumes you copied all of the files to `c:\program files\zen_preboot_services`.

4a Click *Start > Run*.

4b Type `cmd`, then press Enter to open a command console.

4c Type `cd c:\program files\zen preboot services\pdhcp,` then press Enter.

4d Type `dhcpservice -i,` then press Enter.

4e Type `dhcpcfg,` then press Enter.

This starts the Proxy DHCP configuration application.

4f Set the *VSP Host IP* to the IP address of the ZENworks Imaging server, click *Save All*, then click *Exit*.

4g Switch back to the command console.

4h Type `cd c:\program files\zen preboot services\tftp,` then press Enter.

4i Type `tftpservice -I,` then press Enter.

4j Type `tftpcfg,` then press Enter.

The TFTP configuration applet starts. Make sure the TFTP Read Path is correct, and points to a subdirectory containing the TFTP files. The `\tftp` folder is usually located at `c:\program files\zen preboot services\tftp\data.`

4k Click *Exit* to close the application.

5 Open the Service Control Manager, then start the Proxy DHCP and TFTP services that are now listed there.

or

Reboot the server and the services start automatically.

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

If the switch is acting as a firewall and limiting the type of traffic on the network, it might be necessary to open certain UDP ports in the firewall. For a list of UDP ports used by ZENworks Desktop Management Preboot Services, see Section 56.4.3, "Configuring Filters on Switches and Routers," on page 677.

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

- "Example Deployment" on page 675
- "Configuring Cisco Equipment" on page 676
- "Configuring Nortel Network Equipment" on page 676
- "Configuring Bay Network Equipment" on page 677

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 client. The PXE client'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 client, and the PXE client 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 client 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 the Proxy DHCP server and the Transaction server. 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 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 workstation.

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 Make sure that IP is routable.

3 Enable *Bootp* on the PXE workstation subnet or VLAN.

4 Select the interface that the PXE workstations are connected to.

5 Edit the circuit.

6 Click *Protocols*.

7 Click *Add/Delete*.

8 Make sure that the *Bootp* check box is selected.

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, enter the local LAN IP address.

   13c In the Target Server IP Address box, enter 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 on page 676 again and enter the Proxy DHCP server IP address at Step 3 on page 676.

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 workstation subnet to the Proxy DHCP 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 workstation, and *server* is the IP address of the server that the DHCP frame should be forwarded to.

3 Save the configuration.

56.4.3 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 pass through the router or switch successfully for the Preboot Services session to be successful. The Preboot Services session uses the following destination ports:

Table 56-10 *Ports Used by Preboot Services Components*

Component	Port
DHCP and Proxy DHCP Servers	UDP Port 67, 68, and 4011
TFTP Server	UDP Port 69
RPC Port Map Server	UDP Port 111
Transaction Server	UDP Port 18753

56.4.4 Spanning Tree Protocol in Switched Environments

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 workstation) 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 workstation is off, the link light on the switch is obviously off. When the workstation 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 or Preboot Services clients 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 workstation is attached.

After the problem is resolved, the link light on the port should change to green almost immediately after a workstation 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).

56.5 Enabling PXE on a Workstation

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

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

- Section 56.5.1, "Enabling PXE on a PXE-Capable Workstation," on page 678
- Section 56.5.2, "Verifying That PXE Is Enabled on a Workstation," on page 679
- Section 56.5.3, "If a Workstation Is Not PXE Capable," on page 679

56.5.1 Enabling PXE on a PXE-Capable Workstation

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 workstation:

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

The PXE activation method for a workstation 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 workstation.

If the workstation 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 Ctrl+S during the boot process to allow you to configure the PXE functionality. Other network adapters might prompt you to press Ctrl+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.

56.5.2 Verifying That PXE Is Enabled on a Workstation

After you have activated PXE, it becomes available in the Boot section of the BIOS. PXE is correctly enabled on a workstation when the workstation attempts to establish a PXE session during the boot process. You can see this happening when the workstation 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 workstation searches for DHCP.

56.5.3 If a Workstation Is Not PXE Capable

Some older workstations might not support PXE and require you to install PXE on them. There are several ways to do this:

- Update your NIC or NIC driver. Most network adapter manufacturers supply a PXE Boot ROM chip that you can fit into your network adapter to enable PXE on the workstation. Contact the NIC manufacturer or a supplier to see if they sell a PXE Boot ROM. It is also possible that your current NIC might need an upgraded driver to become PXE-enabled.

- Update your BIOS version. Most manufacturers that supply motherboards with the network adapter embedded in the motherboard offer a BIOS upgrade that enables PXE on the workstation. Check the manufacturer's Web site or contact a supplier to check for a BIOS upgrade.

- Use the Desktop Management Preboot Services PXE-on-Disk utility if no PXE is available for the workstation. With this utility, you can create a boot diskette that enables the workstation to participate in the PXE environment.

  The PXE-on-Disk utility is installed to the ZENworks Imaging server as part of Preboot Services (PXE Support) in Desktop Management and is available from the *Create PXE Disk* button in the Imaging Boot Disk Creator (in ConsoleOne, click *Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette*).

For more information about using PXE-on-Disk, see Section 56.7, "Using the Desktop Management Preboot Services PXE-on-Disk Utility," on page 687.

56.6 Administering Desktop Management Preboot Services

This section includes information about administering and configuring Desktop Management Preboot Services.

It includes the following topics:

- Section 56.6.1, "Configuring Preboot Services Servers in Linux," on page 680
- Section 56.6.2, "Configuring Preboot Services Servers in NetWare," on page 681
- Section 56.6.3, "Configuring Preboot Services Servers in Windows," on page 683
- Section 56.6.4, "Configuring IP Port Usage," on page 686

56.6.1 Configuring Preboot Services 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 the files 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 63.6.1, "Initiating the Imaging Processes on Linux Imaging Servers," on page 769.

The following sections explain how to configure the following ZENworks Imaging server components:

- "Configuring the TFTP Server" on page 680
- "Configuring the Proxy DHCP Server" on page 681
- "Configuring Novell-zmgprebootpolicy" on page 681
- "Configuring the DHCP Server" on page 681

The `libzmgserv.so` library file cannot be configured.

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.

For a list of configuration parameters, see "Configuring novell-tftp" on page 771.

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.

For a list of configuration parameters, see "Configuring novell-proxydhcp" on page 769.

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 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 eDirectory (the `libzmgserv.so` library file) 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.

For a list of configuration parameters, see "Configuring novell-zmgprebootpolicy" on page 774.

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 "Network Configuration" on page 668.

56.6.2 Configuring Preboot Services Servers in NetWare

After Desktop Management Preboot Services is installed, it is seldom necessary to change the default server values. If you need to change the settings, however, you can do so by editing the

appropriate `.ini` file for the server you want to change. These `.ini` files can be found on the Preboot Services server in the `sys:\system` directory.

This section contains the following information:

Configuring the MTFTP/TFTP Module

You can set the path that the MTFTP/TFTP module uses for file access by modifying the `tftp.ini` file. The following options are available:

ReadPath: Set the path that the MTFTP/TFTP module uses for file access. The default value for this setting is `sys:\tftp\`.

WriteProtect: Set the value to 0 to cause the MTFTP/TFTP module to accept Write requests, or set the value to 1 to disallow Write requests.

NOTE: The variable names (for example, ReadPath) are case sensitive.

Configuring the Proxy DHCP Module

You can set the parameters that the Proxy DHCP module uses by modifying the `pdhcp.ini` file. The following options are available:

TRANSACTION_SERVER_IP: The Preboot client contacts the server on this IP address to check for imaging work.

TFTP_SERVER_IP: The PXE/Preboot client contacts the server on this IP address to download the Preboot client (`dinic.sys`) and the ZENworks Imaging Engine if imaging work is required.

PDHCP_Server_IP: If this address is set, the Proxy DHCP server tries to bind to this IP address on the server. The IP address set must be a valid IP address on the server.

This setting can also be used to force the Proxy DHCP server to use the virtual LAN adapter on a cluster server, rather than the physical LAN adapter of the server.

This setting can be used to force the PDHCP server to respond on only one interface on a multi-homed server.

BOOT_MENU_TIMEOUT: This setting controls how long (in seconds) the PXE boot menu is displayed while a PXE workstation boots.

USE_DHCP_PORT: Set this to 0 to bind to the BINL port (4011). This is only necessary if you are running proxy DHCP and another DHCP Server on the same machine. This setting replaces the older USE_BINL_PORT setting.

USE_MTFTP: Set this option to 0 to disable multicast TFTP transfers. This is the default setting.

Set this option to 1 to enable multicast TFTP transfers. In this mode, the PXE client waits to join a multicast group for the transfer of the initial `dinic.sys` file. Enabling this option adds 10 to 20 seconds to the PXE boot-up sequence, so this is not recommended.

MTFTP_IP: This value specifies the multicast IP that the server should use for MTFTP transfers.

MTFTP_SERVER_PORT: This value specifies the server port to use for MTFTP transfers.

MTFTP_CLIENT_PORT: This value specifies the client port to use for MTFTP transfers.

MTFTP_OPEN_TIMEOUT: Sets the time to wait before opening the MTFTP session.

MTFTP_REOPEN_TIMEOUT: Sets the time to wait before reopening the MTFTP session.

NOTE: The variable names (for example, MTFTP_IP) are case sensitive.

Configuring the Transaction Server Module

You can set the parameters that the Transaction server module uses by modifying the `dts.ini` file. The following option is available:

Server UdpPort: Set this value to the UDP port number you want to use.

NOTE: This variable name is case sensitive.

Configuring the DHCP Server

For information on running the DHCP server and Proxy DHCP server on the same NetWare 6 server, see Section , "NetWare 6.x DHCP Server," on page 664.

56.6.3 Configuring Preboot Services Servers in Windows

These sections explain how to configure the following Desktop Management Preboot Services servers:

- "Configuring the TFTP Server" on page 683
- "Configuring the MTFTP Server" on page 684
- "Configuring the Proxy DHCP Server" on page 684
- "Configuring the DHCP Server" on page 685

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 From the Windows desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services configuration > TFTP configuration* to display the TFTP Configuration window.

2 Fill in the field:

TFTP Data Path: The data path should point to a directory where the TFTP server looks for files that are requested or written to by clients.

3 Click *Save all* to save new settings.

or

Click *Exit* to close the configuration utility without saving changes.

Configuring the MTFTP Server

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

1 From the Windows desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services configuration > MTFTP configuration* to display the MTFTP Configuration dialog box.
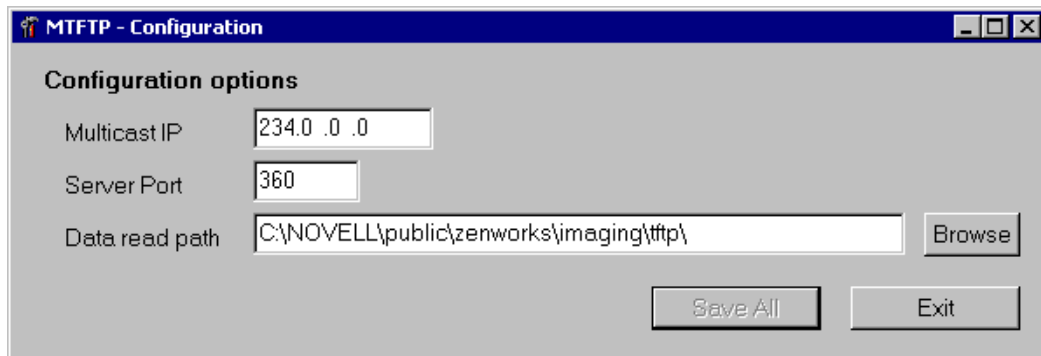
2 Fill in the fields:

Multicast IP: Specify the address to be used as a destination during multicast transfers. Make sure that the address used falls within the IP address range designated for multicast. If you change this value, be sure to update the corresponding entry in the Proxy DHCP configuration.

Server Port: Specify the port number that the server expects to receive requests on. If you change this value, be sure to update the corresponding entry in the Proxy DHCP configuration.

Data Read Path: Specify the directory where the MTFTP server reads the files that are requested by clients.

3 Click *Save all* to save new settings.

or

Click *Exit* to close the configuration utility without saving changes.

Configuring the Proxy DHCP Server

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

Use the following steps to check the settings of the Proxy DHCP server:

1 From the Windows desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services configuration > Proxy DHCP configuration* to display the Proxy DHCP Configuration dialog box.
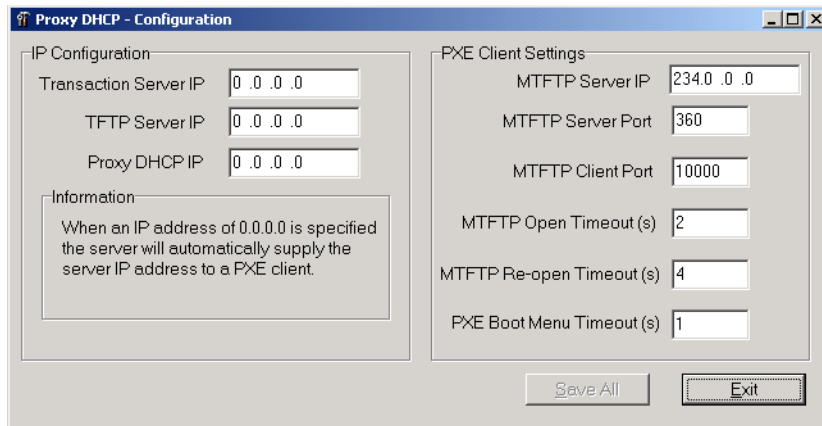
2 Check the fields:

Transaction Server IP: The Preboot client contacts the server on this IP address to check for imaging work.

TFTP Server IP: The PXE Preboot client contacts the server on this IP address to download the Preboot client (`dinic.sys`) and the ZENworks Imaging Engine if imaging work is required.

Proxy DHCP IP: If this address is set, the Proxy DHCP server tries to bind to this IP address on the server. The IP address set must be a valid IP address on the server.

This setting can be used to force the Proxy DHCP server to use the virtual LAN adapter on a cluster server, rather than the physical LAN adapter of the server.

This setting can also be used to force the PDHCP server to respond on only one interface on a multi-homed server.

All of the MTFTP settings in this dialog box should be the same as the settings that appear in the MTFTP Configuration Utility. Do not modify the MTFTP Client Port, MTFTP Open Timeout, MTFTP Reopen Timeout, and PXE Boot Menu Timeout settings from their default values.

3 Click *Save All* to save new settings.

or

Click *Exit* to close the configuration utility without saving changes.

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 DHCP Server

The DHCP server needs to have option tag 60 (decimal) added to the DHCP tags if the PDHCP and the 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 .

56.6.4 Configuring IP Port Usage

This section describes the network ports used by Desktop Management Preboot Services. Using this information in this section, you can configure routers or firewalls to correctly forward the network traffic generated by Preboot Services.

- "Available Ports" on page 686
- "Changing Port Usage in NetWare" on page 687
- "Changing Port Usage in Windows Server" on page 687

Port usage for Linux imaging servers cannot be changed. For further information about configuring routers, see Section 56.4, "Deploying Desktop Management Preboot Services in a Routed or Subneted Network Environment," on page 665.

Available Ports

This section describes the network ports used by ZENworks Desktop Management 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 56.4, "Deploying Desktop Management Preboot Services in a Routed or Subneted Network Environment," on page 665.

Desktop Management 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 listens on this port for client requests.
- **69 decimal:** The TFTP server listens on this port for file requests from PXE or Preboot Services clients.
- **111 decimal:** Port mapper port. Refer to RFC 1057 (http://sunsite.serc.iisc.ernet.in/collection/rfc/rfc1057.html) for a description of this server.
- **4011 decimal:** When running on the same server as the DHCP daemon, the Proxy DHCP server listens on this port for PXE information requests.

For NetWare and Windows imaging servers, the proprietary IP ports include:

- **360 decimal:** The MTFTP server listens on this port for MTFTP requests from PXE or Preboot Services clients.
- **4011 decimal:** The Proxy DHCP server uses this port to communicate with PXE clients, but only when running on the same server as the standard DHCP server.
- **18753 decimal:** Transaction server client connection port. The Transaction server receives all connection requests from the Preboot Services clients on this port.

For Linux imaging servers, the proprietary IP ports include:

- **998 decimal:** Imaging client connection port. eDirectory (`libzmgserv.so`) 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.

Although 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, ZENworks 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.

Changing Port Usage in NetWare

1 Edit the `dts.ini` file located in the same directory as the `dts.nlm` module.

2 Set *ServerUdpPort* to the port number you want to use.

3 Stop and start `dts.nlm` for the changes to take effect.

Changing Port Usage in Windows Server

The Transaction server and MTFTP server can be configured to use different ports if necessary. To change the port, use the following procedure:

1 From the Windows server desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services configuration > preboot_service_configuration.*

2 Change the relevant settings in the configuration.

3 Stop and start the servers for the changes to take effect.

56.7 Using the Desktop Management Preboot Services PXE-on-Disk Utility

This section contains information to help you understand the ZENworks Desktop Management Preboot Services PXE-on-Disk utility, prepare a Windows workstation for it, and use it.

- Section 56.7.1, "What Is PXE-on-Disk Setup?," on page 687
- Section 56.7.2, "Creating a PXE-on-Disk Diskette," on page 688
- Section 56.7.3, "Booting with a PXE-on-Disk Diskette," on page 691
- Section 56.7.4, "If PXE-on-Disk Fails to Operate Correctly," on page 691

56.7.1 What Is PXE-on-Disk Setup?

PXE-on-Disk Setup helps you create a 1.44 MB floppy diskette that contains all of the files needed to allow a non-PXE-compatible network adapter on a Windows workstation to communicate with a Desktop Management Preboot Services server. When you boot a workstation with a PXE-on-Disk diskette in the floppy drive, it is as if that workstation had a PXE-enabled network adapter.

The PXE-on-Disk Setup program runs on the following operating systems:

- Windows 95/98/ME
- Windows 2000/XP

56.7.2 Creating a PXE-on-Disk Diskette

This section contains the following information:

- "Creating the Diskette in a Windows Server Environment" on page 688
- "Creating the Diskette in a NetWare Server Environment" on page 689

Creating the Diskette in a Windows Server Environment

When you installed the Desktop Management Preboot Services component on a Windows server, the PXE-on-Disk creation program was also installed and registered. Use the following procedure to create a PXE-on-Disk diskette from your Windows server.

1 From the Windows desktop, click *Start > Programs > ZENworks Preboot Services > PXE-on-Disk* to display the PXE-on-Disk Setup window.

or

In ConsoleOne, click *Tools > ZENworks Utilities > Imaging > Create or modify boot diskette > Create PXE disk*.
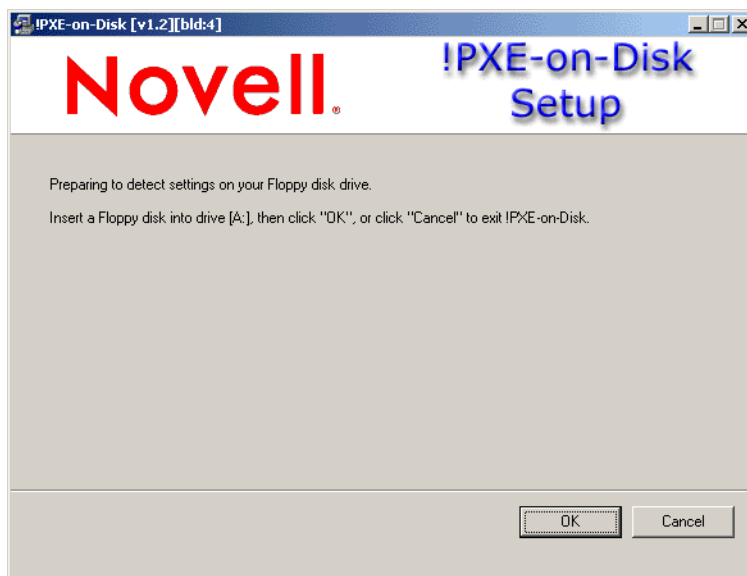
2 Insert an empty, formatted, high-density diskette in the disk drive.

3 Click *OK* to display the *Driver and Information* lists for PXE-compatible network adapters.
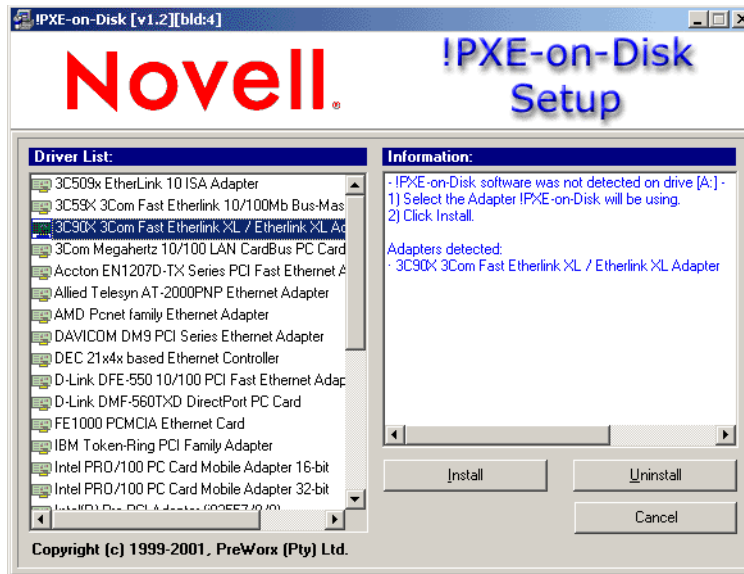
Note that the network adapter (or adapters) installed on your server is detected and the specifications are listed in the *Information* list box of the Setup window. Some driver types might be duplicated. For example, Accton En1207d is the same as SMC 1211TX.

4 From the *Driver List*, select the name of the network adapter driver (or its nearest equivalent) that is installed on the client workstation you want to connect to the Preboot Services server.

5 Insert an empty, formatted, high-density diskette in the disk drive, then click *Install* to start creating a PXE-on-Disk diskette.

When the installation is complete, the diskette contains appropriate PXE-on-Disk information for the intended client workstation.

6 Click *Close* to complete the creation of the PXE-on-Disk diskette.

Creating the Diskette in a NetWare Server Environment

1 From the `sys:\public\zenworks\pxe` directory, run `psetupn.exe` to display the PXE-on-Disk Setup window.
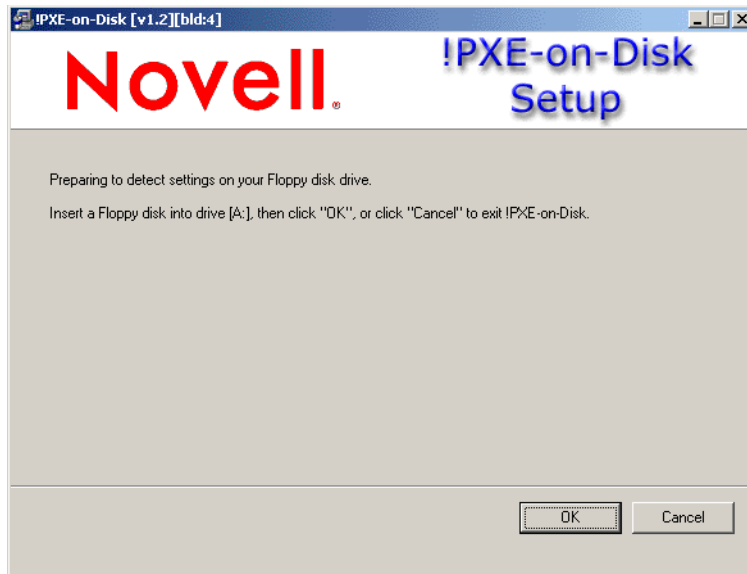
2 Insert an empty, formatted, high-density diskette in the disk drive.

3 Click *OK* to display the *Driver and Information* lists for PXE-compatible network adapters.

The network adapter of machine you are using is detected and its specifications listed in the *Information* list box of the Setup window.

4 From the *Driver List*, select the name of the network adapter driver (or its nearest equivalent) that is installed on the client workstation you want to connect to the Preboot Services server.

Some driver types might be duplicated. For example, Accton En1207d is the same as SMC 1211TX.

5 Click *Install* to start creating a PXE-on-Disk diskette.

When the installation is complete, the diskette contains appropriate PXE-on-Disk information for the intended client workstation.
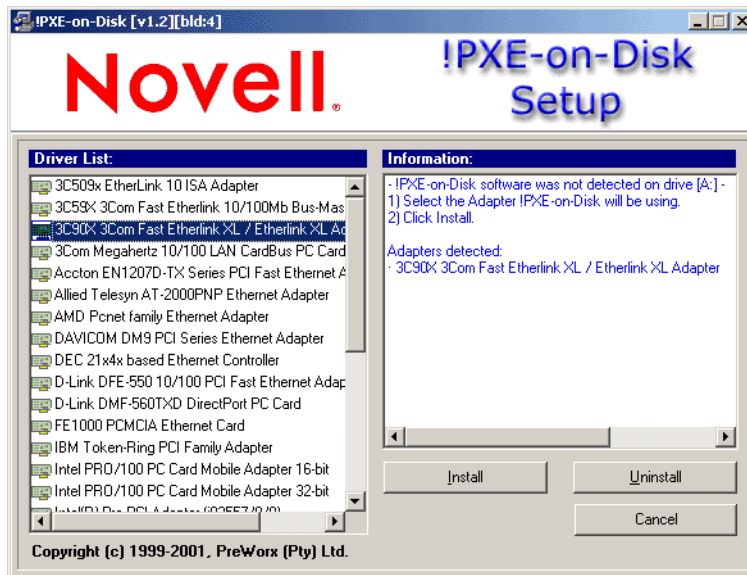
6 Click *Close* to complete the creation of the PXE-on-Disk diskette.

56.7.3 Booting with a PXE-on-Disk Diskette

Before you boot a client workstation with a PXE-on-Disk diskette, you should make sure that Desktop Management Preboot Services is installed on a network server. This is the server that communicates with the client workstation and give it workstation imaging tasks to perform. For more information about installing ZENworks Desktop Management Preboot Services on a server, see Step 12 under "Desktop Management Server Installation Procedure" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

When you know that Desktop Management Preboot Services is installed on the server, you can reboot the client workstation with a PXE-on-Disk diskette. During the reboot cycle, the client workstation does the following:

- ◆ Establishes a connection with the Desktop Management Preboot Services server.
- ◆ Executes any imaging work to be performed.
- ◆ Continues its boot cycle.

56.7.4 If PXE-on-Disk Fails to Operate Correctly

If PXE-on-Disk is not working, an incorrect network adapter is installed, or PXE-on-Disk is not installed on the diskette you are using to boot the workstation. To correct this, install a PXE-enabled network adapter or reinstall PXE files on a diskette using the PXE-on-Disk setup utility. See "Creating a PXE-on-Disk Diskette" on page 688.

56.8 Editing the Desktop Management Preboot Services Menu

When a PXE-enabled workstation is booted, it broadcasts for DHCP information and receives a response from both the DHCP and Proxy DHCP servers. The workstation then downloads the Preboot Services client and checks for imaging work with the Transaction server. If there is imaging work to do, the workstation displays a default Desktop Management Preboot Services (PXE) Menu with the following options:

- ◆ *Start ZENworks Imaging in Automatic Mode*
- ◆ *Start ZENworks Imaging in Maintenance Mode*
- ◆ *Disable the ZENworks Partition*
- ◆ *Enable the ZENworks Partition*
- ◆ *Exit*

The PXE (Preboot Execution Environment) environment provided by PreWorX is used for Windows and NetWare imaging servers. Novell's internally-developed PXE solution for Linux imaging servers in ZENworks 7 with SP1 supports the SLES-based ZENworks Imaging distribution.

The PXE process based on PreWorX files differs from Novell's solution. For example, PreWorX uses a combination of Caldera* DOS, the linld Linux loader program, and `.cmd` configuration files for passing parameters to the Linux kernel. Novell's PXE solution is based on the pxelinux boot loader and `.cfg` configuration files.

Therefore, depending on where the Preboot Services Menu file resides, there are two methods for editing the menu. One menu is provided by PreWorX for Windows for imaging servers, the other by Novell for Linux for imaging servers.

Contact PreWorX (http://www.preworx.com) for their toolkit if more capability is needed in editing the menu in Windows.

Review the applicable sections for instructions on editing the Preboot Services Menu:

56.8.1 Editing the Preboot Services Menu on Linux

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 Linux 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 ZENworks 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 a ZENworks 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`.

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 1.0 August, 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 = 7

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 at the bottom of the screen to explain the selected menu option's function. It changes as you select 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.

56.8.2 Understanding the Windows-based Preboot Services Menu Editor

If you want to create a custom Preboot Services (PXE) menu, you can use the Desktop Management Preboot Services Menu Editor to set and run your own actions and DOS utilities on the client workstation. Novell provides this utility as a service; no custom DOS or Linux utilities have been developed by Novell.

NOTE: Contact PreWorX (http://www.preworx.com) for their toolkit if more capability is needed in editing the menu in Windows.

The Menu Editor is a Windows-based, option-driven utility that lets you do the following on the Preboot Services (PXE) menu:

- Add menu items or submenus to the Preboot Services (PXE) menu
- Add executable commands to be performed on the client workstation
- Delete a submenu or an action from an existing menu

The Menu Editor generates menu files and stores them on the Desktop Management Preboot Services server. These files can be selected from the Menu Editor interface and downloaded to a Preboot Services client workstation.

Installing the Preboot Services Menu Editor

If you chose the Preboot Services component during the Desktop Management Preboot Services installation program, the Menu Editor is automatically installed on Windows servers you designate as Preboot Services servers. For more information, see "Desktop Management Server Installation Procedure" in the *Novell ZENworks 7 Desktop Management Installation Guide*. The Menu Editor is not installed to a NetWare server during the Preboot Services installation; the files must be accessed from a Windows workstation.

Accessing the Preboot Services Menu Editor

If you installed to a Windows server, you can access the Menu Editor from the Windows desktop (after the PXE-enabled Windows workstation is imaged) by clicking *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services Menu Editor*.

If you need to access the Menu Editor from a NetWare server, do the following:

1 Unzip the `\zenworks\sfiles\InstallerData\Installer.zip` file from the *Novell ZENworks 7 Desktop Management Support Pack 1* CD to a temporary directory.

2 From the `$SHADE_SOURCE_PATH$\ZEN Preboot Services_zg_ia_sf.jar` file, copy the `Menu Editor` directory to your NetWare server.

3 On a Windows machine, map to the `Menu Editor` directory copied on the NetWare server in Step 2. Run the Menu Editor.

Understanding the Preboot Services Menu Editor Interface

The Menu Editor interface is not available unless you are creating or editing an existing menu. Add and delete functions are available from the Options menu or from icons on the toolbar. Menu Editor functions can also be initiated with keyboard commands from a Windows workstation. For example, pressing the Insert key while in the Menu Editor adds a menu item, and pressing the Delete key deletes a menu item.

You can enter descriptive text about the menu in the *Information* field. You can also add help by entering appropriate text in the *Help* field.

56.8.3 Editing the Preboot Services Menu on Windows

Although you could use the default Preboot Services (PXE) Menu for Desktop Management Preboot Services, you might want to take advantage of the flexibility of the Preboot Services Menu Editor to create a new menu or to modify the default menu.

This section contains the following information:

- "Modifying the Default Menu" on page 696
- "Creating a New Preboot Services (PXE) Menu" on page 698
- "Creating a Submenu" on page 699
- "Creating Functions Within the Menu" on page 699
- "Saving the Menu as a .Dat File" on page 700

Modifying the Default Menu

There might be circumstances that require you to limit the options on the Desktop Management Preboot Services (PXE) menu. For example, you might want to restrict the user from using the Linux bash command line options. In such a case, you must create a new default menu and copy it to proper location on the Preboot Services server.

The following steps assume that you want to overwrite the existing default menu. If you want to save the options of this menu, we recommend that you rename `defmenu.mnu` (for example, `defmenu_old.mnu`), edit it with the Menu Editor to meet your needs, then save it again as `defmenu.mnu`.

To modify the default menu:

1 In the Windows desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services Menu Editor* to display the following dialog box:
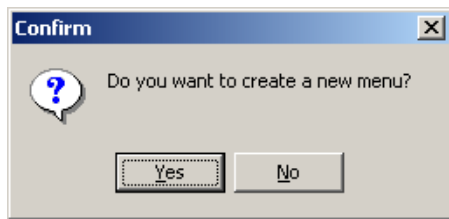
2 Click *No* to display the menu files that reside in the directory from which `meditor.exe` is running.
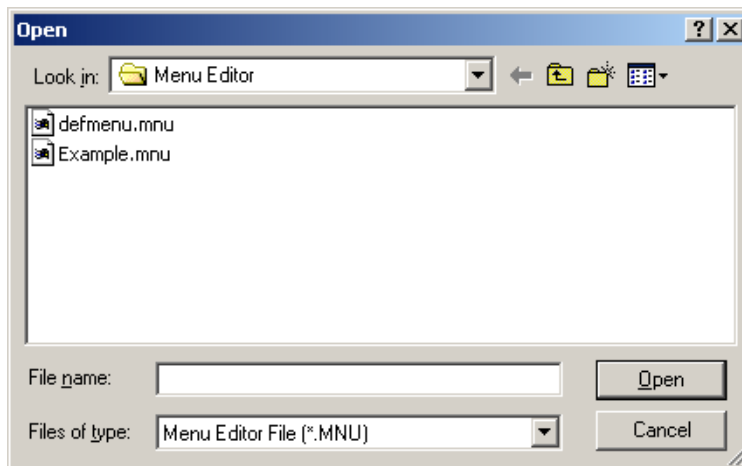
3 Select (or browse to) the `defmenu.mnu` file that you want to change, then click *Open*.
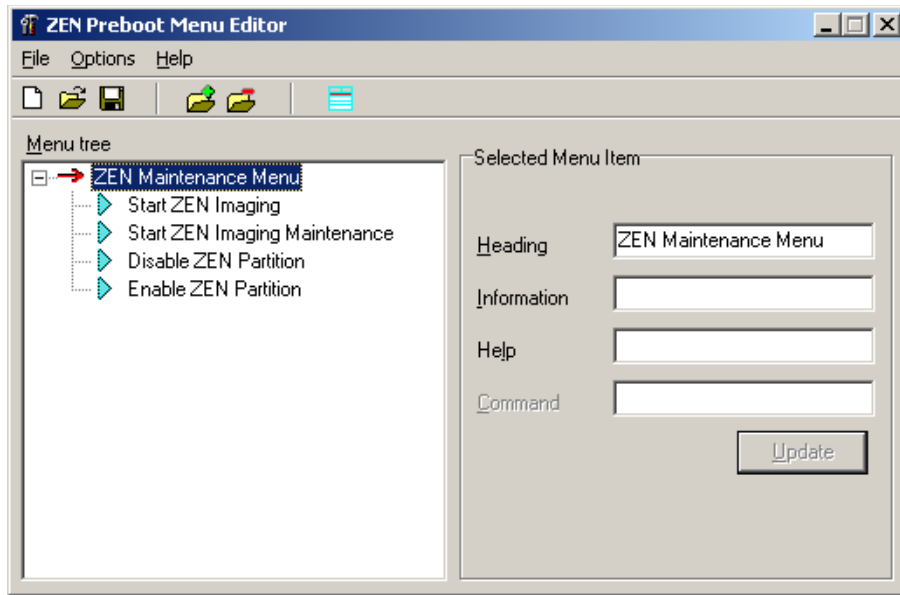
4 Select the menu item that you want to delete, click *Options*, then click *Delete* to display a message similar to the following:

```
Do you want to delete Start ZENworks Imaging Maintenance and its
subitems?
```

5 Click *Yes* to return to the Menu Editor, then click *File > Save* to open the Save As dialog box.
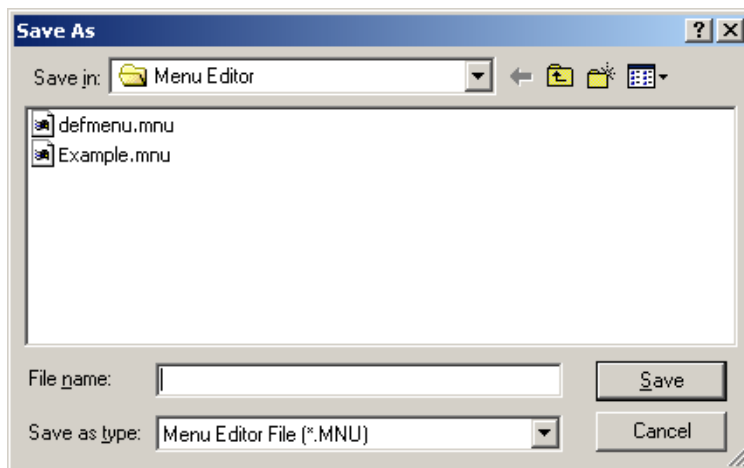
6 Select `defmenu.mnu` to enter this filename in the *Filename* field, then click *Save*. The following prompt is displayed:

```
Do you want to overwrite the old file?
```

7 Click *Yes* to overwrite the file and to return to the Menu Editor window.

You have now modified the `defmenu.mnu` menu template.

8 In the Menu Editor window, click *File > Save* to reopen the Save As dialog box.

9 In the *Save As Type* drop-down list, select *ZENworks Preboot Menu file* (`*.dat`).

10 Select `defmenu.dat` to enter this filename in the *Filename* field, then click *Save*. The following prompt is displayed:

```
Do you want to overwrite the old file?
```

11 Click *Yes* to overwrite the file and to return to the Menu Editor window.

You have now modified the data file that is displayed as the menu on a PXE workstation.

12 Copy the new `defmenu.dat` file to the `/tftp` directory on the Preboot Services server.

Creating a New Preboot Services (PXE) Menu

Use the following steps to create a new Preboot Services (PXE) menu using the Desktop Management Preboot Services Menu Editor:

1 In the Windows desktop, click *Start > Programs > ZENworks Preboot Services > ZENworks Preboot Services Menu Editor* to display the following dialog box:
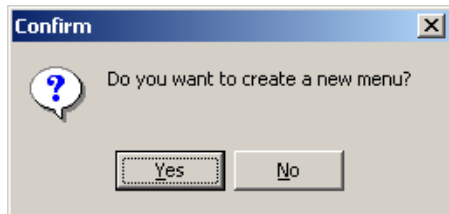

2 Click *Yes* to display the Create Menu dialog box.
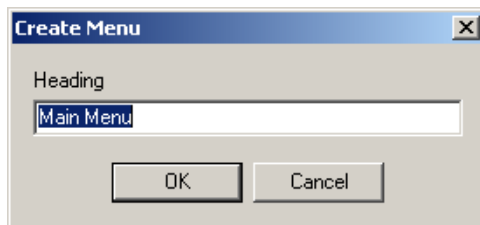
3 Specify the name of menu you want to create, then click *OK* to display the ZENworks Preboot Menu Editor window.
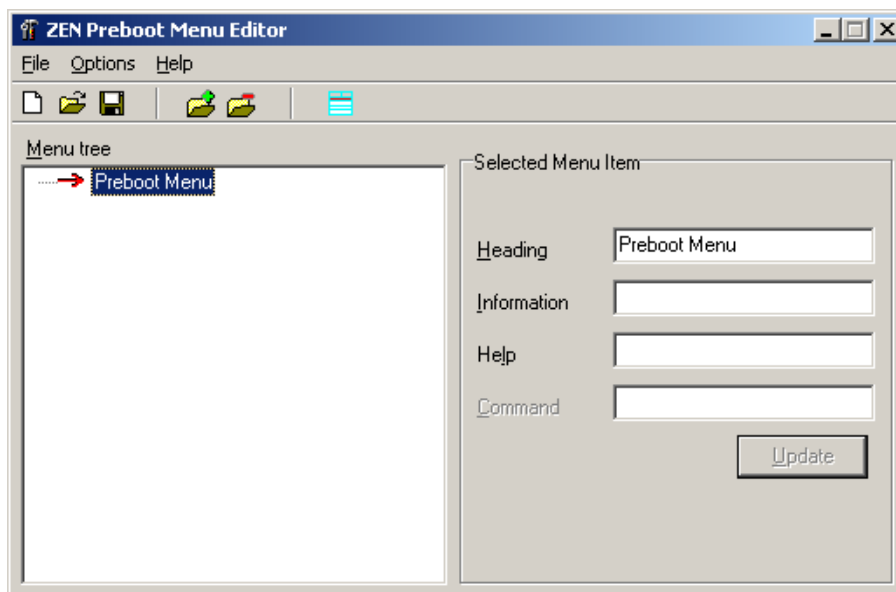
Creating a Submenu

If you want to create your own functions for the Preboot Services (PXE) menu, you need to create a submenu of these functions. Use the following steps to create a submenu.

1 Select *Add* from the Options menu to display the Add Menu Item window.
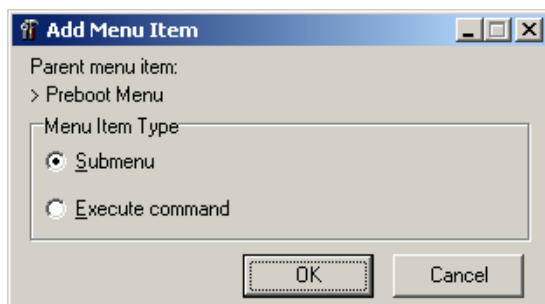
2 Select *Submenu*, then click *OK* to display the Add Menu dialog box.

3 In the *Heading* field of the dialog box, specify the text you want to use as the option in the submenu, then click *OK*.

The Menu Editor displays the submenu option as a subordinate item to the main menu you have already created.

4 Type a description and the help text in the *Information* and *Help* fields.

5 Click *Update* to save the text of the submenu option and any accompanying text you have created.

Although the submenu item is now created and appears on the Preboot Services (PXE) menu, it does not launch any utility; it is merely a text heading that serves as a navigation tool to options that actually perform functions.

Creating Functions Within the Menu

As stated earlier in this document, Desktop Management Preboot Services ships with a Preboot Services (PXE) menu that allows only limited, predesigned actions from the client workstation. Novell does not ship other DOS or Linux utilities. However, if you want to add functionality of your own, you can do so with the Preboot Services Menu Editor.

To add executable commands to the Menu Editor:

1 In the Preboot Services Menu Editor window, select a menu item, click *Options*, then click *Add* to display the Add Menu Item window.
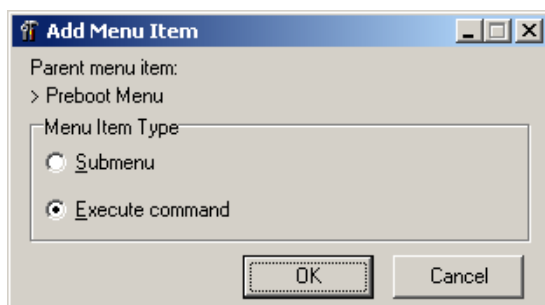
2 Select *Execute Command*, then click *OK*.

3 In the Execute Command dialog box, specify the menu text that describes the functionality of your program, then click *OK*.

4 Specify the command parameters of the utility you want to run, then click *OK*.

5 Specify descriptive text about the item you have created, then click *OK*.

6 Specify any help text that you want to be accessible by an F1 command for this menu item, then click *OK*.

7 When you have finished creating the menu, click *File* > *Save* to save the structure.

By default, the file is saved in `.mnu` format, which is used as a template by the Preboot Services Menu Editor interface. To be used by the Preboot Services (PXE) menu, this file must be exported to a binary (`.dat`) format. For more information, see "Saving the Menu as a .Dat File" on page 700.

Saving the Menu as a .Dat File

To create a `.dat` file for the Preboot Services (PXE) menu using a `.mnu` file:

1 Open the Preboot Services Menu Editor, then click *No* to display the existing `.mnu` files saved to your default directory (the same directory where the menu editor, `meditor.exe`, resides).

2 Select the `.mnu` file of the menu you want to export for later use by the Preboot Services (PXE) menu, click *File*, then click *Export*.

3 In the *Save As Type* drop-down list, select *ZENworks Preboot Menu file* (`*.dat`).

4 In the *Filename* field, type DEFMENU, then click *Save* to return to the Menu Editor window.

You have now created a data file that can be displayed as the default menu on a PXE-enabled workstation.

5 Copy the `defmenu.dat` file to the `/tftp` directory on the Preboot Services Server.

The `.dat` file is saved in the local directory from which you are running the Preboot Services Menu Editor. You must copy the file to the `\tftp` directory at the Preboot Services server.

Setting Up Workstations for Imaging

57

The following sections cover procedures to prepare workstations for imaging, depending on your imaging deployment strategy. For more information, see Chapter 53, "Common Imaging Deployment Strategies," on page 635.

If you are using Preboot Services (PXE) as your imaging method, you need to enable PXE on the workstation. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

If you are using a ZENworks (hard-disk) partition as your imaging method, you need to create the partition on the workstation. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

The following sections contain additional information:

- Section 57.1, "Windows Workstation Requirements," on page 701
- Section 57.2, "Enabling a Windows Workstation for Auto-Imaging Operations," on page 702

57.1 Windows Workstation Requirements

It is possible (but usually not as convenient) to image a workstation without connecting to the network. It is also possible to image non-Windows workstations, but such operations can't be fully automated through Novell® eDirectory™ and the images can only be raw, bit-by-bit images of the entire hard disk, as opposed to customizable, file-by-file images of the data.

The following are the requirements for the workstation:

Table 57-1   Workstation Requirements for ZENworks Imaging

Requirement	Explanation
A supported Ethernet card	The workstation must connect with the ZENworks Imaging server to store or retrieve the images. This connection is made when the workstation is under the control of the Desktop Management Workstation ZENworks® Imaging Engine (which is a Linux application), not when the workstation is running under Windows. Therefore, make sure the workstation has a supported Ethernet card. For more information, see Chapter 66, "Supported Ethernet Cards," on page 811.
Windows 98, 2000, or XP installed	Unattended operations based on Workstation objects are currently supported only on 32-bit Windows platforms.
50 MB free disk space	Unless you are using Preboot Services, unattended operations require a ZENworks partition to be installed on the workstation 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 or DVDs.

Requirement	Explanation
Standard hardware architecture	NEC* PC98 architecture is not supported.
PXE enabled	If you are using Desktop Management Preboot Services, PXE must be enabled either in the BIOS or through a PXE boot disk. See Section 55.1, "Using Preboot Services (PXE)," on page 641 for more information.

NOTE: Desktop Management Imaging does not support workstations 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 workstation from communicating with the ZENworks Imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

57.2 Enabling a Windows Workstation for Auto-Imaging Operations

The following procedure explains how to register the workstation as an object in your eDirectory tree, install a ZENworks Imaging Windows Agent on the workstation, and install a permanent ZENworks partition on the hard disk.

Complete this procedure if you are not using Preboot Services (PXE). If you have enabled PXE on the workstation and have installed Desktop Management Preboot Services on your ZENworks Imaging server, this procedure is not a prerequisite to performing unattended imaging operations. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

When you put a new base image on a Windows workstation, the workstation receives the same identification data as the workstation from which the image was taken, including such settings as the IP address and computer (NETBIOS) name. To work around this, you can install the ZENworks Imaging Windows Agent on the target workstation before reimaging it. This saves the workstation's current identity settings to an area on the hard disk that's safe from reimaging. When the workstation reboots after being reimaged, the agent restores the original settings.

IMPORTANT: The ZENworks Imaging Windows Agent does not save or restore any Windows 2000/XP Domain information. If you change a workstation's domain and then restore an image, the workstation receives whatever domain is embedded in the new image.

This procedure needs to be performed only once prior to performing auto-imaging (unattended) operations. It is not a prerequisite to performing manual imaging operations.

1 If you haven't already done so, register the workstation as an object in your eDirectory tree that contains the ZENworks Imaging server.

When you boot a Windows workstation from an imaging device or method and allow the boot process to proceed in auto-imaging mode, the ZENworks Imaging Engine runs on the workstation and contacts a ZENworks Imaging server. In order for the workstation to be imaged, you must first either define an eDirectory policy for the ZENworks Imaging server (for more information, see Section 58.1, "Defining an Imaging Policy for Unregistered Workstations (Server Policy)," on page 705), or you must register the workstation as an object and configure Imaging on the Workstation object.

For more information on registering the workstation as an object, see .

You don't need to complete all of the tasks mentioned in the instructions. Just create a Server policy package that contains a minimal Workstation Import policy (use the defaults for naming, groups, and limits), and then associate the Server package with the container where you want the Workstation object to be created. Then, configure the workstation to communicate with the import service on the ZENworks Imaging server, and reboot the workstation. Before proceeding with the next step, check your eDirectory tree to make sure that the Workstation object was created.

2 Set a flag in the Workstation object that triggers the imaging operation you want.

For more information, see .

3 Install the ZENworks Imaging Windows Agent on the workstation:

3a Browse to the `sys:\public\zenworks\imaging` directory in your ZENworks Desktop Management installation (on the ZENworks Imaging server).

3b Complete the steps that correspond to the type of workstation:

Workstation Type	Steps
Windows 98	1. Copy `ziswin.exe`, `zislib16.dll`, and `zislib32.dll` to the `novell\zenis` directory.
	2. Run `ziswin.exe` from the `novell\zenis` directory.
	3. Run `regedit.exe` and browse to HKEY_LOCAL_MACHINE > Software > Microsoft > Windows > CurrentVersion > RunServices.
	4. Add the string value ZENwork Imaging Service and set it to the filename and path of the `ziswin.exe` file. For example, `c:\novell\zenis\ziswin.exe`
	5. Save the changes and close regedit.
Windows 2000	1. Copy `ziswin.exe` and `ziswinr.dll` (in the `nls\english` subdirectory or the appropriate language subdirectory) to your `winnt\system32` directory.
	2. From a command prompt, change to your `winnt\system32` directory, type `ziswin -install`, then press Enter.
Windows XP	1. Copy `ziswin.exe` and `ziswinr.dll` (in the `nls\english` subdirectory or the appropriate language subdirectory) to your `windows\system32` directory.
	2. From a command prompt, change to your `windows\system32` directory, type `ziswin -install`, then press Enter.

3c Reboot the workstation.

4 Take an image of the workstation as instructed in .

IMPORTANT: Do this even if you have taken an image of the workstation previously. This ensures that the new image captures the changes you made in the preceding steps.

5 After the image is created, reboot the workstation with the imaging boot method, type `install` at the boot prompt, then press Enter.

This starts the process of creating the ZENworks partition in the first partition slot. It also destroys all existing partitions, even if slot 1 is empty and available. By default, the ZENworks partition size is 150 MB.

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

6 (Optional) After the ZENworks partition is created and the bash prompt is displayed, type `img dump`, then press Enter.

This displays a list of the partition slots on the workstation. Unless you are upgrading your ZENworks partition, each partition slot should be empty and none should be active. The ZENworks partition is hidden from the list, so the number of partition slots in the list should be one less than before.

or

Type `img` to display a menu, select *Dump*, then select *No Geometry*.

7 At the bash prompt, restore the image you took in .

Use the `img restorep` command or select *Restore an Image*, then select *Proxy Image* from the menu as instructed in .

8 (Optional) After the image is restored and the bash prompt is displayed, use the `img dump` command to redisplay the list of the partition slots on the workstation.

or

Type `img` to display a menu, select *Dump*, then select *No Geometry*.

You should now see information about the Windows partitions that are restored and activated. There should still be one less partition slot than before because the ZENworks partition is still hidden (and will continue to be).

9 At the bash prompt, type `grub.s`, then press Enter.

10 When the bash prompt is displayed, reboot the workstation.

The workstation should boot to Windows. If the bash prompt is displayed, enter the `grub.s` command again and reboot a second time.

From this point on, whenever the workstation is rebooted, the ZENworks Imaging Engine takes control and checks the ZENworks Imaging server to see if an imaging operation should be performed. If you have not configured the Workstation object in eDirectory to trigger an unattended imaging operation, the ZENworks Imaging Engine simply exits and automatically reboots the workstation to Windows.

Setting Up Imaging Policies

58

The following sections explain how to set up policies for Novell® ZENworks® Desktop Management imaging services, and how to select general imaging server settings. The procedures that are applicable to you depend on your imaging deployment strategy. For more information, see Chapter 53, "Common Imaging Deployment Strategies," on page 635.

- Section 58.1, "Defining an Imaging Policy for Unregistered Workstations (Server Policy)," on page 705
- Section 58.2, "Defining an Imaging Policy for Registered Workstations (Workstation Policy)," on page 707
- Section 58.3, "Allowing Overwriting Filenames and Restricting the Save Location of Image Files (Imaging Server Settings)," on page 709

58.1 Defining an Imaging Policy for Unregistered Workstations (Server Policy)

If a Windows workstation hasn't been registered as a Workstation object in Novell eDirectory™ and you boot that workstation from an imaging method in auto-imaging mode, the ZENworks Imaging server is contacted and checks its Imaging Server policy in eDirectory to determine which image to put down on the workstation.

If the base image specified by the policy is the same as the base image currently on the workstation (as reported by the ZENworks Imaging Engine), the ZENworks Imaging server doesn't send any new images to put down on the workstation, unless the policy specifies to force down the base image again. If the policy specifies to force down the base image, or if the base image currently on the workstation is different than the base image specified by the policy, the ZENworks Imaging server sends down the new base image and any add-on images specified by the policy, and the ZENworks Imaging Engine puts these images down on the workstation.

IMPORTANT: If you configure a ZENworks Imaging server policy to send an add-on image only (no base image) to a workstation, the workstation receives the add-on image, but it also reboots and brings down the image again, resulting in a reboot/imaging loop.

In addition, if the ZENworks Imaging Engine reports to the ZENworks Imaging server that data is missing from the workstation's image-safe area, the ZENworks Imaging server obtains the missing data from the Imaging Server policy and sends it to the ZENworks Imaging Engine, which then saves the data to the image-safe area.

To define the Imaging Server policy for one or more ZENworks Imaging servers:

1 Prepare the various workstation images that the policy can prescribe. For details, see Chapter 59, "Creating and Restoring Images," on page 711.

2 If a Server Package hasn't already been created to hold the policies for the target ZENworks Imaging servers, create one as instructed in Chapter 11, "Creating Policy Packages," on page 151.

3 Right-click the Server Package, then click *Properties*.

4 Enable the Imaging Server policy, then click *Properties* to display the Rules page.
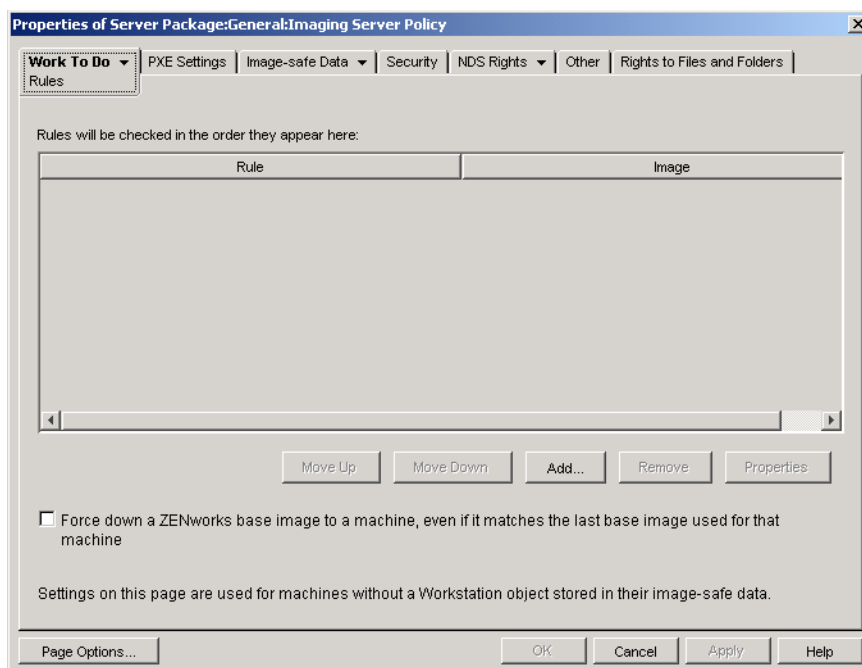
5 Click *Add* to display the New Image Selection Rule dialog box.
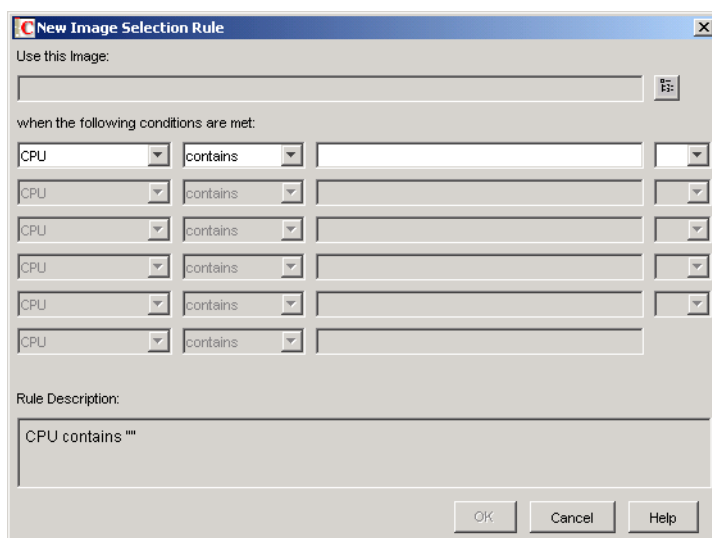
6 Click the browse button next to the *Use This Image* field to select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 714), use the drop-down fields and operators to specify the conditions under which the selected image should be used (click *Help* for details), then click *OK*.

Repeat this step as needed to provide rules that covers all workstations serviced by the target ZENworks Imaging servers.

These rules are used by your ZENworks Imaging server to determine which image to put on workstations during unattended imaging operations. The various hardware configuration data specified in the rules is compared against the actual hardware configuration data detected by

the Workstation ZENworks Imaging Engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot CD or DVD in manual mode and issue the `img info` command or enter `img`, then select *Information* from the menu.

Take care to choose rules that apply only to the unregistered workstations you want imaged. Otherwise, an image could be unintentionally pushed to another workstation.

7 (Optional) If you want the ZENworks Imaging server to force down the base image determined by this policy even if it is the same as the base image currently on the workstation, select the *Force Down a ZENworks Base Image to a Machine* check box on the bottom of the Rules page.

WARNING: Use this option with care, because putting down a base image destroys all data that was added to the workstation since the last base image was put down. In most scenarios, you'll want to use this option only while a specific workstation is being imaged and not generally for all workstations, unless this policy is designed for a lab environment where you want the workstations to be reimaged every time they reboot. If you select this option as a temporary measure, be sure to deselect it after the specific imaging task is done.

---

8 (Conditional) If you are using Preboot Services but previously booted workstations from a ZENworks partition, you can disable the ZENworks partition on the Imaging Partition property page (click the down-arrow next to *Work To Do*, click *Imaging Partition*, then select the *Disable the ZENworks Imaging Partition, If It Exists* check box). The partition is disabled but is not removed with this option.

9 (Optional) If you want to specify the availability of the PXE menu, which is displayed when you boot a PXE-enabled workstation, click the *PXE Settings* tab, then select an option. Click *Help* for details.

If you want to specify a different image when using Preboot Services, rather than the default image that is defined, specify the image file and pathname.

10 On the *Image-safe Data* tab, fill in the IP Configuration, Windows Networking, and DNS Settings pages.

These pages supply image-safe data values that might be missing on the workstations that are serviced by the target ZENworks Imaging servers. For details on these pages, click *Help*.

IMPORTANT: Image-safe data is not supported on Linux workstations.

---

11 Click *OK* to save the policy.

12 On the properties of the Server Package, click the *Associations* tab, add the containers and server objects that represent the target set of ZENworks Imaging servers, then click *OK*.

Remember that the policy won't actually be consulted by the associated ZENworks Imaging servers, unless the client requesting the imaging operation is an unregistered workstation that booted in auto-imaging mode.

58.2 Defining an Imaging Policy for Registered Workstations (Workstation Policy)

If a Windows workstation is registered as a Workstation object in eDirectory and you boot that workstation from an imaging method in auto-imaging mode, the ZENworks Imaging server is contacted and checks the Workstation object to see if the administrator has flagged it to receive an image. If this is the case and the administrator hasn't specified which image to use, the ZENworks

Imaging server consults the Workstation Imaging policy associated with the Workstation object to determine which image to send down.

To define the Workstation Imaging policy for one or more workstations:

1 Prepare the various workstation images that the policy can prescribe. For details, see Chapter 59, "Creating and Restoring Images," on page 711.

2 If a Workstation Package hasn't already been created to hold the policies for the target workstations, create one as instructed in Chapter 11, "Creating Policy Packages," on page 151.

3 Right-click the Workstation Package, then click *Properties*.

4 Enable the Workstation Imaging policy, then click *Properties* to display the Rules page.
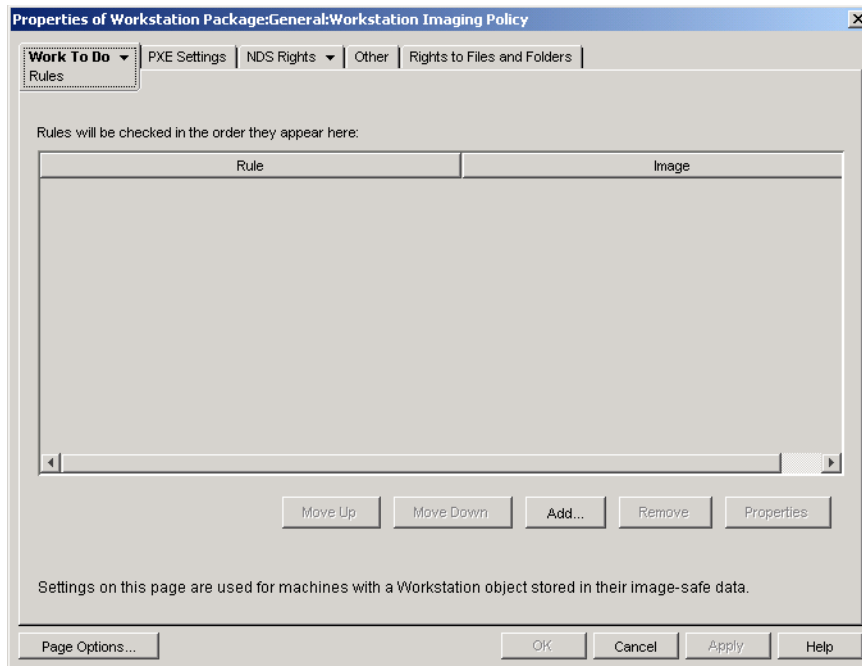
5 Click *Add* to display the New Image Selection Rule dialog box.
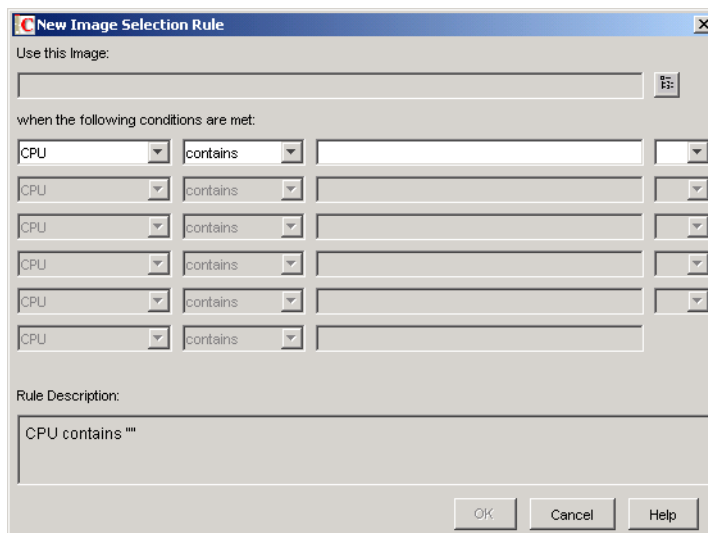
6 Click the browse button next to the *Use This Image* field to select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 714), use the drop-down fields and operators to specify the conditions under which the selected image should be used (click *Help* for details), then click *OK*.

Repeat this step as many times as needed to specify the particular images that should be used under different conditions.

These rules are used by your ZENworks Imaging server to determine which image to put on workstations during unattended imaging operations. The various hardware configuration data specified in the rules is compared against the actual hardware configuration data detected by the Workstation ZENworks Imaging Engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot CD or DVD in manual mode and issue the `img info` command or enter `img`, then select *Information* from the menu.

Take care to choose rules that apply only to the workstations you want imaged. Otherwise, an image could be pushed to another workstation unintentionally.

7 (Conditional) If you are using Preboot Services but previously booted workstations from a ZENworks partition, you can disable the ZENworks partition on the Imaging Partition property page (click the down-arrow next to *Work To Do*, click *Imaging Partition*, then select the *Disable the ZENworks Imaging Partition, If It Exists* check box). The partition is disabled but is not removed with this option.

8 (Optional) If you want to specify the availability of the PXE menu, which is displayed when you boot a PXE-enabled workstation, click the *PXE Settings* tab, then select an option. Click *Help* for details.

If you want to specify a different image when using Preboot Services, rather than the default image that is defined, specify the image file and pathname.

9 Click *OK* to save the policy.

10 On the properties of the Server Package, click the *Associations* tab, add the container, Workstation Group, or Workstation objects that represent the target set of workstations, then click *OK*.

Remember that the policy won't actually be consulted by the ZENworks Imaging server unless you (or another administrator) flag a Workstation object to receive an image on the next boot.

58.3 Allowing Overwriting Filenames and Restricting the Save Location of Image Files (Imaging Server Settings)

Most of the rules that comprise an Imaging Server policy apply only when the ZENworks Imaging server is servicing a request to auto-image a workstation. Such rules aren't in force when the ZENworks Imaging server is servicing a manual (command line or menu) imaging request.

However, the following two aspects of the Imaging Server policy are actually ZENworks Imaging server settings that always apply, including when the ZENworks Imaging server is servicing an automatic imaging request, when the ZENworks Imaging server is servicing a manual imaging request, when registered workstations are booting, and when unregistered workstations are booting:

- Whether to allow the creation of new image files that overwrite existing image files on the server

- Whether to restrict the creation of new image files on the server to specific areas

To define these general behaviors for one or more ZENworks Imaging servers:

1 If a Server Package hasn't already been created to hold the policies for the target ZENworks Imaging servers, create one as instructed in Chapter 11, "Creating Policy Packages," on page 151.

2 Right-click the Server Package, then click *Properties*.

3 Enable the Imaging Server policy, then click *Properties*.

4 Fill in the items on the *Security* tab. Click *Help* for details.

5 Click *OK* to save the policy.

6 On the Associations page, add the containers and server objects that represent the target set of ZENworks Imaging servers.

7 Click *OK* to save the association.

Creating and Restoring Images

<div style="text-align: right; font-size: 3em;">59</div>

Novell® ZENworks® Desktop Management provides tools for creating and compressing images of workstation hard disks as well as images of specific add-on applications or file sets. Desktop Management also provides tools for customizing such images and for making images available to auto-imaging operations through Novell eDirectory™.

Desktop Management Imaging supports devices that physically connect to the network and that meet the minimum requirements for workstations. For more information, see "User Workstation Hardware Requirements" in the "Novell ZENworks 7 Desktop Management Installation Guide". Desktop Management Imaging does not support imaging operations (creating or restoring images) using wireless connectivity.

NOTE: Desktop Management Imaging does not support workstations 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 workstation from communicating with the ZENworks Imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

The following sections explain how to perform these tasks:

59.1 Creating a Workstation (Base) Image

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

The overall process to create a base image is:

1. Boot the source workstation from an imaging method.

2. Run the Desktop Management Workstation ZENworks Imaging Engine to take an image of the workstation.

   You can do this manually or automatically. In manual mode, you interrupt the boot process and issue an imaging command at the Linux prompt. For more information, see Section 60.1, "Manually Taking an Image of a Workstation," on page 719. In automatic mode, you set a flag in the workstation's Workstation object using Novell ConsoleOne® and then let the boot process proceed without interruption. For more information, see Section 59.5, "Performing an Automatic Imaging Creation or Restoration," on page 716.

59.2 Creating an Add-On Image

An add-on image is an archived collection of files to be applied to an existing Windows installation on a target workstation. This is sometimes referred to as an application overlay. The existing partitions and files on the target workstation 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. There are two ways to create an add-on image, each resulting in a different kind of add-on image:

- Produce the add-on image from an Application object

  You do this in ConsoleOne by using the Imaging property page (on the *Common* tab) of the Application object. For details, click *Help* on that property page.

  An add-on image created in this manner is not fully installed on the target workstation until after the workstation reboots from being imaged, the user logs in locally, and Application Launcher/Explorer starts up and force runs the new Application object. Deploying the image is essentially another way to distribute an Application object.

- Drag files into a new image archive using Image Explorer

  You do this by starting Image Explorer, dragging files and folders from an existing Windows installation into the new image archive, and saving the archive to a file with a `.zmg` extension (case-sensitive). For more information, see Section 63.1, "Image Explorer (imgexp.exe)," on page 745.

  Generally, an add-on image created in this manner doesn't require any post-processing on the target workstation. 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 a WinZip archive. One exception is that the add-on image can contain Windows registry (`.reg`) files that are applied to the registry automatically when the workstation reboots after being imaged, if the ZENworks Imaging Windows Agent is installed on the workstation. For more information, see Section 59.3, "Using Image Explorer to Customize an Image," on page 712.

59.3 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 using the Image Explorer utility. Specifically, you can:

- **Compress the image:** You can compress an image (including images created by previous versions of Desktop Management) by 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; and, *Balanced* is a compromise between compression time and image file size. The *Balanced* option is used by default if you compress an image when it is created.

Image Explorer 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 749.

- ◆ **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 749.

You can also use the options on the ZENworks Imaging Configuration property page for the workstation object in ConsoleOne to specify compression options if you do not want the default setting, which is *Balanced*.

- ◆ **Split the image:** You can specify a workstation 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 workstation image is helpful for putting down or restoring images in a disconnected environment. For more information, see "Splitting an Image" on page 750.

- ◆ **Resize a partition in an image:** For workstation (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 "Resizing a Partition in an Image" on page 750.

- ◆ **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 "Excluding a File or Folder from the Open Image" on page 747.

- ◆ **Exclude individual files and folders from the image:** In doing this, you create file sets of the image by specifying which of ten possible sets to exclude a given file or folder from. The file sets exist merely as internal attributes of the same image archive. For more information, see "Purging Files and Folders Marked for Deletion from the Open Image" on page 748.

IMPORTANT: Do not exclude BPB files from a base image or the workstation 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 "Adding a File or Folder to an Open Image" on page 747.

- ◆ **Add Windows registry (.reg) files:** The registry settings contained in the `.reg` files that you add are applied after the image is put down and the target workstation reboots to Windows, if the ZENworks Imaging Windows Agent is installed on the workstation.

  As with any other file or folder that you add, a `.reg` file is included in all file sets of the image unless you explicitly exclude it from one or more file sets. For more information, see "Adding Specific Windows Registry Settings That Are to Be Applied After the Open Image Is Laid Down" on page 747.

To start Image Explorer as a Windows standalone utility:

1 Double-click the `imgexp.exe` file located on the ZENworks Imaging server at:

- ◆ **Linux:** `/opt/novell/zenworks/zdm/winutils/nls/`*language*

  The Image Explorer utility must be run on a Windows device. You need Samba running on the Linux ZENworks Imaging server where the utility file is located in order for the Windows machine to have access to it.

- ◆ **NetWare:** `sys:\public\zenworks\imaging`

The Image Explorer utility must be run on a Windows device. You need a drive mapped to the NetWare server where the utility file is located in order for the Windows machine to have access to it.

- ◆ **Windows:** `zenworks\imaging`

or

To start the utility from Novell ConsoleOne® from the server, click *Tools* > *ZENworks Utilities* > *Imaging* > *Image Explorer*.

59.4 Making an Image Available for Automatic Imaging

When you boot a workstation from an imaging method and allow the boot process to proceed in auto-imaging mode, the imaging operation that is performed on the workstation is determined by policies and settings that you define in eDirectory.

In order to make an image available to such operations, you must expose it as a Workstation Image object in eDirectory. Otherwise, when you define imaging policies and settings in eDirectory, you won't have any way to refer to the image.

Creating a Workstation Image object 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 workstations. 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:

- ◆ Section 59.4.1, "Creating a Workstation Image Object," on page 714
- ◆ Section 59.4.2, "Associating an Add-On Image with a Base Image," on page 715
- ◆ Section 59.4.3, "Using a File Set of an Image," on page 716

59.4.1 Creating a Workstation Image Object

1 Create the base image that the Workstation Image object will refer to.

For more information, see Section 59.1, "Creating a Workstation (Base) Image," on page 711.

Although it isn't typical, you can create a Workstation Image object that refers only to one or more add-on images. However, if you want a base image to be put down in the same operation as the add-on images, you should include both types of images in the Workstation Image object.

2 Copy the image file to a ZENworks Imaging server that is accessible as a server object in your eDirectory tree.

3 In ConsoleOne, open the eDirectory tree and browse to the container where you want to create the Workstation Image object.

4 Right-click the container, click *New*, click *Object*, select *Workstation Image* from the list of object classes, then click *OK*.

5 Specify a name for the new object.

Example: Dell Image

6 Click *Define Additional Properties*, then click *OK*.

7 Click *Use Standard Imaging*.

or

Click *Use Scripted Imaging*, then specify the script you want to use. See the F1 help for examples of how you can use scripts. Skip to Step 10.

You can perform scripted imaging operations from the bash prompt by using the imaging.s command.

8 Under *Base Image File*, click the browse button next to the field, select the ZENworks Imaging server where the image resides, select or specify the path and filename of the image, then click *OK*.

For details on selecting or specifying the path and filename, click *Help* in the Image File Location dialog box.

If the Workstation Image object consists only of add-on images, leave the *Base Image File* field blank, and skip to Step 5 of "Associating an Add-On Image with a Base Image" on page 715.

9 (Conditional) If you are using Preboot Services but formerly booted from ZENworks partitions on workstations, you can delete the ZENworks partition at the same time you put down an image. To do so, select the *Delete the ZENworks Imaging Partition, If It Exists, When Bringing Down The Base Image* check box. You can delete the ZENworks partition only when the workstation is booted from an imaging boot device or method other than the ZENworks partition.

IMPORTANT: After you have deleted the ZENworks partition, you need to make sure that the image you put on the workstation was made on a workstation without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation fails to boot. In addition, if you remove the ZENworks partition from a Windows 2000/XP machine, Windows cannot boot. You should only remove the ZENworks partition if you are going to restore an image to the workstation.

10 Click *OK* to save the Workstation Imaging object.

59.4.2 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 Section 59.2, "Creating an Add-On Image," on page 712.

2 Copy the image file to a ZENworks Imaging server that is accessible as a server object in your eDirectory tree.

You might want to copy the add-on image to the same location as the base image.

3 In ConsoleOne, open the eDirectory tree and browse to the Workstation Image object that refers to the base image. If you haven't created this object yet, do so as instructed in "Creating a Workstation Image Object" on page 714.

4 Right-click the object, then click *Properties*.

5 Under *Add-on Image Files*, click the *Add* button, select the ZENworks Imaging server where the add-on image resides, select or specify the path and filename of the image, then click *OK*.

For details on selecting or specifying the path and filename, click *Help* in the Image File Location dialog box.

You can associate more than one add-on image with a base image. The add-on images are put down after the base image in the order listed on this page.

6 Click *OK* to save the Workstation Imaging object.

59.4.3 Using a File Set of an Image

As explained in Section 59.3, "Using Image Explorer to Customize an Image," on page 712, you can exclude individual files and folders from any of 10 possible file sets of an image. The file sets exist merely as internal attributes of the same image archive.

Because creating an image of a workstation can take time, it is more efficient in some cases to just create an image of a few workstations and customize those images to get all of the file sets you need. Even though the file sets do not all exist as separate, physical image files, you can access them as though they are. How you do this depends on whether you are performing a manual or automated imaging operation, as explained below.

Table 59-1   *File Sets for Imaging Operations*

Type of imaging operation	How to specify the file set to use
Automatic (eDirectory-based)	In the Workstation Image object, specify the number of the file set in the *Use File Set* field. All eDirectory policies and settings that specify that the Workstation Image object use the specified file set.
	You can create multiple Workstation Image objects that point to the same base image but to different file sets.
Manual (commandline or menu)	Use the s parameter on the img restore command. For example, to specify file set number 3:
	``img restorel dellnt4.zmg s3``
	or
	Enter ``img`` at the bash prompt to display a menu, select *Restore an Image*, then select *Local Image*. Specify s*fileset* (for example, s3) in the *Advanced Parameters* field.
	For details, see "ZENworks Imaging Engine Commands" on page 781.

59.5 Performing an Automatic Imaging Creation or Restoration

The following procedure explains how to use ConsoleOne to set a flag in the Workstation object that indicates to take or put an image on the workstation the next time it is booted, and then verify that the imaging operation occurs as expected.

1 If the imaging operation that you want to trigger is to put an image on the workstation, do the following. Otherwise, skip this step.

    1a If you haven't already done so, create the image to be put on the workstation. Make sure to store it on your ZENworks Imaging server. For more information, see Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

1b In ConsoleOne, create a Workstation Image object in your eDirectory tree. Configure the object to point to the image file that is to be put on the workstation. For more information, see "Creating a Workstation Image Object" on page 714. For details on pointing to the image file, click *Help* in the Image File Location dialog box.

2 In ConsoleOne, right-click the Workstation object, then click *Properties*.

3 On the ZENworks Imaging Configuration page, do either of the following:

- ◆ To take an image of the workstation the next time it boots, select the first check box, click the browse button next to the available field, select your ZENworks Imaging server and the path and filename under which to store the new image, select the *Use Compression* check box and select a compression option if you want to use compression (click *Help* for details), then click *OK*.

- ◆ To put an image on the workstation the next time it boots, select the *Put an Image on This Workstation on Next Boot* check box, select the box that says to use an image other than the effective policy image or multicast session, click the browse button next to the available field, select the Workstation Image object you created in Step 1b, then click *OK*.

IMPORTANT: Be sure that the ZENworks Imaging server storing the image or the workstation receiving the image has enough disk space for the image. Otherwise, you receive a "Failed to write to proxy" error.

---

4 Click *OK* to save the imaging configuration settings.

After the imaging operation has been performed on the workstation, Desktop Management clears these imaging configuration settings automatically so that the imaging operation won't keep recurring.

5 Verify that the imaging operation occurs as expected when you reboot the workstation.

When you put a base image and its add-on images on a workstation, if you abort the process after the base image is put down, or if one of the add-on images fails, the ZENworks Imaging Engine reports a "successful image" to Linux.

For example, suppose the base image containing the new OS is successfully laid down and one or more of the add-on images fails. In order for the workstation to reboot to the new OS, the ZENworks Imaging server must report to Linux that the image was successful.

If any add-on images are not successfully laid down, the job is not marked as complete in ConsoleOne. You can see the last base image and the last add-on images that are successfully laid down by looking at the workstation object's properties in ConsoleOne (right-click the Workstation object, click the down-arrow on the *ZENworks Imaging* tab, then click *History*).

Performing Manual Imaging Operations

<div style="text-align: right; font-size: 3em;">60</div>

The following sections provide instructions for these basic imaging operations:

These instructions assume that you have already prepared the ZENworks Imaging server (see Chapter 54, "Preparing a ZENworks Imaging Server," on page 639), prepared workstations for imaging (see Chapter 57, "Setting Up Workstations for Imaging," on page 701), and set up imaging policies (Chapter 58, "Setting Up Imaging Policies," on page 705).

Desktop Management Imaging supports devices that physically connect to the network and that meet the minimum requirements for workstations. For more information, see "User Workstation Hardware Requirements" in the *Novell ZENworks 7 Desktop Management Installation Guide*. Desktop Management Imaging does not support imaging operations (creating or restoring images) using wireless connectivity.

60.1 Manually Taking an Image of a Workstation

This section explains how to take an image of a workstation by booting from an imaging method and entering a particular imaging command. The image is stored on your ZENworks Imaging server.

If you want to store an image locally rather than on an ZENworks Imaging server, see Section 61.1, "Using a CD or DVD for Disconnected Imaging Operations," on page 727 and Section 61.2, "Using a Hard Disk or Jaz Drive for Disconnected Imaging Operations," on page 729.

Make sure that your ZENworks Imaging server has enough disk space for the image. Otherwise, you receive a "Failed to write to proxy" error.

60.1.1 Using the Bash Prompt to Manually Take an Image of a Workstation

1 Boot the workstation using one of the following methods:
- If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

2 Enter `manual` at the boot prompt.

or

Select *Start ZENworks Imaging in Maintenance Mode* from the PXE menu.

3 (Optional) At the bash prompt, type `img dump`, then press Enter.

This displays a list of the partition slots on the workstation. 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 ZENworks Imaging server, enter:

    ```
    img makep serverIPaddr_or_DNSname //uncpath/newimg.zmg
    [comp=comp level]
    ```

    The makep parameter stands for "make on proxy," or in other words, create an image and store it on the imaging (proxy) server.

    The IP address or DNS name should be that of your ZENworks Imaging server. This can be any server running the Imaging Proxy service.

    The `.zmg` filename extension is case-sensitive and must be all lowercase.

    The UNC path to the image file to retrieve, including image filename and `.zmg` extension. The format of this UNC path is as follows:

    ```
    //servername/volume_or_share/path_to_stored_images/
    imagename.zmg
    ```

    When `img makep` is executed at the command line, the *servername* portion of this path is replaced with the value in the address portion of the path.

    For OES Linux, the path to the image file must be from root (/). For example, the path might look like:

    ```
    //servername/media/nss/NSS_volume/path_to_image/
    imagefilename.zmg
    ```

    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," or in other words, create an image and store it on a local (writable) device, such as a hard disk or Jaz drive.

Unless you mount a drive before using the makel command, the image is created in RAM and is lost during a reboot of the workstation.

filepath is the image filename, including the `.zmg` extension (case-sensitive) 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 aren't recognized by Linux. Alternatively, you can use backslashes and enclose the entire UNC path in quotes. The path you specify must exist on your ZENworks Imaging server.

For more information on the parameters you can use and usage examples, see Section 64.3, "Make Mode (img make)," on page 783.

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 CD or DVD from the drive and reboot the workstation.

6 (Optional) Verify that the image file was created on your ZENworks Imaging server. You might also want to check its size.

60.1.2 Using the ZENworks Imaging Engine Menu to Manually Take an Image of a Workstation

1 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

2 Enter `manual` at the boot prompt.

or

Select *Start ZENworks Imaging in Maintenance Mode* from the PXE menu.

3 Enter `img` to display the ZENworks® Imaging Engine menu.

4 (Optional) Click *System Information*, then click *Drive Information* to display a list of the partition slots on the workstation.

For your reference, note the number and type of partitions and which one is active.

5 Click *Imaging*, then click *Make Image*.

6 In the Make Image Wizard window, specify the destination where the image is to be 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 CD or DVD from the drive, then reboot the workstation.

14 (Optional) Verify that the image file was created on your ZENworks Imaging server. You might also want to check its size.

60.2 Manually Putting an Image on a Workstation

The section explains how to put an image on the workstation by booting from an imaging method and entering a particular imaging command. The image is retrieved from your ZENworks Imaging server.

Make sure that the workstation receiving a new image has enough disk space for the image. Otherwise, you receive a "Failed to write to proxy" error.

- Section 60.2.1, "Using the Bash Prompt to Manually Put an Image on a Workstation," on page 723
- Section 60.2.2, "Using the ZENworks Imaging Engine Menu to Manually Put an Image on a Workstation," on page 724

60.2.1 Using the Bash Prompt to Manually Put an Image on a Workstation

1 If you haven't already done so, create the image to put on the workstation, as instructed in Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

Make sure that the image is of the same type of workstation (same hardware configuration) and is stored on your ZENworks Imaging server. You can use a previous image of the same workstation.

IMPORTANT: If you are putting an image on a workstation without a ZENworks partition, make sure the image was made on a workstation without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation fails to boot.

---

2 (Optional) Boot the workstation 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's partitions before and after the imaging operation.

3 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

4 Enter `manual` at the boot prompt.

5 (Optional) At the bash prompt, type `img dump`, then press Enter to display a list of the partition slots on the workstation.

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 ZENworks Imaging server and put it down on a workstation, enter:

  `img restorep` *serverIPaddr_or_DNSname* `//uncpath/newimg`.zmg

  The restorep parameter stands for "restore from proxy," or in other words, retrieve an image from the Imaging (proxy) server and put it on this workstation. The IP address or DNS name should be that of your ZENworks 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 workstation:

```
img restorel filepath
```

  The restorel parameter stands for "restore from local," or in other words, retrieve an image from a local device and put it on this workstation. *filepath* represents the filename of the image to retrieve, including the `.zmg` extension (case-sensitive) 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. Alternatively, you can use backslashes and enclose the entire UNC path in quotes. The server portion of the path must be the name of your ZENworks Imaging server.

If you want to manually restore an image from a directory that uses extended or double-byte characters in its name, you should perform an automatic image restoration using Novell® ConsoleOne®. For more information, see Section 59.5, "Performing an Automatic Imaging Creation or Restoration," on page 716.

  For more information on the parameters you can use and usage examples, see Section 64.4, "Restore Mode (img restore)," on page 786.

  Depending on the size of the image, it might take several minutes to put the image down. Images actually 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.)

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 workstation. 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 `grub.s`, then press Enter.

9 Remove any CD or DVD from the drive and reboot the workstation and verify that it boots to the operating system that was installed by the new image.

60.2.2 Using the ZENworks Imaging Engine Menu to Manually Put an Image on a Workstation

1 If you haven't already done so, create the image to put on the workstation, as instructed in Section 60.1, "Manually Taking an Image of a Workstation," on page 719.

  Make sure that the image is of the same type of workstation (same hardware configuration) and is stored on your ZENworks Imaging server. You can use a previous image of the same workstation.

IMPORTANT: If you are putting an image on a workstation without a ZENworks partition, make sure the image was made on a workstation without a ZENworks partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation fails to boot.

---

2 (Optional) Boot the workstation 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's partitions before and after the imaging operation.

3 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

- Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.

- Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

4 Enter `manual` at the boot prompt.

or

Select *Start ZENworks Imaging in Maintenance Mode* from the PXE menu.

5 Enter `img` to display the ZENworks Imaging Engine menu.

6 (Optional) Click *System Information*, then click *Drive Information* to display a list of the partition slots on the workstation.

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*, then click *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 Chapter 64, "ZENworks Imaging Engine Commands," on page 781.

12 Click *Next*.

Depending on the size of the image, it might take several minutes to put the image down. Images actually 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.)

13 (Optional) Click *System Information*, then click *Drive Information* to display a list of the partition slots on the workstation.

As before, this displays a list of the partition slots on the workstation. 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 `grub.s` from the bash prompt.

16 Remove any CD or DVD from the drive and reboot the workstation. Verify that it boots to the operating system that was installed by the new image.

Setting Up Disconnected Imaging Operations

61

Disconnected imaging operations are inherently manual in the sense that they don't involve the network and thus can't be automated through Novell® eDirectory™.

To perform a disconnected imaging operation on a workstation, 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 workstation from the imaging device. The following sections explain how to set up and perform disconnected operations using several different storage devices:

You can also use other storage devices providing that they are locally accessible to the ZENworks Imaging Engine (in Linux).

61.1 Using a CD or DVD for Disconnected Imaging Operations

Using Desktop Management, you can use CDs and DVDs only as the storage medium for an image to be 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.

61.1.1 Using the Bash Prompt to Put Down an Image

1 Use your CD- or DVD-burning software to burn the source image onto a CD or DVD.

2 Boot the workstation using one of the following methods:
   - If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
   - Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
   - Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

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 of the following format:

`img restorel /mnt/cdrom/`*path*`/`*image*`.zmg`

where *path* and *image* are the path and filename of the image relative to the root of the CD or DVD.

7 After the imaging is done, remove the imaging device (if applicable) and do the following to boot the workstation with the new image:

   7a At the Linux prompt, type `grub.s`, then press Enter.

   7b Press Ctrl+Alt+Delete.

      If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the `grub.s` command again and reboot the workstation a second time.

61.1.2 Using the ZENworks Imaging Engine Menu to Put Down an Image

1 Use your CD- or DVD-burning software to burn the source image onto a CD or DVD.

2 Boot the workstation using one of the following methods:

   ◆ If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.

   ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.

   ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

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 command parameters, see Chapter 64, "ZENworks Imaging Engine Commands," on page 781.

12 Click *Next*.

Depending on the size of the image, it might take several minutes to put the image down. Images actually 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.)

13 After the imaging is done, remove the imaging device (if applicable) and do the following to boot the workstation with the new image:

   13a At the Linux prompt, type `grub.s`, then press Enter.

13b Press Ctrl+Alt+Delete.

If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the `grub.s` command again and reboot the workstation a second time.

61.2 Using a Hard Disk or Jaz Drive for Disconnected Imaging Operations

When you boot a workstation from a Desktop Management Workstation Imaging device, you can create an image on, or put down an image from, any primary FAT16, FAT32, EXT2, or EXT3 partition on an IDE or SCSI hard drive or Iomega* Jaz 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.

61.2.1 Creating an Image on a Hard Disk or Jaz Drive

You can create an image on a hard disk or Jaz drive using either the bash prompt or using the ZENworks Imaging Engine menu.

Using the Bash Prompt to Create an Image

1 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

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 FAT partition where you'll store the new image.

4 Enter a command of the following format:

`img makel[`*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 781.

Using the ZENworks Imaging Engine Menu to Create an Image

1 Boot the workstation using one of the following methods:

- ◆ If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

2 Enter `manual` from the boot prompt.

3 Enter `img` to display the ZENworks Imaging Engine menu.

4 (Optional) Click *System Information*, then click *Drive Information* to display a list of the partition slots on the workstation.

For your information, note the number of the FAT partition where you'll store the new image.

5 Click *Imaging*, then click *Make Image*.

6 In the Make Image Wizard window, click *Local*, then click *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. 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 CD or DVD from the drive, then reboot the workstation.

14 (Optional) Verify that the image file was created. You might also want to check its size.

61.2.2 Putting Down an Image from a Hard Disk or Jaz Drive

You can put down an image from a hard disk or Jaz drive using either the bash prompt or using the ZENworks Imaging Engine menu.

- ◆ "Using the Bash Prompt to Put Down an Image" on page 731
- ◆ "Using the ZENworks Imaging Engine Menu to Put Down an Image" on page 731

Using the Bash Prompt to Put Down an Image

1 Boot the workstation using one of the following methods:

- ◆ If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

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 FAT partition where the source image is stored.

4 Enter a command of the following format:

`img restorel[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 781.

5 After the imaging is done, remove the imaging device (if applicable) and do the following to boot the workstation with the new image:

5a At the Linux prompt, type `grub.s`, then press Enter.

5b Press Ctrl+Alt+Delete.

If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the `grub.s` command again and reboot the workstation a second time.

Using the ZENworks Imaging Engine Menu to Put Down an Image

1 Boot the workstation using one of the following methods:

- ◆ If the workstation is PXE-enabled, boot it from the ZENworks Imaging server. For more information, see Section 55.1, "Using Preboot Services (PXE)," on page 641.
- ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642.
- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646.

2 Enter `manual` from the boot prompt.

3 Enter `img` to display the ZENworks Imaging Engine menu.

4 (Optional) Click *System Information*, then click *Drive Information* to display a list of the partition slots on the workstation.

For your reference, note the number of the FAT partition where the source image is stored.

5 Click *Imaging*, then click *Restore Image*.

6 Click *Local*, then click *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 Chapter 64, "ZENworks Imaging Engine Commands," on page 781.

10 Click *Next*.

Depending on the size of the image, it might take several minutes to put the image down. Images actually 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 After the imaging is done, remove the imaging device (if applicable) and do the following to boot the workstation with the new image:

11a At the Linux prompt, type `grub.s`, then press Enter.

11b Press Ctrl+Alt+Delete.

If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the `grub.s` command again and reboot the workstation a second time.

Multicasting Images

Novell® ZENworks® Desktop Management Imaging software includes an imaging multicast capability. The following sections explain what this is, why you might want to use it, and the overall procedures for using it.

- Section 62.1, "Understanding Multicasting," on page 733
- Section 62.2, "Performing a Multicast Session," on page 734

62.1 Understanding Multicasting

To multicast an image is to take an image of one workstation (the master), immediately send it over the network to multiple other workstations (the participants), and put it down simultaneously on those workstations. You can specify a workstation as the session master, or you can specify an image file that you have previously saved and customized.

If the session master is a workstation, a base image is taken of all partitions on the hard disks and other storage devices (such as Jaz drives) of that workstation.

Before the image is put down on the participating workstations, all existing partitions are removed from the hard disks and writable storage devices of those workstations.

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

In versions of ZENworks for Desktops prior to 3.2, the master had to be a Linux workstation, which formerly restricted multicasting to exact "cloning" of the workstation.

- Section 62.1.1, "Benefits of Multicasting Images," on page 733
- Section 62.1.2, "Limitations of Multicasting Images," on page 734

62.1.1 Benefits of Multicasting Images

Multicasting is the way to use ZENworks Desktop Management Imaging services for mass re-imaging with the least amount of overhead. It is useful if you have one workstation with a clean software configuration that you want to duplicate on several other machines, or if you have a single image that you want to set up on multiple machines.

With multicasting, all you need is a physical network with modern routers and switches.

If you are setting up multicasting by visiting each workstation, you also need an imaging boot CD or DVD, or the workstations must be PXE-enabled. For more information, see Chapter 55, "Preparing an Imaging Boot Method," on page 641.

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

62.1.2 Limitations of Multicasting Images

One significant limitation of using multicast without installing any ZENworks Desktop Management software is that it results in a set of workstations that have duplicate network identities. The IP addresses, Computer (NETBIOS) names, Workgroup memberships, and Security Identifiers (Windows 2000/XP only) are all the same and can cause conflicts if deployed on the network without change.

For multicasting with a handful of workstations, this might not be a problem. But for a larger number, if the workstations have Windows, you should install the ZENworks Imaging Windows Agent on them before doing the multicast. (See Step 3 of Section 57.2, "Enabling a Windows Workstation for Auto-Imaging Operations," on page 702.) The ZENworks Imaging Windows Agent saves the workstation's network identity settings before the multicast session and restores them afterwards.

62.2 Performing a Multicast Session

◆ Section 62.2.1, "Initiating an Automatic Multicast Session in ConsoleOne," on page 734
◆ Section 62.2.2, "Performing a Manual Multicast Session," on page 737

62.2.1 Initiating an Automatic Multicast Session in ConsoleOne

When you initiate an automatic multicast session in Novell ConsoleOne®, you do not need to start the session from the ZENworks Imaging server or physically visit each participating workstation. You name the session, define the master image source (an image file or workstation), and then add Workstation objects to include in the multicast session or define rules to include workstations that meet specific criteria you set.

To initiate an automatic multicast session in ConsoleOne:

1 (Optional) Install the ZENworks Imaging Windows Agent on each of the participating workstations.

> **IMPORTANT:** If you do not install the ZENworks Imaging Windows Agent on each participating machine, those machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 734.

2 In ConsoleOne, right-click the server object, click *Properties*, then click the *ZENworks Imaging* tab.

If you do not see the *ZENworks Imaging* tab, click the right-arrow on the right side of the displayed tabs until it is displayed.
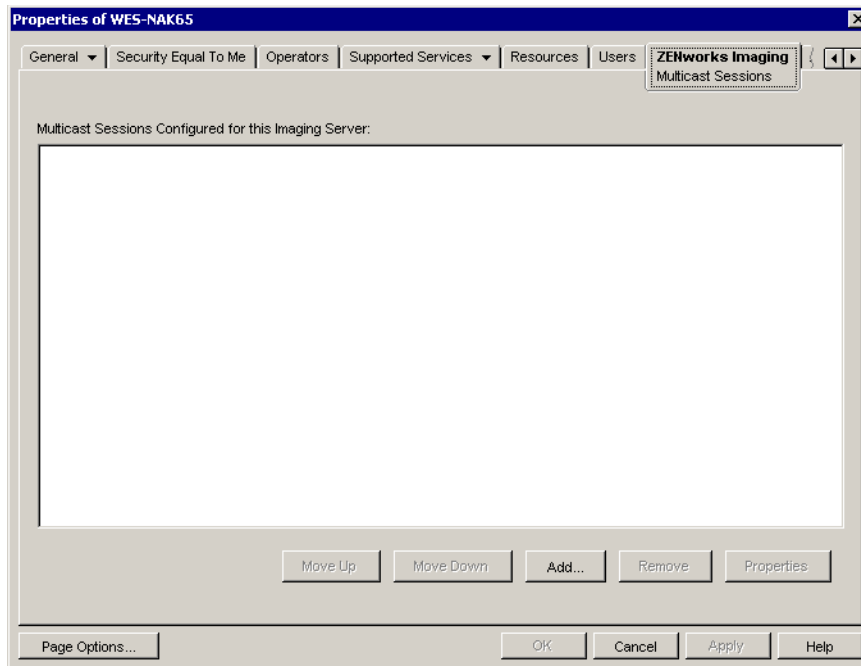
3 Click *Add*, enter a name for the multicast session, then click *OK*.
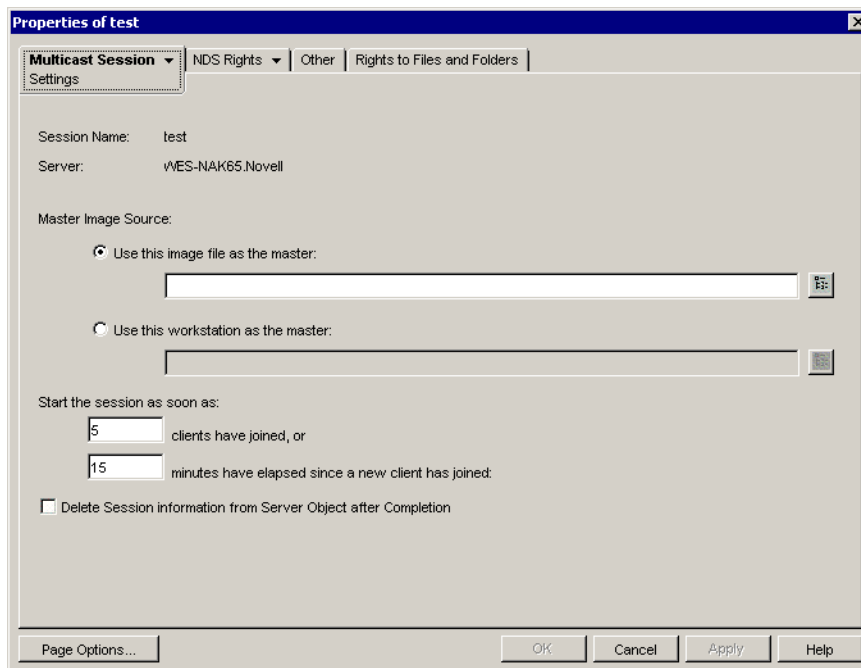
4 Specify the *Master Image Source*.

You can specify an image file or a master workstation.

A workstation cannot be the master if it is being used as a master in another multicast session or if it explicitly participates in any other session.

5 Decide how many participating workstations you want to have booted up before the multicast session begins. Specify this number in the *Clients Have Joined* text box.

The default if you do not specify a number is 5 workstations.

6 If not enough workstations have booted up to fulfill the Clients Have Joined requirement, the multicast session begins if a participating workstation boots up and a certain amount of time passes without another participating workstation booting. Specify this amount of time in the *Minutes Have Elapsed Since a New Client Has Joined* text box.

The default if you do not specify a time is 15 minutes.

7 (Optional) To delete the session after it has finished, select the last check box.

**8** Click the down-arrow on *Multicast Session* tab, then click *Participation*.
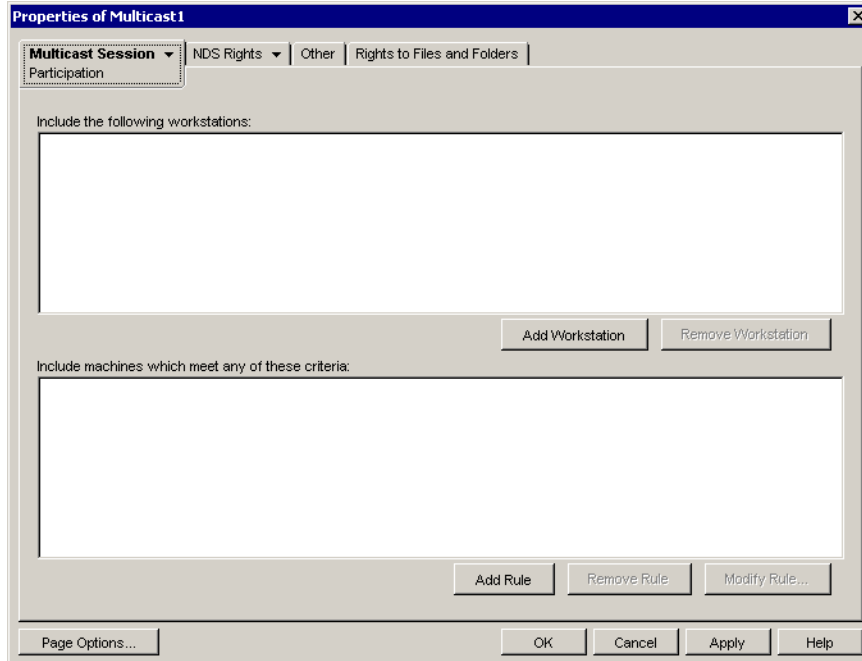
9 Click *Add Workstation* under *Include the Following Workstations* to explicitly add the workstation objects that you want to include in this multicast session.

or

To create rules to select the workstations you want to participate in this multicast session, click *Add Rule* under *Include Machines Which Meet Any of These Criteria*.
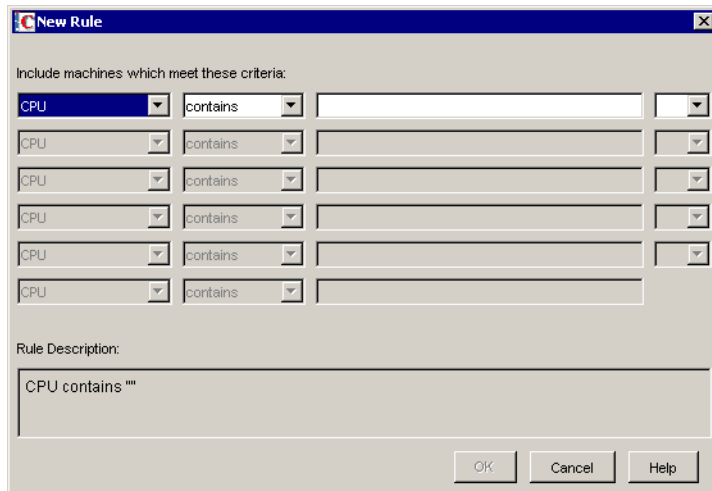
Click *Help* on the Participation page for more information.

10 Click *OK* to return to the ZENworks Imaging Multicast Sessions page.

11 The check box next to the multicast session name is automatically selected, showing that the session is enabled. If you want to disable a multicast session, deselect the check box next to the session name.

12 (Optional) If you want to change the position of a session in the list, select the multicast session name, then click *Move Up* or *Move Down*.

If multiple multicast sessions are defined that use rules to select participating workstations, it is possible that a workstation could qualify to participate in more than one session. If this occurs, the first enabled session in this list for which the workstation qualifies takes precedence over the other enabled sessions.

13 Click *OK*.

62.2.2 Performing a Manual Multicast Session

If you want to perform a manual multicast session, you need to start the multicast session from the ZENworks Imaging server (Linux, NetWare®, or Windows) and physically visit each participating workstation. Performing a manual multicast session is particularly useful in a lab environment in which a small number of workstations 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 sections; however, the order in which you perform the tasks does not matter.

Initiating a Multicast Session from the ZENworks Imaging Server

You can use any ZENworks Imaging server to initiate a multicast session.

Initiating a Multicast Session from a Linux ZENworks Imaging Server

On the Linux ZENworks Imaging server, do the following to initiate the multicast session:

1 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:

Argument	Description
session_name	(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.
-p *path*	(Required) The path to the image to be multicast, which is located on the ZENworks Imaging server. This must be the full path.
-i *IP_address*	(Optional) The IP address of the ZENworks Imaging server.
-f *file_set_number*	(Optional) File sets are assigned to the current ZENworks image using this information. File sets are defined on the ZENworks Imaging server from the base image using the Image Explorer utility, which can be run on a Windows device 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 ZENworks 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 associated with this ZENworks image boots, it is imaged with the smaller version (file set 2) of `device1image.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 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 don't select a file set when using this wizard.

Argument	Description
-t *time_wait*	(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.
-c *client_count*	(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.

2 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.

3 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.

4 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.

5 Continue with .

Initiating a Multicast Session from a NetWare ZENworks Imaging Server

1 From the Netware server, load the ZENworks Imaging server (`imgserv.nlm`).

2 From the Main Menu, select *Manually Start Multicast*.

3 Specify the path to the image archive.

You can either enter the full path to the image file you want to use, or you can press Insert to browse for the image file.

4 Specify the name for the multicast session.

5 Decide how many participating workstations you want to have booted up before the multicast session begins and specify this number in the *Number of Clients* field.

The default if you do not specify a number is 1 workstation.

6 If not enough workstations have booted up to fulfill the Number of Clients requirement, the multicast session begins if a participating workstation boots up and a certain amount of time passes without another participating workstation booting. Specify this amount of time in the *Maximum Time to Wait* field.

The default if you do not specify a time is 5 minutes.

7 (Optional) Specify a file set.

**8** Press Esc, then select *Yes* to start the multicast session.

9 (Conditional) If you have not done so, proceed with the steps under

After you initiate the multicast session from each participating client, the image is sent to and put down on each participating workstation.

At the Main Menu, select *Multicast Sessions* to see how many clients have registered and how many the session is still waiting for. For example, 3/2 means 3 clients have registered and 2 more need to register before the session can begin. You can delete any session listed, even if it is in progress, by selecting the session name, then pressing Delete.

Initiating a Multicast Session from a Windows ZENworks Imaging Server

1 From the Windows taskbar, click the *ZIS* icon to start the ZENworks Imaging server software.
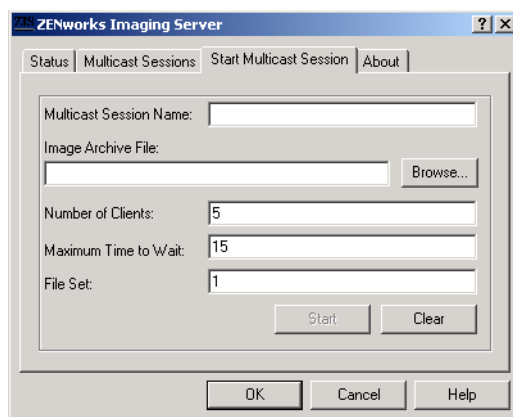
2 Click the *Start Multicast Session* tab.
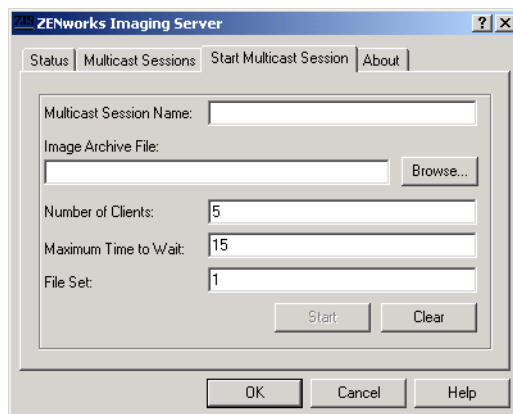
3 Specify the name for the multicast session.

4 Browse to and specify the image archive file.

5 Decide how many participating workstations you want to have booted up before the multicast session begins. Specify this in the *Number of Clients* text box.

The default if you do not specify a number is 5 workstations.

6 If not enough workstations have booted up to fulfill the Number of Clients requirement, the multicast session begins if a participating workstation boots up and a certain amount of time

passes without another participating workstation booting. Specify this amount of time in the *Maximum Time to Wait* text box.

The default if you do not specify a time is 15 minutes.

7 (Optional) Specify a file set.

8 Click *Start*.

9 (Conditional) If you have not done so, proceed with the steps under "Initiating a Multicast Session from Each Client" on page 741.

You can click the *Status* tab to see how many Update Requests have been received, how many images have been sent or received, and the number of client referrals.

You can click the *Multicast Sessions* tab to view current multicast sessions. You can also delete any session listed, even if it is in progress, by selecting the session name, then clicking *Delete*. You can refresh a session by selecting the session name, then clicking *Refresh*.

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 workstation.

- "Using the Bash Prompt to Perform the Multicast Session" on page 741
- "Using the ZENworks Imaging Engine Menu to Perform the Multicast Session" on page 742

Using the Bash Prompt to Perform the Multicast Session

1 (Optional) Install the ZENworks Imaging Windows Agent on each of the participating workstations.

If you do not install the ZENworks Imaging Windows Agent on each participating machine, the machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 734.

2 Create an imaging boot CD or DVD for each person who assists with the multicast session, or enable PXE on the participating workstations.

If you don't know how to do this, see "Preparing an Imaging Boot Method" on page 641.

3 At each workstation, including the master workstation (unless you are starting the multicast session from the ZENworks 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 workstation in the multicast session, enter the following command at the bash prompt of every workstation:

`img session name`

where *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 workstations in this multicast session. You can specify any multicast session, including one that originates from the ZENworks Imaging server (as long as you specify the session name used by the ZENworks Imaging server).

Example: img session mcast01

The img session command can take other parameters that allow you to designate the master workstation and the imaging start time beforehand. See Chapter 64, "ZENworks Imaging Engine Commands," on page 781 for details.

6 (Conditional) If you have not already done so, start the multicast session from the master workstation or from the ZENworks Imaging server.

Master Workstation: To start the multicast session from the master workstation, after all of the other workstations have registered as participants, click *Start Session*.

If you start the session from the master workstation, the session master must be a workstation. If you start the session from the ZENworks Imaging server, the session master must be a previously saved image file.

The ZENworks Imaging Engine begins creating the image of the master workstation and the image is sent to and put down on each participating workstation. Any problems are reported and displayed on the master workstation.

Imaging Server: To start the multicast session from the ZENworks Imaging server, follow the steps under "Initiating a Multicast Session from the ZENworks Imaging Server" on page 737.

7 At each participating workstation, when the imaging is done, do the following to boot the workstation with the new operating system:

7a At the Linux prompt, type grub.s, then press Enter.

7b Press Ctrl+Alt+Delete.

If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the grub.s command again and reboot the workstation a second time.

Using the ZENworks Imaging Engine Menu to Perform the Multicast Session

1 (Optional) Install the ZENworks Imaging Windows Agent on each of the participating workstations.

If you do not install the ZENworks Imaging Windows Agent on each participating machine, the machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 734.

2 Create an imaging boot CD or DVD for each person who assists with the multicast session, or enable PXE on the participating workstations.

If you don't know how to do this, see "Preparing an Imaging Boot Method" on page 641.

3 At each workstation, including the master workstation (unless you are starting the multicast session from the ZENworks 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 in Maintenance Mode* from the PXE menu.

5 To identify each participating workstation in the multicast session, type img at the bash prompt to display the ZENworks Imaging Engine menu.

6 Click *Imaging*, then click *Multicast Session*.

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 workstations in this multicast session. You can specify any multicast session, including one that originates from the ZENworks Imaging server (as long as you specify the session name used by the ZENworks 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 workstation.

9 (Optional) If you chose *Master* in Step 8, specify any additional options:

  ◆ **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 workstations. You might use this option if the master workstation has a slow CPU; the amount of time to compress the data is eliminated and the data is immediately sent across the network. Using this option, however, the multicast session 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 workstations. You might use this option if the master workstation 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 workstations. You might use this option if the master workstation 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 workstations.

  ◆ **Automated Session:** Click *Enabled* to specify the number of participating workstations (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 workstations to register before starting the automated multicast session. If you do not select the *Enabled* check box, you must manually start the multicast session.

10 Click *Next*, then click *Start Session*.

11 At each participating workstation, when the imaging is done, do the following to boot the workstation with the new operating system:

11a At the Linux prompt, type `grub.s`, then press Enter.

11b Press Ctrl+Alt+Delete.

If the workstation doesn't boot to the new operating system (that is, if the Linux prompt is displayed), enter the `grub.s` command again and reboot the workstation a second time.

Imaging Utilities and Components

63

The following sections provide reference information on Novell® ZENworks® Desktop Management imaging utilities, commands, configuration settings, and log formats.

63.1 Image Explorer (imgexp.exe)

Use the Image Explorer utility at a Windows workstation to view or modify workstation images, create add-on images, compress image files, and split images.

Non-Windows partitions, such as NetWare® partitions, are visible when you open an image, but their contents are not.

Although the ZENworks Imaging Explorer looks, and in most situations, functions like the Microsoft Windows Explorer, the two programs are different and some functionality differences exist:

- **Replacing Files in an Image:** During the life cycle of an image, files might be deleted or updated using Image Explorer. When you replace an existing file in an image by using Image Explorer, the original file is not deleted from the image. Image Explorer purges only deleted files; it does not purge files that have been updated.

    When files are added to an image where the file already exists, Image Explorer appends the entry to the end of the image. When images are restored, all files that have been previously updated (but not deleted) are sequentially restored.

    To avoid performance problems, you should manually delete and purge each instance of duplicate files in order to have them purged from the image. In Windows Explorer, replaced files are automatically deleted.

- **Dragging Files from Image Explorer:** You cannot drag files from Image Explorer in order to extract them, which you can do in Windows Explorer. However, you can drag and drop files and folders into an image by using Image Explorer.

IMPORTANT: Do not exclude BPB files from a base image or the workstation won't be able to boot the new operating system after receiving the image.

The following sections describe the tasks that you can perform using the Image Explorer:

63.1.1 Starting Image Explorer (Imgexp.exe)

There are no command line parameters for the Image Explorer utility.

1 To start the Image Explorer as a Windows standalone utility, double-click the `imgexp.exe` file located on the ZENworks Imaging server at:

- **Linux:** `/opt/novell/zenworks/zdm/winutils/nls/`*language*

  The Image Explorer utility must be run on a Windows device. You need Samba running on the Linux ZENworks Imaging server where the utility file is located in order for the Windows machine to have access to it.

- **NetWare:** `sys:\public\zenworks\imaging`

  The Image Explorer utility must be run on a Windows device. You need a drive mapped to the NetWare server where the utility file is located in order for the Windows machine to have access to it.

- **Windows:** `zenworks\imaging`

or

To start the utility from Novell ConsoleOne® from the server, click *Tools > ZENworks Utilities > Imaging > Image Explorer*.

63.1.2 Opening an Image

1 Open Image Explorer (`imgexp.exe`).

2 Click 🗁 on the toolbar, browse for and select the image (`.zmg`) file, then click *Open*.

Large image files might take a few moments to open.

63.1.3 Adding a File or Folder to an Open Image

1 Open Image Explorer (`imgexp.exe`).

2 In the left pane, browse to the partition or directory where you want to add the file or folder.

3 Click ⬛ or ⬛ on the toolbar, browse to the file or folder, then click *Add* or *OK*.

63.1.4 Creating a Folder in an Open Image

1 Open Image Explorer (`imgexp.exe`).

2 In the left pane, browse to the partition or directory where you want to create the folder, click ⬛, enter the name of the folder, then click *OK*.

63.1.5 Adding Specific Windows Registry Settings That Are to Be Applied After the Open Image Is Laid Down

This only applies to Windows machines being imaged.

1 Open Image Explorer (`imgexp.exe`).

2 Select a partition in the left pane, click *Image*, then click *Add Registry File*.

3 Select the registry (`.reg`) file that contains the settings, then click *Add*.

The registry file is added to a fixed, known area of the partition and is applied when the workstation reboots after receiving the image.

63.1.6 Excluding a File or Folder from the Open Image

1 Open Image Explorer (`imgexp.exe`).

2 Select the file or folder, click *Edit*, click *File Sets*, then select the file sets that you want the file or folder to be excluded from.

This image has 10 possible file sets, labeled Set 1, Set 2, and so on. The files and folders that you selected in the main window are excluded only from the file sets that you select in this dialog box.

63.1.7 Marking a File or Folder for Deletion in the Open Image

1 Open Image Explorer (`imgexp.exe`).

2 Select the file or folder, click *Image*, then click *Delete*.

IMPORTANT: Deleting a file in the Image Explorer merely marks it for deletion; it can still be retrieved. A file marked as deleted is not removed from the image until the image is purged; files and folders marked as deleted are not restored during imaging.

63.1.8 Purging Files and Folders Marked for Deletion from the Open Image

1 Open Image Explorer (`imgexp.exe`).

2 Make sure that the open image is saved, click *File*, then click *Purge Deleted Files*.

3 Browse to the image filename or specify a new image filename, then click *Save*

63.1.9 Extracting a File or Directory from the Open Image to a Folder

1 Open Image Explorer (`imgexp.exe`).

2 Click the file or directory, click *File > Extract > As Files*, browse to and select a folder, then click *OK*.

63.1.10 Extracting a File or Directory from the Open Image as an Add-On Image

1 Open Image Explorer (`imgexp.exe`).

2 Click the file or directory, click *File > Extract > As Add-on Image*, enter the name of the new add-on image, then click *OK*.

63.1.11 Viewing a File from the Open Image in its Associated Application

1 Open Image Explorer (`imgexp.exe`).

2 Click the file, then click *File > Extract and View*.

63.1.12 Saving Your Changes to the Open Image

1 Open Image Explorer (`imgexp.exe`).

2 Click 🖫 on the toolbar.

63.1.13 Creating a Workstation Add-On Image

1 Open Image Explorer (`imgexp.exe`).

2 Click ❒ on the toolbar, open Windows Explorer, browse to the files and folders you want the add-on image to contain, drag the files and folders into the right pane from Windows Explorer, then click *Save*.

63.1.14 Adding a Partition to a New Add-On Image

1 Open Image Explorer (`imgexp.exe`).

2 Click ❒ on the toolbar, click the root of the image, click *Image*, then click *Create Partition*.

You cannot add a partition to an existing add-on image or to any base image.

63.1.15 Compressing an Image

You can set compression options so that it takes less time to restore the image file and less space to store the file on your ZENworks Imaging server. You can compress an uncompressed image (including images created by previous versions of ZENworks Desktop Management) to 40 to 60 percent of the original file size.

The ZENworks Desktop Management Image Explorer provides the following types of image compression:

* "Compressing an Open Image" on page 749
* "Compressing Any Image without Waiting for the File to Fully Load into Image Explorer" on page 749

Compressing an Open Image

1 Open Image Explorer (`imgexp.exe`).

2 Browse for the image (`.zmg`) file, then click *Open*.

Large image files might take a few moments to open.

3 Click *File > Compress Image*.

4 Browse to a directory, specify a new image filename, then select a compression option:

* **Optimize for Speed:** Takes the least amount of time to compress but creates the largest compressed image file.
* **Balanced (Recommended):** Represents a compromise between compression time and image file size. This option is used by default when an image is created.
* **Optimize for Space:** Creates the smallest image file but takes longer to compress.

5 Click *Compress*.

Files marked for deletion in the image are removed during the compression operation.

Compressing Any Image without Waiting for the File to Fully Load into Image Explorer

You can set compression options to quickly compress an image file without waiting for the file to fully load into Image Explorer.

1 Open Image Explorer (`imgexp.exe`).

2 Click *Tools > click QuickCompress*.

3 Browse to the image file, browse to a directory, specify a new image filename, select a compression option:

* **Optimize for Speed:** Takes the least amount of time to compress but creates the largest compressed image file.
* **Balanced (Recommended):** Represents a compromise between compression time and image file size. This option is used by default when an image is created.
* **Optimize for Space:** Creates the smallest image file, but takes longer to compress.

4 Click *Compress*.

Files marked for deletion in the image are removed during the compression operation.

63.1.16 Splitting an Image

You can split an image file into separate files so that you can span the entire image across several CDs or DVDs.

When you split a workstation image and span it across several CDs or DVDs, you are essentially creating a base image on the first CD or DVD. The remaining CDs or DVDs are add-on images.

To restore a workstation image that is spanned across several CDs or DVDs, you should restore the first CD or DVD before restoring the remaining CDs or DVDs containing the add-on images. For more information, see Section 60.2, "Manually Putting an Image on a Workstation," on page 722.

Restoring split images is a manual task and can only be automated by scripted imaging. For more information, see Step 7 on page 715.

To split an image:

1 Open Image Explorer (`imgexp.exe`).

2 Click *Tools* > *Image Split*.

3 Specify an existing base image file to split, specify the directory in which to store the split images, then specify the maximum file size of each split-image file.

   Because images are split by placing individual files into different images, an image cannot be split if it contains any single file that is larger than the specified maximum file size.

4 Click *Split*.

63.1.17 Resizing 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 example, suppose you create a base image of a workstation with a 20 GB hard drive and you want to then put that image on a new workstation with a 60 GB hard drive. If you do not increase the size of the partition, the partition will be 20 GB, thus making the remaining 40 GB unusable.

However, if you increase the number in the *Original Size* text box to match the size of the new hard drive, the ZENworks Imaging Engine expands the partition when the image is restored so that you can use the entire drive.

To resize a partition:

1 Open Image Explorer (`imgexp.exe`).

2 Right-click a partition in the left frame, then click *Properties*.

3 Increase or decrease the value in the *Original Size* text box.

   You cannot decrease the number in the *Original Size* text box to a smaller value than what is in the *Minimum Size* text box.

   The *Original Size* field is not applicable for add-on images and cannot be modified.

63.2 ZENworks Imaging Windows Agent (Ziswin.exe)

When you install the ZENworks Imaging Windows Agent (`ziswin.exe`) on an existing Windows workstation, it saves certain workstation-unique data (IP address, computer name, etc.) to an area on the hard disk that is safe from reimaging.

WARNING: When running `ziswin.exe` in the service mode, its restoration submode removes image-safe data. This only applies to images created with previous versions of ZENworks. For more information, see "Preserving Image-Safe Data" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

The following sections contain additional information:

- Section 63.2.1, "Understanding the ZENworks Imaging Windows Agent," on page 751
- Section 63.2.2, "Running the ZENworks Imaging Windows Agent in Interactive Mode," on page 753
- Section 63.2.3, "Running the ZENworks Imaging Windows Agent in Service Mode," on page 758
- Section 63.2.4, "Running the ZENworks Imaging Windows Agent in Installation Mode," on page 761
- Section 63.2.5, "Running the ZENworks Imaging Windows Agent in Uninstallation Mode," on page 761

63.2.1 Understanding the ZENworks Imaging Windows Agent

The ZENworks Imaging Windows Agent is an extension to the Windows boot procedure on a workstation.

The ZENworks Imaging Windows Agent (`ziswin.exe`) is installed on each workstation when you install the Desktop Management Agent. On Windows 98 workstations, the default location is `windows\system\ziswin.exe`. On Windows 2000/XP workstations, the default location is `windows\system32\ziswin.exe`. During installation of the Desktop Management Agent, you must select the *Workstation Imaging* feature on the Select Features page. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

If you want to run the ZENworks Imaging Windows Agent on a workstation without the Desktop Management Agent installed, you can install it manually. For more information, see "Manually Installing the ZENworks Imaging Windows Agent" on page 753.

The ZENworks Imaging Windows Agent is also installed on the ZENworks Imaging server (`sys:public\zenworks\imaging\ziswin.exe`, by default).

The ZENworks Imaging Windows Agent runs before any network communications are established. It enables you to:

- Make an existing Windows workstation safe for reimaging

  When you install the ZENworks Imaging Windows Agent on an existing Windows workstation, it saves certain workstation-unique data (such as the IP address and Computer

name) to an area on the hard disk that is safe from reimaging. After the workstation is reimaged and Windows reboots, the agent restores the data from the image-safe area so the workstation can use the same network identity as before.

 * Automatically assign a network identity to a brand new workstation

   A new workstation (with no Windows operating system) doesn't have a network identity established yet. You can define network identity information for such a workstation in a Novell eDirectory™ policy and apply it when the workstation receives its first Windows image. In this scenario, the Windows image is put down (including the ZENworks Imaging Windows Agent) on the workstation and the identity information from the eDirectory policy is written to the image-safe area on the hard disk. When the workstation reboots, the agent reads the data from the image-safe area and applies it to the Windows installation, thus establishing the workstation's network identity.

The data that the ZENworks Imaging Windows Agent saves to (or restores from) the image-safe area includes the following:

 * Whether a static IP address or DHCP is used
 * If a static IP address is used:
     * IP address
     * Subnet mask
     * Default gateway (router)
 * Computer (NETBIOS) name
 * Workgroup that the workstation belongs to, if any
 * Workstation Security ID (SID)
 * If the workstation is registered in eDirectory:
     * Distinguished name of the Workstation object
     * Context of the Workstation object
     * eDirectory tree that the Workstation object belongs to
 * DNS settings
     * DNS suffix
     * DNS hostname
     * DNS servers

On a workstation that has just received a new Windows 2000/XP base image, in addition to restoring the above data, the agent also locates and modifies all instances of the Security Identifier (SID). This ensures that the workstation has a SID that is unique from other workstations that might receive the same image.

IMPORTANT: The ZENworks Imaging Windows Agent does not save or restore any Windows2000/XP Domain information. If you change a workstation's domain and then restore an image, the workstation receives whatever domain is embedded in the new image.

Manually Installing the ZENworks Imaging Windows Agent

The ZENworks Imaging Windows Agent is installed on each workstation when you install the Desktop Management Agent. You can also run the ZENworks Imaging Windows Agent on a workstation without the Desktop Management Agent installed.

- "Manually Installing Ziswin.exe on a Windows 98 Workstation:" on page 753
- "Manually Installing Ziswin.exe on a Windows 2000/XP Workstation:" on page 753

Manually Installing Ziswin.exe on a Windows 98 Workstation:

1 From the `windows\system` directory on the ZENworks Imaging server, copy the following files to the `windows\system` directory on the workstation:
   - `ziswin.exe`
   - `zislib16.dll`
   - `zislib32.dll`
2 From the command prompt, run ziswin -install.

Manually Installing Ziswin.exe on a Windows 2000/XP Workstation:

1 From the `windows\system` directory on the ZENworks Imaging server, copy the ziswin.exe file to the `windows\system32` directory on the workstation.
2 From the command prompt, run `ziswin -install`.

63.2.2 Running the ZENworks Imaging Windows Agent in Interactive Mode

You can use the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode to view and edit a workstation's image-safe data using a graphical user interface rather than from the command line or regedit. The ZENworks Imaging Windows Agent combines the capabilities of the Image-Safe Data Viewer (zisview) to let you view a workstation's image-safe data and the Image-Safe Data Editor (zisedit) to let you edit this data.

IMPORTANT: Image-safe data is not supported on Linux workstations.

The following sections describe the tasks that you can perform using the ZENworks Imaging Windows Agent in interactive mode:

- "Starting the ZENworks Imaging Windows Agent in Interactive Mode" on page 754
- "Reloading a Workstation's Image-Safe Data" on page 754
- "Saving a Workstation's Unique Data to the Image-Safe Data Store" on page 754
- "Exporting a Workstation's Image-Safe Data to a File" on page 754
- "Importing a Workstation's Image-Safe Data from a File" on page 754
- "Modifying a Workstation's Image-Safe Data" on page 754
- "Clearing a Workstation's Image-Safe Data" on page 756
- "Viewing the Contents of a Workstation's Image-Safe Data" on page 756
- "Modifying a Workstation's Image-Safe Options" on page 756

◆

Starting the ZENworks Imaging Windows Agent in Interactive Mode

1 To run the ZENworks Imaging Windows Agent in interactive mode, manually run `ziswin.exe` from your preferred location, such as from the command line prompt, Windows Explorer, or the *Windows > Start > Run* command.

The ZENworks Imaging Windows Agent (`ziswin.exe`), is installed on each workstation during installation of the Desktop Management Agent (if you selected the *Desktop Imaging* feature). For Windows 98 workstations, the default location is `windows\system\ziswin.exe`. For Windows 2000\XP workstations, the default location is `windows\system32\ziswin.exe`. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

If the ZENworks Imaging Windows Agent is started as part of a boot sequence, it is automatically started in service mode. If the ZENworks Imaging Windows Agent is started manually, it is automatically started in interactive mode.

Reloading a Workstation's Image-Safe Data

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *File > Reload Image-Safe Data*.

Saving a Workstation's Unique Data to the Image-Safe Data Store

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *File > Save Image-Safe Data > Save*.

Exporting a Workstation's Image-Safe Data to a File

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *File*, then click *Export to File*.

3 Browse to the location in which you want to save the file, then enter the filename.

4 Click *Save*.

Importing a Workstation's Image-Safe Data from a File

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *File*, then click *Import from File*.

3 Browse to and select the `.zis` file you want to import data from, then click *Open* to apply the imported image-safe data to the workstation.

Modifying a Workstation's Image-Safe Data

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *Edit*, then click *Modify Image-Safe Data*.

3 In the Modify Image-Safe Data dialog box, modify the desired data on the *Imaging* tab:

Just Imaged Flag: If this option is selected, the ZENworks Imaging Windows Agent (`ziswin.exe`) reads data from the image-safe data store and writes it to the Windows registry. If this option is not selected, the ZENworks Imaging Windows Agent reads data from the Windows registry and writes it to the image-safe data store.

Last Base Image: Displays information about the last base image that was restored to this workstation. The ZENworks Imaging Engine uses this information to prevent the same image from being restored to the workstation, unless you specify in ConsoleOne that the same image be restored.

- ◆ **Filename:** The last base image that was restored to the workstation.

- ◆ **File Time:** The time stamp of the last base image that was restored to the workstation.

- ◆ **File Size:** The size of the last base image that was restored to the workstation.

Scripted Image: Indicates whether or not the last imaging operation was a scripted image.

- ◆ **Scripted Image Flag:** If this option is selected, the last imaging operation was a scripted image. If this option is not selected, the last imaging operation was not a scripted image.

- ◆ **Script Checksum:** Displays the checksum value representing the last script run. The ZENworks Imaging Engine uses the checksum to prevent the same script from re-running on the workstation unless you specify in ConsoleOne that you want to rerun the same script.

4 Click the *Identity* tab in the Modify Image-Safe Data dialog box, then modify the desired data:

Object Name: The name of the eDirectory Workstation object for this workstation.

Tree Name: The eDirectory tree that contains the Workstation object for this workstation.

Object ID: The ZENworks Object ID for this workstation, which together with the workstation DN, uniquely identifies this workstation.

5 Click the *Windows* tab in the Modify Image-Safe Data dialog box, then modify the desired data:

NETBIOS Name: Displays the Windows NETBIOS name for this workstation. For Windows 2000/XP workstations, the computer name and the NETBIOS name are not necessarily the same. For these workstations, the ZENworks Imaging Windows Agent uses the *DNS Hostname* field in the image-safe data as the computer name, which takes precedence over the NETBIOS name entered here.

Workgroup: Displays the network workgroup that this workstation belongs to, if any. A workgroup is a group of users who work on a common project and share information on interconnected computers, often over a LAN.

Workstation SID: Displays the workstation's Security ID (SID), a unique number that identifies this workstation in Windows.

Clear SID: Clears this workstation's SID. If you clear the workstation's SID, the ZENworks Imaging Windows Agent generates a new SID if the agent is run in Enabled mode. To specify that the agent run in Enabled mode, click *Edit*, click *Options*, then click *Enabled* on the *Mode* tab. You must also set the Just Imaged flag (click Edit, click *Modify Image-Safe Data*, then click *Just Imaged Flag* on the *Imaging* tab).

6 Click the *IP Settings* tab in the Modify Image-Safe Data dialog box, then modify the desired data to configure the IP settings stored in the image-safe data area of this workstation:

Uses DHCP to Get an IP Address: Indicates that this workstation uses DHCP to obtain its IP address.

Uses a Static IP Address: Indicates that this workstation uses a static IP address.

- ◆ **IP Address:** Displays the static IP address that this workstation uses.

- ◆ **Subnet Mask:** Displays the subnet mask that this workstation uses.

- ◆ **Gateway:** Displays the gateway that this workstation uses.

7 Click the *DNS* tab in the Modify Image-Safe Data dialog box, then modify the desired data to configure the DNS settings stored in the image-safe data area of this workstation:

DNS Suffix: Displays the DNS context of the workstation.

DNS Hostname: Displays the DNS local hostname of the workstation. For Windows 2000/XP, this is the Computer name plus the first 15 characters of the NETBIOS name.

DNS Servers: Displays the names of DNS servers used for DNS name resolution. You can use the drop-down list to select another DNS server or you can use the browse button to enter additional DNS servers for this workstation.

8 Click *OK*.

Clearing a Workstation's Image-Safe Data

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *Edit > Clear Image-Safe Data*.

Viewing the Contents of a Workstation's Image-Safe Data

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *Edit > Copy to Clipboard*.

Modifying a Workstation's Image-Safe Options

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *Edit > Options*.

3 In the ZENworks Imaging Windows Agent Options dialog box, modify the desired data on the *Mode* tab to select the mode for the ZENworks Imaging Windows Agent (`ziswin.exe`) to run during the boot process:

Enabled: If this option is selected and the *Just Imaged Flag* is set (*File > Edit > Modify Image-safe Data > Imaging*), the ZENworks Imaging Windows Agent reads data from the image-safe data store and write it to the Windows registry.

If this option is selected but the *Just Imaged Flag* is not set, the ZENworks Imaging Windows Agent reads data from the Windows registry and writes it to the image-safe data store.

Disabled: If this option is selected, the ZENworks Imaging Windows Agent runs automatically during the boot process, but exits without doing any work.

- ◆ **Re-enable After _ Boot:** Enable this option and specify the number of boot cycles to take place before the ZENworks Imaging Windows Agent returns to an enabled state.

Uninstalled: If this option is enabled, the ZENworks Imaging Windows Agent does not automatically run during the boot process.

4 Click the *Logging* tab in the ZENworks Imaging Windows Agent Options dialog box, then modify the desired data to specify history log and debug logging setting for the ZENworks Imaging Windows Agent (`ziswin.exe`):

History Logging: Use the options in this group box to specify the location of the history log file and how many entries you want the log file to contain before discarding the oldest entries.

  - **History Log File:** Click the browse button to specify the location in which you want to store the history log file (`ziswin.hst`).

  - **Maximum History Log Entries:** Specify the maximum number of log entries that you want the history log file to contain. After the number of entries you enter in this field is reached, each new entry causes the oldest entry to be discarded.

Debug Logging: The debug log file, `ziswin.log`, is located in the system `\temp` directory if the ZENworks Imaging Windows Agent is run in service mode. The ZENworks Imaging Windows Agent runs, by default, in service mode during each Windows boot process when the workstation is started. When you run the `ziswin.exe` executable file, by default, the agent is started in interactive mode and `ziswin.log` is located in the interactive user's user `\temp` directory.

  - **Disabled:** Turns off debug logging.

  - **Single Log File:** Enables debug logging and specifies that the current debug log file be overwritten during each boot process.

  - **Multiple Log Files:** Enables debug logging and specifies that a new debug log file is created during each boot process. Each new log file is given a unique name (`ziswin`*x*`.log`, where *x* represents a number that identifies each log file). Although these log files are small, you might want to periodically delete older files that you no longer need.

5 Click the *Restore Mask* tab in the ZENworks Imaging Windows Agent Options dialog box, then use this tab to prevent restoration of certain image-safe data components to the workstation when the ZENworks Imaging Windows Agent (`ziswin.exe`) restores image-safe data.

To prevent image-safe data from being restored to the workstation, select the box next to the desired component.

If the check box is enabled (a check mark is displayed next to an item), that information is not restored to the workstation from the image-safe data.

If the check box is not enabled (a check mark does not display next to an item), that information is restored to the workstation from the image-safe data.

6 Click the *Collection Mask* tab in the ZENworks Imaging Windows Agent Options dialog box, then use this tab to prevent certain items from being overwritten in the image-safe data store when the ZENworks Imaging Windows Agent (`ziswin.exe`) collects data from Windows.

To prevent image-safe data from being overwritten, select the box next to the desired component.

If the check box is enabled (a check mark is displayed next to an item), that information is not written to the workstation's image-safe data. Any corresponding existing image-safe data is not overwritten.

If the check box is not enabled (a check mark does not display next to an item), that information is collected from the workstation and stored with the workstation's image-safe data. Any corresponding existing image-safe data is overwritten.

7 Click *OK*.

Viewing a Workstation's Image-Safe Data History

1 Open the ZENworks Imaging Windows Agent (`ziswin.exe`) in interactive mode.

2 Click *View > View History*.

From the ZENworks Imaging Windows Agent History dialog box, you can view the image-safe data's history, load a history file from another location, clear the workstation's image-safe data history, and view a specific history entry's details, including the image-safe data that was loaded when booting and saved during shutdown. To view a specific history entry's data, select the entry in the ZENworks Imaging Windows Agent History dialog box, then click *Details*.

63.2.3 Running the ZENworks Imaging Windows Agent in Service Mode

WARNING: When you run `ziswin.exe` in the service mode, its restoration submode removes image-safe data. This only applies to images created with previous versions of ZENworks. For more information, see "Preserving Image-Safe Data" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

The ZENworks Imaging Windows Agent (`ziswin.exe`) runs in service mode when no parameters are given on the command line. This is always the mode when the ZENworks Imaging Windows Agent is run automatically by Windows during the boot process (because of the registry entries made during the installation mode install process.) When it is in service mode, the ZENworks Imaging Windows Agent reads the registry to determine if it should be disabled or inactive. If the ZENworks Imaging Windows Agent is not disabled and not inactive, it reads the image-safe data to determine whether to run in restoration or collection submode. If the Just-Imaged flag in the image-safe data is set, the ZENworks Imaging Windows Agent runs in the restoration submode. If the Just-Imaged flag in the image-safe data is not set, or if image-safe data does not exist on the machine, the ZENworks Imaging Windows Agent runs in collection submode.

IMPORTANT: Image-safe data is not supported on Linux workstations.

- "Disabled Submode" on page 758
- "Inactive Submode" on page 758
- "Collection Submode" on page 759
- "Restoration Submode" on page 759

Disabled Submode

To run the ZENworks Imaging Windows Agent in the disabled submode of service mode, edit the workstation's `HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN Disabled` registry setting.

When this string value is set to 1, the ZENworks Imaging Windows Agent exits without doing any work.

Inactive Submode

You can set a registry value to cause the ZENworks Imaging Windows Agent to consider itself inactivated for a certain number of executions.

To run the ZENworks Imaging Windows Agent in the inactive submode of service mode, edit the workstation's `HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN Inactive` setting. You can set this value at anything greater than zero.

When the ZENworks Imaging Windows Agent runs in service mode and determines that this registry value is set, the agent decrements the inactive count by one and then exits. When the inactive count reaches zero, the ZENworks Imaging Windows Agent reactivates itself and performs its normal collection or restoration work.

Collection Submode

The ZENworks Imaging Windows Agent gathers Windows registry information necessary to populate the image-safe data store and writes that information to an area on the workstation's hard disk that is safe from reimaging. In so doing, the ZENworks Imaging Windows Agent does not collect information for any image-safe data components that are specified in the Do Not Collect entry in the registry. This functionality provides a means for administrators to prevent certain components in the image-safe data store from being overwritten with new data.

You can also edit the edit the workstation's `HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN Do Not Collect Mask` to specify which components you do not want the ZENworks Imaging Windows Agent to collect inside of the image-safe data store. This value is interpreted as a mask (as seen in Table 63-1), with each component receiving one bit in the mask. To stop the collection of one item, specify its corresponding mask as the value in the registry. To stop the collection of multiple items, add the masks together and the sum is the value defined in the registry.

You can use the following values for the `ZISWIN Do Not Collect Mask`:

Table 63-1 *The Ziswin Do Not Collect Mask Values*

Component	Value
Workstation Distinguished Name	0x00000001
Workstation Tree	0x00000002
NetBios Name	0x00000004
Workgroup	0x00000008
IP Address	0x00000010
SID	0x00000020
DNS	0x00000100
Workstation ID	0x00000200

Restoration Submode

The ZENworks Imaging Windows Agent reads the information stored in the image-safe data store and restores that information into the Windows registry.

WARNING: When running `ziswin.exe` in the service mode, this restoration submode removes image-safe data. This only applies to images created with previous versions of ZENworks. For more

information, see "Preserving Image-Safe Data" in the *Novell ZENworks 7 Desktop Management Installation Guide*.

You can also edit the workstation's `HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN Do Not Restore Mask` to specify image-safe data components that you do not want the ZENworks Imaging Windows Agent to restore to the Windows registry upon successful completion of an image. This value is interpreted as a mask (as seen in Table 63-2), with each component receiving one bit in the mask. To stop the restoration of one item, specify its corresponding mask as the value in the registry. To stop the restoration of multiple items, add the masks together and the sum is the value defined in the registry.

You can use the following values for the `ZISWIN Do Not Restore Mask`:

Table 63-2   The Ziswin Do Not Restore Mask Values

Component	Value
Workstation Distinguished Name	0x00000001
Workstation Tree	0x00000002
NetBios Name	0x00000004
Workgroup	0x00000008
IP Address	0x00000010
SID	0x00000020
DNS	0x00000100
Workstation ID	0x00000200

Following are common scenarios and example usages of the `ZISWIN Do Not Restore Mask`:

Windows Domain Environment: The ZENworks Imaging Windows Agent does not currently add workstations to the domain. However, you can use sysprep to add the workstation to the domain. In this scenario, you can specify that the ZENworks Imaging Windows Agent restore everything but the Workgroup. To do this, set the value of this registry key to 0x00000008.

DHCP Environment: Administrators who push IP and DNS configuration through DHCP do not need the ZENworks Imaging Windows Agent to restore this information from image-safe data store. To not restore these two components, the value of this registry key is 0x00000110.

Sysprep Naming Environment: Administrators can have a process (running during the mini-setup that sysprep performs) that names the NetBios name of the computer. Because the ZENworks Imaging Windows Agent runs after sysprep, there could be a case where the ZENworks Imaging Windows Agent is renaming the workstation (to its original name) after the proper name was determined during the sysprep routine. To have the ZENworks Imaging Windows Agent not restore the NetBios name of a workstation, set the value of this registry key to 0x00000004.

If your environment has all three of the configurations mentioned above, add the four components' mask values. The resulting registry value is 0x0000011C.

If your environment needs only the Workstation Object, Workstation ID, and Workstation Tree to be restored after imaging, add up all of the other components' mask values. The resulting registry value is then 0x0000013C.

If your environment does not need anything restored by the ZENworks Imaging Windows Agent, the registry value can be set to 0xFFFFFFFF.

NOTE: You can use the registry `REG_SZ` value in `HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN Prevent Reboot=1` to prevent the ZENworks Imaging Windows Agent from causing the workstation to reboot after performing work in restoration mode.

63.2.4 Running the ZENworks Imaging Windows Agent in Installation Mode

To install the ZENworks Imaging Windows Agent so that it runs automatically each time Windows starts, follow the instructions in .

To run the ZENworks Imaging Windows Agent in installation mode, entering the following on the workstation's command line:

```
ziswin -install
```

The `ziswin.exe` file must be located in the workstation's *windows*\system32 directory for Windows 2000/XP workstations. For Windows 98 workstations, `ziswin.exe` must be located in the workstation's *windows*\system directory.

When you run `ziswin.exe` with the -install switch, the ZENworks Imaging Windows Agent creates the registry entries necessary for it to run automatically during subsequent boot cycles of the workstation. This switch adds the String Value System with a Value Data of ZISWIN.EXE to the registry location so that `ziswin.exe` executes during subsequent boot sequences. On Windows 2000/XP workstations, this location is `HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION\WINLOGON`. On Windows 98 workstations, this location is `HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENT VERSION\RUN SERVICES`.

63.2.5 Running the ZENworks Imaging Windows Agent in Uninstallation Mode

The ZENworks Imaging Windows Agent (`ziswin.exe`) is uninstalled if you uninstall the ZENworks Imaging Windows Agent from the workstation.

If you want to uninstall only the ZENworks Imaging Windows Agent, you can run ziswin -remove from the workstation's command line. Running ziswin -remove removes the registry entries that cause `ziswin.exe` to be executed during the boot cycle; however, the `ziswin.exe` file is not removed from the workstation.

63.3 Image-Safe Data Viewer and Editor (Zisview and Zisedit)

After booting a workstation from an imaging boot medium (PXE, CD, DVD, or ZENworks partition), you can enter `zisedit` or `zisview` at the Linux bash prompt to edit and view the image-safe data for that workstation.

IMPORTANT: Image-safe data is not supported on Linux workstations.

NOTE: You can also use the ZENworks Imaging Windows Agent (`ziswin.exe`) to view and edit a workstation's image-safe data. The ZENworks Imaging Windows Agent combines the capabilities of the Image-Safe Data Viewer (`zisview`) to let you view a workstation's image-safe data and the Image-Safe Data Editor (`zisedit`) to let you edit this data. For more information, see

63.3.1 Information Displayed by the Image-Safe Data Viewer

After booting a workstation from an imaging device, you can enter `zisview` at the Linux bash prompt to view the image-safe data for that workstation.

The image-safe data viewer (`zisview`) displays the following information about the workstation

Table 63-3   *Zisview Information*

Category	Information
Image-safe Data	• **Version:** The version number of the ZENworks Imaging Windows Agent (ziswin).
	• **Just Imaged Flag:** If this is set to False, the ZENworks Imaging Windows Agent (`ziswin.exe`) reads data from the Windows registry and writes it to the image-safe data store. If this is set to True, the ZENworks Imaging Windows Agent reads data from the image-safe data store and writes it to the Windows registry.
	• **Last Base Image:** The last base image that was restored to the workstation.
	• **Last Base Image Time:** The time stamp of the last base image that was restored to the workstation.
	• **Last Base Image Size:** The size of the last base image that was restored to the workstation.
	• **Scripted Image Flag:** If this option is set to True, the last imaging operation was a scripted image. If this option is set to False, the last imaging operation was not a scripted image.
	• **Script Checksum:** Displays the checksum value representing the last script run. The ZENworks Imaging Engine uses the checksum to prevent the same script from re-running on the workstation unless you specify in ConsoleOne that you want to rerun the same script.

Category	Information
Workstation Identity Information	◆ **Workstation Tree:** The eDirectory tree that contains the Workstation object for this workstation.
	◆ **Workstation Object:** The distinguished name of this computer's workstation.
	◆ **Workstation ID:** The workstation identification number.
	◆ **Win 9x Computer Name:** The computer name for the workstation. This is only used for changing the computer name of Windows 9.*x* workstations. To change the computer name of Windows 2000 or XP workstations, use DNS Hostname.
	◆ **Windows Workgroup:** The Microsoft network workgroup of the workstation.
	◆ **Windows SID:** The Windows Security ID of the workstation, which is a unique number that identifies this workstation in Windows.
Network Information	◆ **DHCP:** Displays whether this workstation uses DHCP to obtain its IP address.
	◆ **IP Address:** Displays the static IP address that this workstation uses.
	◆ **Subnet Mask:** Displays the subnet mask that this workstation uses.
	◆ **Gateway:** Displays the gateway that this workstation uses.
	◆ **DNS Servers:** The number of DNS name servers used for DNS name resolution.
	◆ **DNS Suffix:** The DNS context of the workstation.
	◆ **DNS Hostname:** The DNS local hostname of the workstation. This is also used for changing the computer name of Windows 2000 or XP workstations.

63.3.2 Image-Safe Data Viewer

To use zisview, enter any of the following commands at the Linux bash prompt:

Table 63-4 *Zisview Bash Commands*

Command	Explanation
zisview	Displays all image-safe data.

Command	Explanation
`zisview -z` `field`	Displays information about a specific field or fields. *field* is one or more field names separated by a space. *field* is not case-sensitive. All of the following are valid field names. The corresponding minimum names that can also be entered on the command line follow each field name in parenthesis. JustImaged (J) ScriptedImage (SC) LastBaseImage (L) Tree (T) ObjectDN (ObjectDN) NetBIOSName (N) WorkGroup (WorkG) SID (SI) WorkstationID (Works) DHCP (DH) IP (I) Gateway (Gateway) Mask (M) DNSServerCount (DNSServerC) DNSServer (DNSServer) DNSSuffix (DNSSu) DNSHostName (DNSH)
`zisview -s`	Creates a script that can be used to generate environment variables that contain all of the image-safe data fields.
`zisview -h`	Displays help for `zisview`.

63.3.3 Image-Safe Data Editor

After booting a workstation from an imaging device, you can enter `zisedit` at the Linux bash prompt to change, clear, or remove information the image-safe data for that workstation.

To use `zisedit`, enter any of the following commands at the Linux bash prompt:

Table 63-5 *Zisedit Bash Commands*

Command	Explanation
`zisedit`	Displays a screen showing all of the image-safe data fields. You can add or change any of the information in the fields.

Command	Explanation
`zisedit` `field=new_information`	You can change the information for one field using this syntax, where *field* is any valid field name and *new_information* is the information you want this field to contain. *field* is not case sensitive. For example, enter `zisedit Mask=255.255.252.0` to enter this information in the *Subnet Mask* field. All of the following are valid field names. The corresponding minimum names that can also be entered on the command line are shown in parenthesis after each field name. JustImaged (J) ScriptedImage (SC) LastBaseImage (L) Tree (T) ObjectDN (ObjectDN) NetBIOSName (N) WorkGroup (WorkG) SID (SI) WorkstationID (Works) DHCP (DH) IP (I) Gateway (Gateway) Mask (M) DNSServerCount (DNSServerC) DNSServer1 (DNSServer1) DNSSuffix (DNSSu) DNSHostName (DNSH) PXEWorkRevision (PXEWorkR) PXEWorkObject (PXEWorkO) PXETaskID (PXETaskI) PXETaskState (PXETaskS) PXETaskRetCode (PXETaskR)
`zisedit -c`	Clears all image-safe data fields.
`zisedit -r`	Removes the image-safe data store.
`zisedit -h`	Displays help for `zisedit`.

63.4 Imaging Floppy Boot Disk Creator (zimgboot.exe)

Use the ZENworks Imaging Floppy Boot Disk Creator at a Windows workstation to:

- Create or update the `settings.txt` file so that you can boot workstations to perform imaging tasks
- Create a CD boot diskette for workstations that cannot be booted using a CD or DVD
- Create a PXE boot disk to be used with a workstation that cannot be PXE enabled

Zimgboot.exe is located in the `sys:public\zenworks\imaging` directory in your ZENworks Desktop Management installation (on the ZENworks Imaging server). It is also accessible from the Tools menu of ConsoleOne.

For more information, see Section 55.3, "Using the ZENworks Imaging Boot Disk Creator," on page 643.

63.5 Imaging Configuration Parameters (Settings.txt)

The `settings.txt` file contains parameters that control how the imaging boot-up process occurs.

You should maintain the working copy of `settings.txt` at the root of the imaging boot device (CD or DVD, or ZENworks partition).

`Settings.txt` is a plain text file that contains various parameters, each on a separate line. Each parameter has the general format of PARAMETER=value. Lines that begin with a pound sign (#) are comments and are ignored during the imaging boot process.

You can edit this file manually in a text editor, manually using the *Load Settings from Disk* option in the `zimgboot.exe` utility, or by making configuration changes in the `zimgboot.exe` utility.

The format and function of each parameter in the `settings.txt` file are described in Table 63-6:

Table 63-6 *Settings.txt Parameters*

Parameter	Description
MANUALREBOOT	Specifies whether to access the bash prompt to reboot a workstation manually after it was booted from the imaging device in automatic mode. (If the workstation was booted from the imaging device in manual mode, you must always reboot the workstation manually.)
	If you boot a workstation from the imaging device and you let the boot process proceed in automatic mode, the ZENworks Imaging Engine starts and checks the ZENworks Imaging server to see if an imaging operation should be performed on the workstation. If so, it performs the imaging operation and then quits. If not, it quits without doing anything.
	What happens next depends on how you set this parameter. If you leave it commented out or set it to *No*, you are prompted to remove the imaging device (such as the CD or diskette, if necessary) and press any key to reboot the workstation to the native operating system. If you set this parameter to *Yes*, the workstation doesn't reboot automatically but instead displays the Linux prompt, allowing you to perform additional imaging-related tasks using the Linux menu or at the command line. This is helpful if you want to do things like check the current partition information or the image-safe data before booting to the native operating system.
	Example: MANUALREBOOT=YES

Parameter	Description
PARTITIONSIZE	The number of megabytes to allocate to the ZENworks partition if you choose to create one locally on a workstation when you boot the workstation from the imaging device. The default size is 150 MB. The minimum partition size is 50 MB. The maximum size allowed is 2048 MB (2 GB). If you plan to store an image in the ZENworks partition, for example to enable the workstation to be restored to a certain state without connecting to the network, you might want to specify a larger size for this parameter. Example: PARTITIONSIZE=500
netsetup	If you are using DHCP, keep this option enabled. If you are using a specific IP address, replace `dhcp,all` with `-dhcp,all` then uncomment and configure the other three IP address lines (HostIP, NETMASK, and GATEWAY). Example: netsetup=-dhcp,all
HostIP	The IP address used by a device to communicate on the network when you boot the device from the imaging device, if a static IP address is needed. Example: HostIP=137.65.95.126 If you want DHCP to be used, leave this and the next two parameters commented.
NETMASK	The subnet mask to be used by the workstation, if the workstation is using a static IP address. Example: NETMASK=255.255.252.0 If DHCP is being used, leave this parameter commented.
GATEWAY	The IP address of the gateway (router) to be used by the workstation, if the workstation is using a static IP address. Example: GATEWAY=137.65.95.254 If DHCP is being used, leave this parameter commented.
NAMESERVER	The list of DNS name servers, by IP address, to use for resolving DNS domain names used on this workstation. Use a space to separate entries. Example: NAMESERVER=123.45.6.7 123.45.6.9 If DHCP is being used, leave this parameter commented.
DOMAIN	The list of DNS domain suffixes to be used to identify connections used by this workstation. Use a space to separate entries. Example: DOMAIN=example.novell.com example.xyz.org If DHCP is being used, leave this parameter commented.

Parameter	Description
PROXYADDR	The IP address or full DNS name of the imaging (proxy) server to connect to when you boot a workstation from the imaging device in auto-imaging mode.
	Examples:
	PROXYADDR=137.65.95.127 PROXYADDR=imaging.xyz.com
	This parameter is used to set the PROXYADDR environment variable in Linux when the workstation is booted from the imaging device. The ZENworks Imaging Engine then reads this variable to determine which server to contact if it's running in automatic mode. Whether it's running in automatic or manual mode, the ZENworks Imaging Engine attempts to log the imaging results to the server specified in this variable.
export PS1="\`\`pwd \`#"	Configures the string used by the bash shell. You can change the string by editing the text after the = symbol. The ' character is not a single quote mark, but is from the ~ key.
export IMGCMD	Use this parameter to alter the behavior of automated imaging. If this variable is defined as a script (or a series of commands), then that script (or those commands) are executed instead of the usual img auto command (see `/bin/imaging.s`).
netdevice=eth0	Selects a specific network adapter. If necessary, replace eth0 with the correct interface.

63.6 Imaging Server (Imgserv.nlm or .dll or .dlm, or Linux Daemons)

The ZENworks Imaging server is a software component of the Desktop Management server. It enables imaging clients (workstations that are booted from an imaging device) to connect with the network to receive imaging services, including:

- Storage or retrieval of an image on a server
- Automatic imaging based on an eDirectory policy or setting
- Logging the results of an imaging operation
- A multicast imaging session

Use the ZENworks Imaging server to do the following:

63.6.1 Initiating the Imaging Processes on Linux Imaging Servers

An imaging server daemon is initiated by running the script at the Linux terminal program command line, which in turn calls the executable and uses the configuration set in the corresponding `.conf` file. Because the scripts do not normally accept parameters, but only arguments (such as `start`), you can configure parameters in their corresponding `.conf` files.

The following Linux daemons and libray file run the imaging server processes:

libzmgserv.so

The `libzmgserv.so` library file is used by eDirectory to provide imaging services to the devices.

This library file is used automatically by eDirectory when installing ZENworks Linux Management, or when rebooting the server.

novell-proxydhcp

The novell-proxydhcp daemon provides PXE devices with the information that they require in order to connect to the ZENworks Preboot Services system.

This daemon is not started automatically when installing ZENworks Linux Management.

Understanding the novell-proxydhcp Components

To initiate the novell-proxydhcp daemon, enter the following command listed for Script Location on the Linux command line in a terminal program:

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

This command executes `/opt/novell/bin/novell-proxydhcpd`.

The following script arguments are available for the `novell-proxydhcp` command:

start	restart	status	install
stop	force-reload	showpid	

For descriptions of these arguments, see "Understanding Script Arguments" on page 775.

Configuring novell-proxydhcp

The novell-proxydhcp configuration file (`/etc/opt/novell/novell-proxydhcp.conf`), contains the following parameters:

Table 63-7   *Novell-proxydhcp Parameters*

Parameter	Description
LocalDHCPFlag = 0	Indicates whether the DHCP server for this subnet resides on the same server as novell-proxydhcp. 0 (the default) means novell-proxydhcp is not running on the same server as the DHCP service. 1 means they are running on the same server. The Proxy DHCP server needs to behave slightly differently if it is loaded on the same server as the DHCP service.
LocalInterface = 10.0.0.1	Indicates the IP address to be used by the Proxy DHCP server. This setting is intended only for use on servers with multiple LAN interfaces. The IP address must be valid on the server. By default, this parameter is commented out.
NovellPolicyEngine = 10.0.0.1	The IP address of the server where a Novell Preboot policy engine is running. Most often, this is a ZENworks imaging daemon. If no value is specified, the Proxy DHCP assumes that the daemon is running on the same server. By default, this parameter is commented out.
NBPx86 = nvlnbp.sys	The name of the boot file this service suggests for all x86 computers, such as `nvlnbp.sys`.
MenuTimeout = 2	The number of seconds the F8 menu is displayed before automatically choosing the first option, which is always this server and its default NBP. The default is 2 seconds.
ProxyLogLevel = 2	The value assigned here determines which events are entered in `novell-proxydhcp.log`. Specifying a high level in an active system can quickly fill the log. Valid values are 0, 1, 2, 3, and 4. The default is 2. Each message from the Proxy DHCP server is assigned a priority level. If *ProxyLogLevel* is set to a value equal to or greater than a message's priority level, that message is entered in `novell-proxydhcp.log`. All other messages are ignored. Priority meaning: **0:** Critical information. Service start, stop, and critical events are logged. **1:** Warning information. Additionally, warning information is logged. **2:** Transaction information. All completed client transactions are logged. **3:** Request information. All client requests and Proxy DHCP requests received are logged, including ignored requests. If a request is ignored, the reason for ignoring it is also logged. **4:** Debugging information. All DHCP packets received and accepted are decoded and logged.
ProxyLogFile = /var/opt/novell/log/novell-proxydhcp.log	The file where all log file entries are placed. It is located at `/var/opt/novell/log/novell-proxydhcp.log`. By default, this parameter is commented out.

Parameter	Description
ProxyLogFileSize = 15	The size of the ProxyLogFile file is controlled by the value of ProxyLogFileSize, where 15 is the default (in MB).
	When the log file exceeds the ProxyLogFileSize value, it is deleted and restarted.

Parameters that are not commented out, but contain no values, are given a default value.

The novell-proxydhcp daemon is compliant with the following RFCs:

RFC 2131: Dynamic Host Configuration Protocol

RFC 2132: DHCP Options and BOOTP Vendor Extensions

The novell-proxydhcp daemon is compliant with the Preboot eXecution Environment (PXE) Specification v2.1 industry specification, published by Intel.

novell-tftp

The novell-tftp daemon provides TFTP services to imaging clients.

This daemon is started automatically when installing ZENworks Linux Management, or when rebooting the server.

- ◆
- ◆

Understanding the novell-tftp Components

To initiate the novell-tftp daemon, enter the following command (listed under Script Location) on the Linux command line in a terminal program:

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

This command executes `/opt/novell/bin/novell-tftpd`.

The following script arguments are available for the `novell-tftp` command:

start	restart	status
stop	force-reload	showpid

For descriptions of these arguments, see .

Configuring novell-tftp

The novell-tftp configuration file (`/etc/opt/novell/novell-tftp.conf`), contains the following parameters for the Novell TFTP server:

Table 63-8 *Novell-tftp Parameters*

Parameter	Description
TFTPInterface = 10.0.0.1	The IP address that is used for all TFTP communications. If a value is not given here, the service tries to detect one.
	This value is most useful for multihomed servers.
	By default, this parameter is commented out.
TransferBlockSize = 1428	This value determines the size of the data block used by the TFTP server to transmit and receive data to and from a client. Valid values are between 512 and 4428.
	For Ethernet networks, this value should be 1428.
	For token ring networks, this value can be 4428, but only if you are sure there are no Ethernet segments; otherwise, use 1428.
	Older TFTP clients might be restricted to 512 bytes, which is the original transfer block size before the adoption of RFC 2348. The Novell TFTP server is compatible with these clients.
	By default, this parameter is commented out.
TimeoutInterval = 1	This is the amount of time (in seconds) that the TFTP server waits for a client to acknowledge before resending a packet. However, because the TFTP server uses an adaptive algorithm to calculate the actual timeout interval, this value is only used as an initial value. It can increase or decrease, depending on the performance of the network.
	This value is only a default. It can be changed at the request of a client. See RFC 2349.
	Valid values are 1 through 60.
	By default, this parameter is commented out.
Linux -- TFTPDirectory = /srv/tftp	TFTPDirectory is the directory where the TFTP server can store and retrieve files. All paths submitted to the TFTP server by clients are assumed to be relative to this directory.
	Because TFTP has no security, it is suggested that you not place files with sensitive information in this directory, and that you place a space quota on it.
	The TFTP server does not load if this directory does not exist.
	By default, this parameter is commented out.
TFTPAllowWrites = 0	This tells the TFTP server whether to allow users to place new files on the server. Setting this variable to 0 (the default) makes the TFTP server more secure by not allowing users to place new files on the server. The other option is 1, which allows users to place new files on the server.
AllowOverwrites = 0	This tells the TFTP server whether to allow users to overwrite existing files on the server. Setting this variable to 0 (the default) makes the TFTP server more secure by not allowing users to overwrite files on the server. The other option is 1, which allows users to overwrite files on the server.
	TFTPAllowWrites must be set to 1 in order for the AllowOverwrites parameter to be recognized.

Parameter	Description
TFTPLogLevel = 2	The value assigned here determines which events are entered in `novell-tftp.log`. Specifying a high level in an active system can quickly fill the log. Valid values are 0, 1, 2, 3, and 4. The default is 2.
	Each message from the TFTP server is assigned a priority level. If TFTPLogLevel is set to a value equal to or greater than a message's priority level, that message is entered in `novell-tftp.log`. All other messages are ignored.
	Priority meaning:
	0: Critical information. Service start, stop, and critical events are logged.
	1: Warning information. Only failed client transactions are logged.
	2: Transaction information. All completed client transactions are logged.
	3: Request information. All client requests and TFTP options are logged.
	4: Debugging information. All server events, including each packet received, are logged.
	By default, this parameter is commented out.
TFTPLogFile = /var/opt/novell/log/novell-tftp.log	The file where all log file entries are placed.
	By default, this parameter is commented out.
TFTPLogFileSize = 15	The size of the log file is controlled by the value of TFTPLogFileSize, where 15 is the default (in MB).
	When the log file exceeds the TFTPLogFileSize value, it is deleted and restarted.
	By default, this parameter is commented out.

Parameters that are not commented out, but contain no values, are given a default value.

The novell-tftp daemon is compliant with the following RFCs:

RFC 1350: THE TFTP PROTOCOL (REVISION2)
RFC 2347: TFTP Option Extension
RFC 2348: TFTP Blocksize Option
RFC 2349: TFTP Timeout Interval and Transfer Size Options

novell-zmgprebootpolicy

The novell-zmgprebootpolicy daemon allows PXE devices to query the ZENworks Linux Management system for work to do and for Preboot Menu policies.

This daemon is started automatically when installing ZENworks Linux Management, or when rebooting the server.

Understanding the novell-zmgprebootpolicy Components

To initiate the novell-zmgprebootpolicy daemon, enter the following command (listed under Script Location) on the Linux command line in a terminal program:

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

This command executes `/opt/novell/zenworks/preboot/bin/novell-zmgprebootpolicyd`.

The following script arguments are available for the `novell-zmgprebootpolicy` command:

start	restart	status
stop	force-reload	showpid

For descriptions of these arguments, see .

Configuring novell-zmgprebootpolicy

The novell-zmgprebootpolicy configuration file (`/etc/opt/novell/zenworks/preboot/novell-zmgprebootpolicy.conf`), contains the following parameters:

Table 63-9 *Novell-zmgprebootpolicy Parameters*

Parameter	Description
LocalInterface = 10.0.0.1	The IP address that is used by the policy server. This setting is intended only for use on servers with multiple LAN interfaces. The address must be valid on the server. By default, this parameter is commented out.
PolicyLogLevel = 1	The value assigned here determines which events are entered in `novell-zenprebootpolicy.log`. Specifying a high level in an active system can quickly fill the log. Valid values are 0, 1, 2, 3, and 4. The default is 2. Each message from the novell-zmgprebootpolicy server is assigned a priority level. If PolicyLogLevel is set to a value equal to or greater than a message's priority level, that message is entered in `novell-zenprebootpolicy.log`. All other messages are ignored. Priority meaning: **0:** Critical information. Service start, stop, and critical events are logged. **1:** Warning information. Only failed client transactions are logged. **2:** Transaction information. All completed client transactions are logged. **3:** Request information. All client requests are logged. **4:** Debugging information. All server events, including each packet received, are logged. By default, this parameter is commented out.

Parameter	Description
PolicyLogFile = /var/opt/novell/log/zenworks/preboot/novell-zenprebootpolicy.log	The file where all log file entries are placed. By default, this parameter is commented out.
PolicyLogFileSize = 15	The size of the log file is controlled by the value of PolicyLogFileSize, where 15 is the default (in MB). When the log file exceeds the PolicyLogFileSize value, it is deleted and restarted.
PrebootServer = 10.0.0.5	This field contains the address of the ZENworks Imaging server that should be used to resolve policies. By default, this parameter is commented out.

Parameters that are not commented out, but contain no values, are given a default value.

Understanding Script Arguments

The following arguments are available for each of the Preboot Services daemons described above:

Table 63-10 *Script Arguments*

Argument	Function
start	Starts the daemon. Because novell-proxydhcp is optional, use this argument to start this daemon. However, this daemon does not automatically start when the server reboots. (See install below.)
stop	Stops the daemon.
restart	Stops and restarts the daemon if it is already running.
force-reload	Causes the daemon's configuration file to be reloaded.
status	Displays the current status of the daemon. For example, if you enter `/etc/inid.d/novell-proxydhcp status`, information similar to the following is returned: `Novell ZENworks Proxy DHCP Service running`

showpid	Displays the daemon's process ID.
	
	For example, if you enter `/etc/inid.d/novell-proxydhcp showpid`, information similar to the following is returned:
	
	`Novell ZENworks Proxy DHCP Service running`
	`10211`

install	For novell-proxydhcp only, causes the daemon to be automatically loaded when the server boots.

63.6.2 Initiating the Imaging Processes on Windows or NetWare Imaging Servers

The ZENworks Imaging server modules are located on a NetWare server in `sys:\system` or on a Windows server in the directory where eDirectory is installed (such as `c:\novell\nds`).

In most environments, the ZENworks Imaging server starts automatically when you reboot the server after installing Desktop Management. With eDirectory 8.5 on Windows, you must start the ZENworks Imaging server manually as follows: from the directory where eDirectory is installed, double-click `ndscons.exe`, select the `imgsrv.dlm` service, then click *Start*. You might also want to click *Startup* to configure the service to start automatically each time the server reboots.

You can use the following parameters with the ZENworks Imaging server:

Table 63-11 *ZENworks Imaging Server Parameters*

Parameter	Description
`-i:ip_address`	Used in a clustering environment to specify the IP address of the virtual server. This parameter is automatically set during installation in a clustering environment. You can also use this parameter in a multiple-NIC environment to bind the ZENworks Imaging server to a specific IP address.
`-s:DN`	Used in a clustering environment to specify the DN of the virtual server. If the DN contains spaces, enclose the DN in quotation marks. This parameter is automatically set during installation in a clustering environment.

63.6.3 Viewing Information About Imaging Requests

After the ZENworks Imaging server has started, you can view information about the status and results of the imaging requests that it has received from imaging clients. A statistical summary of these requests is shown on the NetWare server console, in a window accessible from the Windows taskbar, or from the command line on a Linux server. The Linux server commands are:

- For the local server:

  `/opt/novell/zenworks/preboot/bin/novell-zmgmcast -status`

- For a remote server:

  `/opt/novell/zenworks/preboot/bin/novell-zmgmcast -status -i`
  remote_server_ID

  where *remote_server_ID* is the IP address or DNS of the remote server.

All statistics are reset to zero when you restart the ZENworks Imaging server.

The statistics shown on this screen are explained in Table 63-12 on page 777.

Table 63-12   *Imaging Request Statistics*

Statistic	Specifies
Update Requests	The number of imaging requests of any kind that have been received by the ZENworks Imaging server since it was started. This includes requests that failed, were denied, or were referred to other Imaging servers (see Client Referrals below). Information about each of these requests is logged on the ZENworks Imaging server, including the source, type, date/time, and results, as explained in Section 63.7, "Imaging Server Log (Zimglog.xml)," on page 777.
Images Sent	The number of images that the ZENworks Imaging server has sent to imaging clients since the ZENworks Imaging server was started. This includes only images that are retrieved from this ZENworks Imaging server. See Client Referrals below for more information.
Images Received	The number of new images that have been received and stored on the ZENworks Imaging server since it was started. This includes images that were received through client referrals (see Client Referrals below).
Client Referrals	The number of client requests that have been referred (redirected) by the ZENworks Imaging server to other ZENworks Imaging servers since this ZENworks Imaging server was started. Such referrals are made only when the client is running in auto-imaging mode and the ZENworks Imaging server determines from eDirectory that the image to be created or retrieved is on a different ZENworks Imaging server. **IMPORTANT:** If a client is running in manual imaging mode and it requests to store or retrieve an image on a different ZENworks Imaging server, the request is denied and an error is returned to the client. Referrals are currently supported only when the client is running in auto-imaging mode.

63.6.4 Starting a Manual Multicast Session

On the server console (NetWare) or in a window accessible from the system tray (Windows), you can start a manual multicast session, see any sessions in progress, and delete sessions. For more information, see "Initiating a Multicast Session from Each Client" on page 741 in Chapter 62, "Multicasting Images," on page 733.

63.7 Imaging Server Log (Zimglog.xml)

`Zimglog.xml` is a chronological record of all imaging requests that have been received by the ZENworks Imaging server since it was installed and first started, including requests merely to log information about imaging operations serviced elsewhere. For each imaging request, the ZENworks Imaging server logs information such as the source, type, date/time, and results of the request.

`Zimglog.xml` is created on a NetWare server in `sys:\system,` or on a Windows server at the root of the drive where eDirectory is installed (such as `c:\`). It is not created on a Linux server.

`Zimglog.xml` is an XML file. The oldest imaging request is logged at the top of the file and the most recent at the bottom. The file continues to grow unless you trim it manually (using a text editor) or delete it. It isn't cleared if you restart the ZENworks Imaging server.

Each imaging operation is entered in the log as a group of lines. For example, the log file shown below has two entries: one describing a successful *upload* operation and another describing a failed *download* operation. (An *upload* is the taking of a client image and storing it on the ZENworks

Imaging server or other available (local) medium. A *download* is the retrieval of a client image from the ZENworks Imaging server or local medium and putting it down on the client.)

```
<ZENImageLog>

<CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>
<Tree>XYZ</Tree>
<Status>Success</Status>
<Operation>Upload</Operation>
<ImageType>Base Image</ImageType>
<ImagePath>\\XYZ_SERVER\sys\imgs\dell_nt.zmg</ImagePath>
<Timestamp>Thur Nov 22 13:10:05 2001
</Timestamp>
</CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>

<CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>
<Tree>XYZ</Tree>
<Status>Failure</Status>
<ErrorMessage>Unable to find an image to download</ErrorMessage>
<Operation>Download</Operation>
<Timestamp>Thur Nov 22 13:13:17 2001
</Timestamp>
</CN=CV7PB00:C0:4F:DC:2A:B5.O=sales>

</ZENImageLog>
```

Table 63-13 describes the various XML elements that comprise the log entries shown above. Each element has an opening and closing tag, such as `<tree>` and `</tree>`. The outermost element contains all of the other elements in the entry.

Table 63-13 *XML Elements for the Zimglog.xml Log Entries*

XML Element	Specifies
outermost_container	The distinguished eDirectory name of the workstation that requested the imaging operation. This name is read by the ZENworks Imaging Engine from the workstation's image-safe data. If the workstation name isn't found (for example, if the workstation hasn't been registered as an object in eDirectory), the name of the ZENworks Imaging server that serviced the request is given instead (for example, XYZ_SERVER).
Tree	The eDirectory tree containing the workstation or server specified in the *Outermost_Container* element.
Status	Whether the requested imaging operation succeeded or failed.
ErrorMessage	The reason why the requested imaging operation failed, if applicable.

XML Element	Specifies
Operation	Whether the requested imaging operation was an upload or download attempt. An upload is the taking of a client image and storing it on the ZENworks Imaging server or other available (local) medium. A download is the retrieval of a client image from the ZENworks Imaging server or local medium and putting it down on the client.
	NOTE: Occasionally, you might see an entry in the log that omits the Operation element. Such an entry is typically a follow-up to the previous operation. For example, you might see an entry indicating that a download operation was successful, but the next entry (time-stamped a few seconds later and specifying no operation) might indicate that the ZENworks Imaging server failed to get image-safe data from eDirectory. In this case you could assume that the client that just received the download didn't have its own image-safe data, and so the ZENworks Imaging server was trying to get that data from eDirectory to apply it to the client.
ImageType	Whether the image that was created or retrieved is a base image or an add-on image. With a base image, all existing partitions and data are removed before the image is put down. With an add-on image, the existing partitions are left intact and are merely augmented with additional data.
ImagePath	The full path and filename of the image that was created, retrieved, or requested.
Timestamp	The time when the results of the requested imaging operation were logged by the ZENworks Imaging server, including the week day, month, date, 24-hour time (including seconds), and year.

ZENworks Imaging Engine Commands

<div style="text-align: right; font-size: 3em">64</div>

After booting a workstation from an imaging device, you can use the img command at the Linux bash prompt or the ZENworks® Imaging Engine menu to do any of the following:

- Take an image of the workstation's hard disks
- Put down an image on the workstation's hard disks
- View or manipulate the workstation's hard-disk partitions
- View the workstation's hardware configuration or image-safe data
- Display a menu from which you can also perform all of these tasks

The ZENworks Imaging Engine is installed to the /bin directory on the imaging boot device. If the imaging boot device is a CD or DVD, the /bin directory is actually archived in the root.tgz file, which is expanded during the imaging boot process. If the imaging boot method is Preboot Services, the ZENworks Imaging Engine is downloaded to the workstation when booting.

Because the ZENworks Imaging Engine is a Linux application, the command syntax is case sensitive. The overall syntax is:

img [*mode*]

where *mode* is any of the modes described in the sections below.

NOTE: Each mode can be abbreviated to the first letter of its name. For example, img dump can be abbreviated img d.

To access the ZENworks Imaging Engine menu from which to perform all of these tasks, enter img with no parameters.

64.1 Help Mode (img help)

Use Help mode to get information about the img command if you don't have documentation available.

To use the Help mode:

1 Do one of the following:

- Enter:

  `img [help [`*`mode`*`]]`

  where *mode* is the mode whose command syntax you want help with.

  Examples:

Example	Explanation
`img help`	Displays a short description of each mode.
`img help m`	Displays information on how to use the Make mode.
`img help p`	Displays information on how to use the Partition mode.

- Enter `img` to display the ZENworks Imaging Engine menu, select *Help*, then select a mode name.

64.2 Auto Mode (img auto)

Use Auto mode to image the workstation automatically, based on any applicable Novell® eDirectory™ policies and settings. The ZENworks Imaging Engine runs in this mode if you let the imaging boot process proceed without interruption, or if you enter the command listed below at the Linux prompt.

To use the Auto mode, do any of the following at the bash prompt:

- Enter:

  `img auto`

- To display the ZENworks Imaging Engine menu, enter:

  `img`

  and on the menu bar, click *Imaging*, then click *Query for work*.

- To display the ZENworks Imaging Engine menu, enter:

  `img`

  then click *F9 Query for work* on the taskbar.

- To display the ZENworks Imaging Engine menu, enter:

  `img`

  then press *F9*.

In this mode, the ZENworks Imaging Engine queries the ZENworks Imaging server specified in the PROXYADDR environment variable for any work to do. The ZENworks Imaging server checks the relevant eDirectory policies and settings to determine what imaging tasks should be performed (if any), such as taking or putting down an image. It then instructs the ZENworks Imaging Engine to perform those tasks. If any tasks involve storing or retrieving images on other ZENworks Imaging servers, the ZENworks Imaging server refers the ZENworks Imaging Engine to those servers to complete those tasks. After the ZENworks Imaging Engine has completed its work, it communicates the results to the original ZENworks Imaging server, and the results are logged on that server.

For information on configuring the eDirectory policies and settings that control what happens in this mode, see Chapter 58, "Setting Up Imaging Policies," on page 705.

64.3 Make Mode (img make)

Use the Make mode to take an image of the workstation and store it in a specified location. Normally, all partitions on hard disks and other storage devices (such as Jaz drives) are included in the image, but there are some exceptions noted in Table 64-1 on page 783.

You can take an image of a workstation using either the bash prompt or using the ZENworks Imaging Engine menu. For step-by-step instructions, see Section 60.1, "Manually Taking an Image of a Workstation," on page 719. You can also use the Make Locally mode to take an image of the workstation and store it in a partition on a local (writable) device, such as a hard disk or Jaz drive. For step-by-step instructions, see Chapter 61, "Setting Up Disconnected Imaging Operations," on page 727.

The image size is about the size of the data in the Windows partitions plus the entire size of any non-Windows partitions (such as NetWare® partitions). ZENworks partitions and Compaq configuration partitions are always excluded. The data from Windows partitions is stored in an intelligent, file-by-file format so you can customize it later using the Image Explorer (imgexp.exe) utility. Non-Windows partitions are stored in a raw, bit-by-bit format that cannot be customized.

The syntax of this mode depends on whether you store the image locally or on an Imaging (proxy) server.

The following sections contain additional information:

- Section 64.3.1, "Make Locally (img makel)," on page 783
- Section 64.3.2, "Make on Proxy (img makep)," on page 784

64.3.1 Make Locally (img makel)

Using the bash prompt, the following example explains the syntax and available parameters that you can use with the makel "make locally" parameter:

```
img makel[pNumber] filepath [comp=comp level] [xpartition]
```

Commands

Table 64-1 *Img Makel Parameters*

Parameter	Description
makel[*pNumber*]	The partition number (as displayed by img dump) of the local partition to store the image in. It must be a primary FAT16 or FAT32 partition. This partition is excluded from the image that's created.
	If you omit the partition number from this parameter, the image is stored in the local ZENworks partition.
filepath	The image filename, including a `.zmg` extension (case-sensitive) and the complete path from the root of the partition. The directories in the path must exist. If the file already exists, it is overwritten.

Parameter	Description
[comp=*comp level*]	*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.
xpartition	The partition number (as displayed by img dump) of a local partition to exclude from the image. You can repeat this parameter as needed to exclude multiple partitions. If you omit this parameter, all partitions are included in the image except the one where the image is stored.

Examples

Table 64-2 *Img Makel Examples*

Example	Explanation
`img makel8 /imgs/ dellnt.zmg`	Takes an image of all partitions except the one in slot 8 and saves the image to `imgs/dellnt.zmg` in the partition in slot 8. (This example assumes that slot 8 contains a primary FAT16 or FAT32 partition.)
`img makel /imgs/ dellnt.zmg`	Takes an image of all partitions and saves it to `imgs/dellnt.zmg` in the ZENworks partition. (This example assumes that the ZENworks partition is installed.)
`img makel /imgs/ dellnt.zmg x2 x3`	Takes an image of all partitions except those in slots 2 and 3 and saves the image to `imgs/dellnt.zmg` in the ZENworks partition. (This example assumes that the ZENworks partition is installed.)

64.3.2 Make on Proxy (img makep)

Using the bash prompt, the following example explains the syntax and available parameters that you can use with the makep "make on proxy" parameter:

```
img makep address filepath [comp=comp level] [xpartition]
```

Commands

Table 64-3 *Img Makep Parameters*

Parameter	Description
address	The IP address or DNS name of the ZENworks Imaging server where the image is stored. This can be any server running the Imaging Proxy service.

Parameter	Description

filepath	The UNC path to the new image file being created, including the image filename and the `.zmg` extension (case-sensitive). The format of the UNC path is as follows:
	
	`//`*servername*`/`*volume_or_share*`/`*path_to_store_images*`/`
	imagename`.zmg`
	
	For OES Linux, the path to the image file must be from root (/). For example, the path might look like:
	
	`//`*servername*`/media/nss/`*NSS_volume*`/`*path_to_image*`/`
	imagefilename`.zmg`
	
	Upon execution of `img makep` at the command line, the *servername* portion of this path is replaced with the value in the address portion of this syntax.
	
	The image filename, including a `.zmg` extension (case-sensitive) and the complete path in UNC style. The directories in the path must exist. If the file already exists, the ZENworks Imaging server won't overwrite it unless you enable it to do so in the ZENworks Imaging server's policy in eDirectory. (See Section 58.3, "Allowing Overwriting Filenames and Restricting the Save Location of Image Files (Imaging Server Settings)," on page 709.) If no directories are specified in the path, the image is created at the root of the volume or drive where the ZENworks Imaging server software is installed.
	
	IMPORTANT: Because Linux doesn't recognize backslashes, you must use forward slashes in the UNC path or enclose the entire path in quotes.

[comp=*comp level*]	*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.
x*partition*	The partition number (as displayed by img dump) of a local partition to exclude from the image. You can repeat this parameter as needed to exclude multiple partitions. If you omit this parameter, all partitions are included in the image.

Examples

Table 64-4 *Img Makep Examples*

Example	Explanation

`img makep 137.65.95.127 /`
`/xyz_server/sys/imgs/`
`dellnt.zmg`
	Takes an image of all partitions and saves it to `sys/imgs/`
	`dellnt.zmg` on xyz_server. (This example assumes that 137.65.95.127 is the IP address of xyz_server.)

`img makep img.xyz.com //`
`xyz_server/sys/imgs/`
`dellnt.zmg x2 x3`
	Takes an image of all partitions except those in slots 2 and 3 and saves the image to `sys/imgs/dellnt.zmg` on xyz_server. (This example assumes that img.xyz.com is the DNS name of xyz_server.)

Example	Explanation

`img makep img.xyz.com //`
`bogus/sys/imgs/`
`dellnt.zmg`
	Takes an image of all partitions and saves the image to `sys/imgs/`
	`dellnt.zmg` on img.xyz.com. (This example assumes that img.xyz.com is the DNS name of a server running the Imaging Proxy service).

	Because the servername inside the UNC path is replaced by the address value defined earlier in the cmd line, //bogus becomes //img.xyz.com

64.4 Restore Mode (img restore)

Use the Restore mode to retrieve an image from a specified location and put it down on a workstation.

You can restore an image of a workstation using either the bash prompt or using the ZENworks Imaging Engine menu. For step-by-step instructions, see Section 60.2, "Manually Putting an Image on a Workstation," on page 722. You can also use the Restore mode to restore an image from a partition on a local (writable) device, such as a hard disk or Jaz drive. For step-by-step instructions, see Chapter 61, "Setting Up Disconnected Imaging Operations," on page 727.

Normally, if the image to be put down is a base image (one created previously by the ZENworks Imaging Engine), all existing partitions except ZENworks Linux and Compaq configuration partitions are removed from all local writable devices (such as hard disks and Jaz drives) before the new image is put down. When the image is put down, the sizes of the original partitions from which the image was taken are preserved if possible. If there is insufficient space, the last partition is sized to fit unless it results in data loss, in which case the ZENworks Imaging Engine denies the requested operation. If there is extra space left after all partitions in the image have been restored to their original sizes, that space is left unpartitioned.

If the image to be put down is an add-on image (one produced from an Application object or created by the Image Explorer (imgexp.exe) utility), or if it's a base image and you specify the a*partition*:p*partition* parameter, none of the existing physical partitions are removed. Instead, the appropriate partitions are updated with the files from the image. The update process does not remove any existing files or overwrite any existing files of the same names if they are newer.

Restoring add-on images over 4 GB in size is not supported by Desktop Management imaging.

The syntax of this mode depends on whether you retrieve the image from a local device or from an Imaging (proxy) server, as explained in the subsections below:

- Section 64.4.1, "Restore from Local (img restorel)," on page 786
- Section 64.4.2, "Restore from Proxy (img restorep)," on page 788

64.4.1 Restore from Local (img restorel)

Use the Restore from Local mode to retrieve an image from a local device and put it down on the workstation. For more information, see Chapter 61, "Setting Up Disconnected Imaging Operations," on page 727.

Using the bash prompt, the following example explains the syntax and available parameters that you can use with the restorel "restore from local" parameter:

```
img restorel[pNumber] filepath [sfileset] [apartition:ppartition]
```

Commands

Table 64-5 *Img Restorl Parameters*

Parameter	Description
restorel[*pNumber*]	The partition number (as displayed by img dump) of the local partition to retrieve the image from. It must be a primary FAT16 or FAT32 partition. This partition is not changed by the imaging operation. If you omit the partition number from this parameter, the image is retrieved from the local ZENworks partition.
filepath	The filename of the image to retrieve, including the `.zmg` extension (case-sensitive) and the complete path from the root of the partition.
s*fileset*	The number of the image file set to put down. Valid values are 1 through 10. For information on creating file sets of an image, see Chapter 59, "Creating and Restoring Images," on page 711. If you omit this parameter, file set 1 is used.
a*partition*:p*partition*	A mapping between a partition in the image archive (a*partition*) and a target physical partition on the local machine (p*partition*). Use this parameter to selectively restore a specific part of the image to a specific local partition. **IMPORTANT:** If you use this parameter, none of the existing local partitions are removed, and only the target local partition is updated. The update process does not remove any existing files; however, any existing files of the same names are overwritten. If you want to remove all existing files from the target partition before updating it, first use img pd and img pc to delete and re-create the partition. For a*partition*, use the partition number displayed for the source partition in the Image Explorer (imgexp.exe) utility. For p*partition*, use the partition number displayed by img dump for the target partition. The target partition must be a Windows partition. You can repeat this parameter as needed to request multiple selective restorations in a single operation. In doing so, you can apply multiple parts of the image to a single local partition, but you can't apply the same part of an image to multiple local partitions in a single operation.

Examples

Table 64-6 *Img Restorl Examples*

Example	Explanation
`img restorel8 /imgs/` `dellnt.zmg`	Removes all existing local partitions except the one in slot 8, retrieves the image from `imgs/dellnt.zmg` in slot 8, and puts down the partitions and contents of that image on the available local writable devices. (This example assumes that there is sufficient local space and that slot 8 contains a primary FAT16 or FAT32 partition.)

Example	Explanation
`img restorel /imgs/` `dellnt.zmg`	Removes all existing local partitions, retrieves the image from `imgs/` `dellnt.zmg` in the ZENworks partition, and puts down the partitions and contents of that image on the available local writable devices, if there is sufficient space.
`img restorel /imgs/` `dellnt.zmg s2`	Removes all existing local partitions, retrieves the image from `imgs/` `dellnt.zmg` in the ZENworks partition, and puts down the partitions and contents of file set 2 of that image on the available local writable devices, if there is sufficient space.
`img restorel /imgs/` `dellnt.zmg a2:p1 a3:p1`	Retrieves the image from `imgs/dellnt.zmg` in the ZENworks partition, updates local partition 1 with the data from partitions 2 and 3 of that image, and leaves the other local partitions unchanged, if there is sufficient space in local partition 1.

64.4.2 Restore from Proxy (img restorep)

Use the Restore from Proxy mode to retrieve an image from an Imaging (proxy) server and put it down on the workstation. For more information, see Section 60.2, "Manually Putting an Image on a Workstation," on page 722.

Using the bash prompt, the following example explains the syntax and available parameters that you can use with the restorep "restore from proxy" parameter:

`img restorep` *address filepath* [s*fileset*] [a*partition*:p*partition*]

Commands

Table 64-7 *Img Restorp Parameters*

Parameter	Description
address	The IP address or DNS name of the ZENworks Imaging server to retrieve the image from. This can be any server running the Imaging Proxy service.
filepath	The UNC path to the image file to retrieve, including the image filename and the `.zmg` extension (case-sensitive). The format of the UNC path is as follows:
	`//`*servername*`/`*volume_or_share*`/`*path_to_store_images*`/` *imagename*`.zmg`
	For OES Linux, the path to the image file must be from root (/). For example, the path might look like:
	`//`*servername*`/media/nss/`*NSS_volume*`/`*path_to_image*`/` *imagefilename*`.zmg`
	Upon execution of `img restorep` at the cmd line, the *servername* portion of this path is replaced with the value in the address portion of this syntax.
	IMPORTANT: Because Linux doesn't recognize backslashes, you must use forward slashes in the UNC path or enclose the entire path in quotes.

Parameter	Description
s*fileset*	The number of the image file set to put down. Valid values are 1 through 10. For information on creating file sets of an image, see Chapter 59, "Creating and Restoring Images," on page 711.
	If you omit this parameter, file set 1 is used.
a*partition*:p*partition*	A mapping between a partition in the image archive (a*partition*) and a target physical partition on the local machine (p*partition*). Use this parameter to selectively restore a specific part of the image to a specific local partition.
	IMPORTANT: If you use this parameter, none of the existing local partitions are removed, and only the target local partition is updated. The update process does not remove any existing files or overwrite any existing files of the same names if they are newer. If you want to remove all existing files from the target partition before updating it, first use the Partition Mode (img p) to delete and re-create the partition.
	For a*partition*, use the partition number displayed for the source partition in the Image Explorer (imgexp.exe) utility. For p*partition*, use the partition number displayed by img dump for the target partition. The target partition must be a Windows partition. You can repeat this parameter as needed to request multiple selective restorations in a single operation. In doing so, you can apply multiple parts of the image to a single local partition, but you can't apply the same part of an image to multiple local partitions in a single operation.

Examples

Table 64-8   Img Restorp Examples

Example	Explanation
`img restorep 137.65.95.127 // xyz_server/sys/imgs/ dellnt.zmg`	Removes all existing local partitions, retrieves the image from `sys/ imgs/dellnt.zmg` on xyz_server, and puts down the partitions and contents of that image on the available local writable devices. (This example assumes that there is sufficient local space and that 137.65.95.127 is the IP address of xyz_server.)
`img restorep img.xyz.com //xyz_server/sys/imgs/ dellnt.zmg s2`	Removes all existing local partitions, retrieves the image from `sys/ imgs/dellnt.zmg` on xyz_server, and puts down the partitions and contents of file set 2 of that image on the available local writable devices. (This example assumes that there is sufficient local space and that img.xyz.com is the DNS name of xyz_server.)
`img restorep img.xyz.com //xyz_server/sys/imgs/ dellnt.zmg a2:p1`	Retrieves the image from `sys/imgs/dellnt.zmg` on xyz_server, updates local partition 1 with the data from partition 2 of that image, and leaves the other local partitions unchanged. (This example assumes that there is sufficient space in local partition 1 and that img.xyz.com is the DNS name of xyz_server.)

Example	Explanation

`img restorep img.xyz.com`
`//bogus/sys/imgs/`
`dellnt.zmg`
	Removes all existing local partitions, retrieves the image from `sys/`
	`imgs/dellnt.zmg` on img.xyz.com, and puts down the partitions and contents of that image on the available local writable devices. (This example assumes that there is sufficient local space, and that img.xyz.com is the DNS name of a server running the Imaging Proxy).

	Because the servername inside the UNC path is replaced by the address value defined earlier in the cmd line, //bogus becomes //img.xyz.com

64.5 Session (Multicast) Mode (img session)

Use the Session (Multicast) mode to take an image of one workstation and put it down on multiple other workstations simultaneously over the network in a single operation.

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

For step-by-step instructions of the different ways you can perform multicast sessions, see the following sections:

For multicasting to work, each participating workstation must boot from an imaging device and run the ZENworks Imaging Engine in this mode, as explained below. The workstation from which the image is taken is called the *master*, and the workstations that receive the image are called *participants*.

Starting in ZENworks for Desktops 4, you can start the multicast session from the ZENworks Imaging server. If you start the session this way, you specify an image file for multicasting rather than a workstation as the session master.

Using the bash prompt, the following example explains the syntax and available parameters that you can use with the session parameter:

```
img session name [master|client] [clients=count [t=minutes]]
```

Commands

Table 64-9 *Img Session Parameters*

Parameter	Description
name	The name of the multicast session. Each workstation joining the session uses the same value for this parameter.
	NOTE: The name must be unique among concurrent multicast sessions. It is hashed by the ZENworks Imaging Engine to produce a Class D IP address for the multicast session. To facilitate troubleshooting (wire sniffing), all Desktop Management Workstation Imaging multicast addresses start with 231. For example, the session name mcast01 produces the multicast address 231.139.79.72.
master|client	That this workstation is the session master or a session client.
	If you omit this parameter, the ZENworks Imaging Engine waits for a user on one of the workstations to press m to designate that workstation as the master, or for the imaging session to be started from the ZENworks Imaging server by selecting *Manually Start Multicast*, providing the required information, then selecting *Yes*.
clients=*count*	The number of participating workstations that must register with the master before imaging begins. The option applies only for session masters.
	If you omit this parameter, the ZENworks Imaging Engine waits for the master user to press g. After imaging has begun, any participating workstations attempting to register are denied.
time=*minutes*	The number of minutes the master workstation waits for the next participant to register before starting the imaging process without reaching *count* registered participants. The option only applies for session masters.
	If you omit this parameter, the imaging process won't start until *count* is reached or the master user presses g. After that, any participants attempting to register are denied.

Examples

Table 64-10 *Img Session Examples*

Example	Explanation
img session mcast01	Starts a multicast session named mcast01. Each successive workstation that issues this same command before the imaging begins joins the session. Imaging doesn't start until one of the users presses m to designate himself as master and presses g to start the imaging, or the imaging session is started from the ZENworks Imaging server by selecting *Manually Start Multicast*, providing the required information, then selecting *Yes*.
img session mcast01 m	Starts a multicast session named mcast01 and designates this workstation as the master. Each successive workstation that issues img session mcast01 before the imaging begins joins the session as a participant. Imaging doesn't start until the master user presses g.

Example	Explanation
`img session mcast01 master clients=5`	Starts a multicast session named mcast01. Each successive workstation that issues img session mcast01 before the imaging begins joins the session. Imaging doesn't start until one of the users presses m to designate himself as master, or until the imaging session is started from the ZENworks Imaging server by selecting *Manually Start Multicast*, providing the required information, then selecting *Yes*. Five other workstations must also register as participants before the session begins.
`img session mcast01 master clients=5 time=20`	Starts a multicast session named mcast01. Each successive workstation that issues img session mcast01 before the imaging begins joins the session. Imaging doesn't start until one of the users presses m to designate himself as master, or until the imaging session is started from the ZENworks Imaging server by selecting *Manually Start Multicast*, providing the required information, then selecting *Yes*. Either five other workstations must register as participants or more than 20 minutes must elapse between any consecutive participant registrations, whichever occurs first, and then the session begins.

64.6 Partition Mode (img p)

Use the Partition mode to activate (make bootable), add, or delete a partition on the workstation.

You can activate, add, or delete a partition using either ZENworks Imaging Engine menu or the bash prompt.

The Partition mode can be used in two ways:

64.6.1 Using the ZENworks Imaging Engine Menu

1 Enter `img` to display the ZENworks Imaging Engine menu, then click *Partitioning*.

2 Click *Modify Partitions*, then click an option.

Active: Select a partition that you want to activate (make bootable), then click *Active*.

Add: Opens the Create New Partition window. Click a partition type, partition size, and cluster size, then click *OK*.

Delete: Select a partition, then click *Delete*.

For more information, see the table in

64.6.2 Using the Bash Prompt

To use the Partition mode from the bash prompt:

1 From the bash prompt, enter:

`img p`*operation*

where *operation* is one of the following:

Operation	Description
pc*pNumber type* [*size*] [cluster=*clusterSize*]	Create a new partition, where: ◆ *pNumber* is the number of the partition slot (as displayed by img dump) in which to create the partition ◆ *type* is a keyword, FAT12, FAT16, FAT32, NTFS, or Extended, or a numerical value for the partition type, for example 0x0C (hexadecimal) or 11 (decimal) If you are creating an extended partition, you can create a logical drive inside of the extended partition. See the next table for an example. ◆ *size* is a valid size for the partition type in MB If you omit this parameter, the largest valid size for the partition type is used, given the available unpartitioned space on the drive. ◆ *clusterSize* is the cluster size for an NTFS partition. This parameter is not valid for any other partition type. Don't use this parameter unless you have a specific reason to do so. It must be a power of 2 (2, 4, 8, 16, ...128). If you omit this parameter, the ZENworks Imaging Engine uses a reasonable cluster size for the NTFS partition size. The new partition is recognizable by other operating systems, but must be formatted or have a base image restored to it before you can store files in it.
pd*pNumber*	Delete the partition from slot number *pNumber*. Use img dump to get the slot number.
pa*pNumber*	Activate (make bootable) the partition in slot number *pNumber*. Use img dump to get the slot number.

The following are examples:

Example	Explanation
img pc1 fat16	Creates a FAT16 partition in slot 1 using all of the available unpartitioned space on the drive.
img pc5 fat32 5671	Creates a FAT32 partition in slot 5 using 5,671 MB on the drive.
img pd3	Deletes the partition from slot 3.
img pa5	Activates (makes bootable) the partition in slot 5. (This assumes that a partition exists in that slot.)
img pc2 extended 2500 img pc2 NTFS 2000 cluster=1 img pc2 fat16 500	Creates an extended partition with a 2000 MB NTFS logical drive and a 500 MB FAT16 logical drive.
img pc1 NTFS 40% img pc2 NTFS 60%	Creates an extended partition using 40% of the available NTFS logical drive space and another partition using 60% (the remaining). This can be useful with scripted imaging.

64.7 ZENPartition Mode (img zenPartition)

Use the ZENPartition mode to enable, disable, or remove the installed ZENworks Workstation Imaging (Linux) partition.

1 Do one of the following:

- From the bash prompt, enter the following:

  `img zenPartition` *operation*

  where *operation* is enable, disable, or remove.

- Enter `img` to display the ZENworks Imaging Engine menu, click *Partitioning*, then click one of the following:

  Disable ZENworks partition

  Enable ZENworks partition

  Remove ZENworks partition

2 Enter `grub.s` to make this change effective.

IMPORTANT: If you remove an installed ZENworks partition, you must immediately restore a base image with a valid non-grub MBR (Master Boot Record). If you do not, the workstation is not able to boot properly.

64.8 Dump Mode (img dump)

Use the Dump mode to view information about the storage devices and partitions on the workstation.

1 Do one of the following:

- Enter `img` to display the ZENworks Imaging Engine menu, click *System information*, then click *Drive information*.

- Enter the following:

  `img dump [geo]`

  where:

Parameter	Action
dump	Lists the existing partitions on all local hard drives. For each partition, the type, size, and slot number of the partition are given.
	The ZENworks partition and Dell or Compaq configuration partitions are not listed.
geo	Displays additional information about the geometry (cylinders, heads, and sectors) and capacity of each hard drive.

Examples:

Example	Explanation
`img dump`	Lists the current partitions on all local writable devices.
`img dump geo`	Lists all hard drives, their geometry and capacity, and the current partitions on the writable devices.

64.9 Information Mode (img info)

Use the Information mode to view the following:

- The data currently stored in the image-safe area on the workstation

  This data is saved by the ZENworks Imaging Windows Agent during each Windows session to ensure that it can be restored after the workstation is reimaged. If the workstation is new and doesn't have Windows yet, an initial set of data is supplied from an eDirectory policy via the ZENworks Imaging server to the ZENworks Imaging Engine when the first base Windows image is put down. (For more information, see Section 58.1, "Defining an Imaging Policy for Unregistered Workstations (Server Policy)," on page 705.)

- Information about the hardware devices on the workstation

  This information is detected during the imaging boot process. If the ZENworks Imaging Engine runs in auto-imaging mode, this information is sent to the ZENworks Imaging server to help determine which image to put on the workstation, if necessary.

- Name of the base image that was last put down on the workstation

To use the Information mode:

1 Enter `img` to display the ZENworks Imaging Engine menu, click *System Information*, then click *Image-Safe Data* or *Detected Hardware* (see the table below for details).

or

Enter the following from the bash prompt:

`img info [zisd]`

IMPORTANT: Image-safe data is not supported on Linux workstations.

Menu Item or Parameter	Description

System Information > Detected Hardware
 	
or
 	
info from the bash prompt
	Lists the detected hardware devices on the workstation, including:
	    ◆ CPU chipset
	    ◆ BIOS asset tag
	    ◆ BIOS serial number
	    ◆ Video adapter
	    ◆ Network adapter
	    ◆ MAC address
	    ◆ Sound card
	    ◆ Hard drive controller
	    ◆ Hard disk capacity
	    ◆ Detected RAM
	    ◆ Boot media

System Information > Image-Safe Data or zisd from the bash prompt	Lists the data currently stored in the image-safe area on the workstation. The items that comprise this data are listed in Section 63.2, "ZENworks Imaging Windows Agent (Ziswin.exe)," on page 751. In addition to the image-safe data, the last base image that was put down on the workstation is also listed.

Example	Explanation
img info	Lists the detected hardware devices on the workstation.
img info zisd	Lists the Desktop Management image-safe data currently stored on the workstation and the last base image that was put down.

Updating ZENworks Imaging Resource Files

65

In Novell® ZENworks® 7 Desktop Management, you can manually update ZENworks imaging resource files.

The following sections provide concepts on how the boot process works with ZENworks imaging, and instructions for updating imaging resource files:

65.1 The Linux Distribution for Imaging

ZENworks Imaging uses a small Linux distribution on the client device to perform imaging operations. The distribution shipping with ZENworks 7 is based on the SUSE® installation system, where SUSE Linux or SUSE Linux Enterprise Server (SLES) boot to a small distribution to perform a YaST installation. ZENworks Imaging uses the same installation system found in SLES, but instead of starting a YaST installation, it starts a ZENworks Imaging session.

In ZENworks 6.5 SP1 and earlier, Linux kernel 2.4.x is used in the customized distribution; in ZENworks 6.5 SP2 the kernel is updated to 2.6 and is a SLES-based distribution.

Using a stable Linux distribution based on SLES gives customers a distribution with the broadest range of stable drivers available. The hardware industry is continually introducing new and updated network and disk drivers, so it's not always possible to provide the latest drivers in its software releases.

This section covers how to update Linux drivers using the new distribution. It deals with the Imaging resource files that are based on the SLES distribution and ZENworks Preboot Services processing.

NOTE: The PXE (Preboot Execution Environment) environment provided by PreWorX, used in ZENworks 6.5 SP1 and earlier for Windows and NetWare® servers, has been modified for ZENworks 7 to support the SLES-based ZENworks Imaging distribution. Linux servers use Novell's internally-developed PXE solution.

The PXE process based on PreWorX files differs from Novell's solution. For example, PreWorX uses a combination of Caldera DOS, the linld Linux loader program, and `.cmd` configuration files

for passing parameters to the Linux kernel. Novell's PXE solution is based on the pxelinux boot loader and `.cfg` configuration files. PreWorX-specific information is not included in this imaging resource files section.

65.2 Understanding Device Boot Processes in a ZENworks Imaging Environment

The following provides a high-level overview of a Linux boot process and how ZENworks 7 imaging affects it:

1. A boot loader program loads the Linux kernel and `initrd` (initial RAM drive) into memory.

   The SLES-based imaging distribution uses `isolinux` as the boot loader for imaging CDs, a modified `pxelinux` for booting using PXE, or `linld.com` when using a single diskette with the CD. If you have a ZENworks partition installed, it uses the grub program to boot alternately between the ZENworks partition and the installed operating system.

   The following provides the current paths and filenames and a historical comparison:

Files	ZENworks 6.5 SP1 and Earlier	ZENworks 7 NetWare and Windows Servers [1]	ZENworks 7 Linux Servers [2]
Preboot Loader	Does the following: • Loads DOS • Runs `loadlin`	CD boot: `isolinux` PXE boot: `linld.com`	CD boot: `isolinux` PXE boot: `/srv/tftp/pxelinux.0`
Linux Kernel Name	CD boot: `kernel` PXE boot: `linux.1` Diskette: `kernel.zen`	CD boot: `\boot\loader\linux` PXE boot: `\tftp\boot\linux`	CD boot: `/boot/loader/linux` PXE boot: `/srv/tftp/boot/linux`
Initrd Filename	CD boot: `initrd.gz` PXE boot: `linux.2` Diskette: `initrd` (on the second diskette)	CD boot: `\boot\loader\initrd` PXE boot: `\tftp\boot\initrd`	CD boot: `/boot/loader/initrd` PXE boot: `/srv/tftp/boot/initrd`

   [1] The same as ZENworks 6.5 SP2.

   [2] The same as ZENworks 7 Linux Management.

2. The Linux kernel starts running, does some device driver setup, then mounts the `initrd` file system.

   Regardless of which boot loader method is used, the main purpose is to set up the `initrd` file as a RAM drive, load the Linux kernel into memory, then turn control over to it with an indication to the Linux kernel of where to find `initrd`.

3. The Linux kernel turns control over to linuxrc for performing initial hardware detection. When finished, control is returned to the Linux kernel.

   NOTE: ZENworks 6.5 SP1 and earlier imaging contains a `linuxrc` script file that performs some initial setup, but not the hardware detection.

4. The Linux kernel starts a background process (`/sbin/init`).

   After control is passed to the linuxrc program, control is never returned to the Linux kernel or passed on to the init process.

   NOTE: ZENworks 6.5 SP1 and earlier use the init process to perform the imaging. All ZENworks imaging processing is performed within the linuxrc process. For this reason, some of the standard processes you are familiar with do not work or exist in ZENworks 7 imaging.

   For example, the `halt` and `reboot` commands are different. In a fully-installed Linux system, `reboot` actually performs an init 6 call. Because init is not running during the ZENworks 7 imaging process, an init 6 call cannot be made. Therfore, `reboot` has been aliased to `reboot -r`, which forces a reboot without trying to call init.

   Most other commands do run from the bash prompt, because bash is running.

For more information on `linuxrc` and `zenworks.s`, review the following sections:

65.2.1 linuxrc

When control is turned over to linuxrc, there are several processes it performs to get the system ready for the imaging process. Linuxrc is initially configured from the `/linuxrc.config` file, which is located in the `initrd` file system. Additional configuration information for linuxrc can be placed in the `/info` file (located in the `initrd` file system), but ZENworks does not normally use this information.

Linuxrc also loads a `root` file system, which is combined with the `initrd` file system that is set up by the boot loader. The `root` file system is located on an imaging CD as the file `/boot/root`. For PXE booting, the `root` file system is stored on the ZENworks Imaging server as:

- **NetWare/Windows servers:** `\tftp\boot\root`
- **Linux servers:** `/srv/tftp/boot/root`

Linuxrc attempts to locate and load the `settings.txt` file, either on the root of the imaging CD, or on the ZENworks Imaging server in the TFTP directory. From `settings.txt`, linuxrc reads and processes any parameters that pertain to itself, then copies `settings.txt` to the root (`/`) of the file system.

65.2.2 zenworks.s

A normal SUSE installation for SUSE Linux or SLES boots to a small distribution to perform a YaST installation. ZENworks Imaging boots with the same installation system, but instead of starting a YaST installation, it starts the ZENworks Imaging process. Control is turned over to the ZENworks script `/bin/zenworks.s`, which is the main script file for ZENworks imaging processing. The script performs a certain number of setup tasks, then gives control to the appropriate script for the selected imaging process. For more information on the imaging process, see Section 56.1, "Understanding Desktop Management Preboot Services," on page 649.

One of the setup tasks is to apply any update files. When booting from a CD, `zenworks.s` copies the `/addfiles` directory structure to the Linux file system. For more information, see Section 65.4.1, "Adding Files to an Imaging Boot CD," on page 802.

65.2.3 Forcing a Reboot in an Imaging Script

If you are using a script to image a device, in order for the device to reboot properly during the init process, you need to include the `reboot -f` command in this script. The `-f` switch forces a reboot, even if init cannot be found.

Using `reboot` without a switch, or even using `shutdown -h now`, causes errors in rebooting.

65.3 Understanding ZENworks Partitions and Command Line Parameters

The following sections provide an understanding of the ZENworks partition and imaging commands that are used when updating Linux drivers:

- Section 65.3.1, "The ZENworks Partition," on page 800
- Section 65.3.2, "Command Line Parameters and Variables," on page 800

65.3.1 The ZENworks Partition

The ZENworks partition is used to store the files required to load Linux into RAM, making the result similar to using a CD or PXE boot method. The ZENworks partition has a similar boot media layout as an imaging CD.

NOTE: To provide additional imaging functionality, ZENworks has changed the way it uses the ZENworks partition. In ZENworks 7, the partition is no longer mounted as the `root` file system and has a minimum size of 150 MB. In ZENworks 6.5 SP1 and earlier, the partition is mounted and used as the Linux `root` file system with a minimum size of 100 MB.

The files stored on the ZENworks partition are `/boot/loader/linux`, `/boot/loader/initrd`, and `/boot/root`, which are the same directories as on the imaging CD. In ZENworks 7, the boot loader continues to be grub, which loads Linux as described under Section 65.2, "Understanding Device Boot Processes in a ZENworks Imaging Environment," on page 798. The `settings.txt` file is searched for and loaded from the ZENworks partition.

If you need to modify the Linux files, you must modify the `initrd` or `root` file sets the same way as you would for other boot methods. For information, see Section 65.4.2, "Adding Files to the Initrd or Root File Systems," on page 802.

65.3.2 Command Line Parameters and Variables

There are four types of command line parameters that can be used with the ZENworks imaging process. They are entered manually on the command line when booting from a CD or they can be placed in the `isolinux.cfg` file located in the `/boot/loader` directory. The commands are

also located in the `*.cfg` files for PXE and are located in the `/srv/tftp` directory on the ZENworks Imaging server.

- **Kernel parameters:** The valid parameters for the Linux kernel are found in the `/Documentation/kernel-parameters.txt` file that is installed with the kernel source.

  Some devices have a faulty BIOS, where you must turn off ACPI processing for the kernel to load properly. To do this, use the kernel parameter acpi=off. For more information, see Novell Support (http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=10099330&sliceId=&dialogID=1284337&stateId=1%200%20548668).

- **Linuxrc parameters:** These parameters affect the way linuxrc detects hardware or sets hardware settings. They are described briefly in the `/usr/share/doc/packages/linuxrc/linuxrc.html` file in a Linux system.

  Linuxrc parameters can be found in the `/linuxrc.config` or `/info` files that reside in the `initrd` file system. Some parameters can be placed in the `settings.txt` file that is located on the root of the imaging CD or ZENworks partition, or in the `/srv/tftp/boot` file for PXE booting.

  Parameters that can be placed in the `settings.txt` file (the easiest file to edit) are limited. During PXE booting, parameters that affect the network are not processed from `settings.txt`, because by the time linuxrc loads the `settings.txt` file, the network is already set up. Network settings can be placed in the `settings.txt` file when booting from an imaging CD, because it is loaded early enough in the process to take effect.

- **ZENworks variables:** Some environment variables affect the way imaging performs. They can be configured in any file, but should normally be configured in the `settings.txt` file.

  If you add variables to the `settings.txt` file that were not originally defined there, you must export the variable. For example, in the `settings.txt` file, enter:

  `export IMGCMD="myscript"`

  A list of all image engine or script variables is listed under Section 65.7, "Variables and Parameters," on page 808.

- **Other variables:** Environment variables that you might want in your script can be added in the same manner as described for the ZENworks variables.

65.4 Modifying ZENworks Imaging Resource Files

From time to time you might want to modify an imaging distribution by adding your own files. These can be additional programs, scripts, data files, or updated Linux drivers.

You can use the following methods to update imaging resource files:

- The easiest method is to edit the `settings.txt` file, which is located on the root of the imaging CD or in `/srv/tftp/boot` on the ZENworks Imaging server for PXE booting.

- Where you are using a ZENworks partition, you can boot to the manual or maintenance mode, mount the ZENworks partition, then copy the modified `settings.txt` and the files in `initrd` or `root` to the mounted ZENworks partition.

- Another easy method is to edit the `.cfg` files located in `/srv/tftp` on the ZENworks Imaging server for PXE booting. This method is only available for Linux imaging servers, because the configuration files are provided by Novell's version of PXE.

- You can modify files in the `initrd` or `root` file systems, but you need a Linux environment for performing the modification process. Files required during the initial setup (during linuxrc processing time), such as LAN drivers, must be placed in the `initrd` file system. Other files that are not needed until the `zenworks.s` script file takes control can be placed in the `root` file system (for example, an imaging script).

   This method is discussed in this section.

The following sections provide various methods for modifying imaging resource files:

65.4.1 Adding Files to an Imaging Boot CD

If you have files to add to an imaging boot CD so they can be available for use when you get to the actual imaging process (such as scripts, but normally not driver modules), you can copy the files to the `/addfiles` directory on the imaging CD. This is an easy way to insert your script or other files into the distribution without modifying the `initrd` or `root` file systems. However, these files are not available during the boot and module loading phases.

The imaging boot CD has a directory named `/addfiles` where you can add files. They should be placed below this directory in their proper directory names. They are then available in this directory structure during the imaging process.

An example of how you can add files:

1 If you want to execute your own script instead of the normal imaging process, create a script file named `myscript.s` and place it on the boot CD. For example, `/addfiles/bin/myscript.s`.

> **IMPORTANT:** The script file must have proper LF line terminators that Linux requires, not the DOS CR and LF end-of-line characters. In other words, you cannot use `Notepad.exe` to create the script; you must use a text editor compatible with Linux, such as TextPad.

2 To place the following line in the `settings.txt` file, enter:

`export IMGCMD=/bin/myscript.s`

When imaging is run, it runs `/bin/myscript.s` instead of using the normal `img auto` command.

65.4.2 Adding Files to the Initrd or Root File Systems

This is the preferred method for updating imaging resource files, and must be performed in a Linux environment.

Before performing the procedure given below, make sure you have created backup copies of any files you plan to change, specifically the `/srv/tftp/boot/initrd` file. If you want to change the files on an imaging CD, you need an ISO editor or some other process for extracting and replacing the file in the `bootcd.iso` image file.

IMPORTANT: When updating or adding files and Linux drivers in the `initrd` or `root` file systems, document the changes you make. When you receive updated resource files from Novell, they do not contain your customized changes. If the kernel version has changed with the newer resource files from Novell, previously added drivers must be updated either by obtaining a new version from the manufacturer or recompiling the driver using the correct Linux kernel version source.

Adding to Initrd

To modify the `initrd` file system:

1 Using a Linux device, create a working directory and change to that directory.

2 To copy initrd from the PXE server or the boot CD to the new working directory:

- For PXE, copy `/tftp/boot/initrd` to the Linux workstation's working directory.

- For the CD, extract `initrd` from the `/boot/i386/loader` directory on the boot CD, then copy the extracted `initrd` to the Linux workstation's working directory.

3 To rename `initrd` to `initrd.gz`, enter:

```
mv initrd initrd.gz
```

4 To unzip the `initrd.gz` file, enter:

```
gunzip initrd.gz
```

5 To create another working directory for use as a mount point in the subsequent steps, enter:

```
mkdir work
cd work
```

6 To extract `initrd` into the `/work` directory, enter:

```
cpio -idmuv < ../initrd >/dev/null 2>&1
```

7 To copy your files or updated driver to the extracted `initrd` file system, enter:

```
cp /your_path/module.ko work/lib/modules/2.6.5-override-default/
initrd
```

where *your_path* is the path to the *module*.ko file and *module* is the name of the module.

Other files to be included in the `initrd` file system should be copied to the appropriate directory.

8 To re-package the `initrd` file system, enter:

```
cd work
find . | cpio --quiet -o -H newc > ../initrd
cd ..
```

9 To zip the new `initrd` file, enter:

```
gzip -v9c initrd > initrd.gz
```

10 To rename `initrd.gz` back to `initrd`, enter:

```
mv initrd.gz initrd
```

11 To copy the file back:

- For PXE, copy the updated `initrd` file to the `/tftp/boot` directory on the PXE server.

- For the CD, copy the updated `initrd` file to the `/boot/i386/loader` directory on the boot CD.

Adding to Root

To modify the `root` file system:

1 Using a Linux device, create a working directory and change to that directory.

2 To copy `initrd` from the PXE server or the boot CD to the new working directory:

- For PXE, copy `/tftp/boot/initrd` to the Linux workstation's working directory.

- For the CD, extract `root` from the `/boot/i386/` directory on the boot CD, then copy the extracted `root` to the Linux workstation's working directory.

3 To rename `root` to `root.gz`, enter:

`mv root root.gz`

4 To unzip the `root.gz` file, enter:

`gunzip root.gz`

5 To create another working directory for use as a mount point in the subsequent steps, enter:

`mkdir work`

6 To mount the `initrd` file system to the `/work` directory, enter:

`mount -o loop root work`

7 To copy your files or updated driver to the mounted `root` file system, enter:

`cp /your_path/module.ko work/lib/modules/2.6.5-override-default/initrd`

where *your_path* is the path to the *module*.`ko` file and *module* is the name of the module.

Other files to be included in the `initrd` file system should be copied to the appropriate directory.

8 To unmount the `root` file system, enter:

`umount work`

9 To zip the new `rrot` file, enter:

`gzip -v9c root > root.gz`

10 To rename `root.gz` back to `root`, enter:

`mv root.gz root`

11 To copy the file back:

- For PXE, copy the updated `root` file to the `/tftp/boot` directory on the PXE server.

- For the CD, copy the updated `root` file to the `/boot/i386/` directory on the boot CD.

65.5 Adding or Updating LAN Drivers

As LAN card manufacturers develop and release new LAN adapters, they usually release new or updated drivers as well. Sometimes the new LAN card functions properly with an earlier driver, and sometimes the earlier driver does not recognize the new LAN card and refuses to load. Occasionally,

the older driver does load, but the LAN card exhibits serious performance problems. To obtain the full performance capabilities of a new LAN card, you should use the new driver.

The following sections explain how to obtain or compile drivers:

65.5.1 Obtaining Drivers

New LAN drivers should be obtained from the manufacturer. Most LAN card manufacturers have drivers available for free downloading from their Web site. Some drivers are available from www.scyld.com/network, and the source to the Broadcom BCM5700 driver can be downloaded from http://www.broadcom.com/drivers/downloaddrivers.php.

If a manufacturer has a binary driver compiled specifically for the kernel version used by ZENworks, you can obtain the driver and use one of the update methods to add the driver. ZENworks 7 is based on SLES 10 SP1, kernel version 2.6.16.46-0.12. If the driver is not for this specific version, you must obtain the source and compile it for this version. For more information, see Section 65.5.2, "Building Drivers," on page 805.

65.5.2 Building Drivers

Nearly all Linux drivers are distributed in source code form and need to be compiled before they can be used. Follow the manufacturer's instructions included with the new driver to build the driver module. Many drivers can be built in such a way that they are built into the kernel itself; however, we recommend that LAN drivers be built as external kernel modules.

When building your LAN drivers, make sure that your build machine uses the same kernel as the imaging environment. If you have a LAN driver that doesn't load in your imaging environment, it usually means that you have a mismatch between your build environment and the imaging environment.

You can find the current kernel version of your Linux environment by using the following command:

```
uname -r
```

However, you might need to modify the results from the `uname` command to get your kernel versions to match. For more information, see Section 65.6, "Using Uname," on page 807.

To build your drivers:

Obtaining the Linux Source Code Tree

To compile a module, you need the Linux source code tree that contains the configuration matching the ZENworks kernel.

To use the Linux source code tree:

1 To obtain the necessary source code, download the `linux-2.6.16.46-0.12-pulsar.tgz` Linux source code tree file (http://download.novell.com/Download?buildid=co6fQyGvW1k~).

2 Unzip the file and install the source code tree in the `/usr/src` directory.

For example, the tar file creates the following directories:
```
/usr/src/linux-2.6.16.46-0.12
/usr/src/linux-2.6.46-0.12-obj
```

3 To create a link to the source tree:

3a To change to the `/usr/src` directory, enter:
```
cd /usr/src
```

3b If there is a Linux soft link in the directory, delete it.

3c Create the Linux soft link, such as:
```
ln -s linux-2.6.16.46-0.12 linux
```

After you have the Linux kernel source tree and soft link ready for compiling the module, continue with "Compiling the Module" on page 806.

Compiling the Module

1 Install the source.

Follow the instructions supplied from the manufacturer to install the source.

Normally, the module source is in a directory under `/usr/src`. Module source files usually come in the form of a gzipped tar file (`.tar.gz` or `.tgz`). The file might also be a bzipped file (`.bz2`).

2 To compile the source:

2a Change directories to the source.

2b If you modified `uname` to change to the proper kernel version, issue a `make` command.

3 When you have your module compiled for ZENworks, take the generated `.ko` module file (make sure you select the proper module name and not a work `.ko` file) and install it by placing it in the `initrd` file system.

65.5.3 Loading Existing Drivers

If there is a module that you want to load during the linuxrc processing time, and if linuxrc does not recognize that it needs to be loaded, or you want to specify the load parameters, you can enter a line in the `linuxrc.config` or `/info` file. This file then needs to be updated in the `initrd` file system.

Open the configuration file and add the following line:
```
modprobe="modulename"
```

or
```
insmod="modulename.ko"
```

where *modulename* is the name of an existing driver.

Then copy the module to your modules directory.

65.5.4 Loading Drivers with Parameters

You might need to load a LAN driver module with specific parameters. You can do this with a line like:
```
insmod="modulename parm=xxx"
```

where `parm=` provides identification of the parameter.

This type of line is most commonly used to load a LAN driver with specific parameters, such as full duplex or specific speed.

65.6 Using Uname

The `uname` command enables you to find the current kernel version of your Linux environment. However, you might need to modify the results from the `uname` command to get your kernel versions to match.

The following steps modify the `uname` command to provide the value you need:

1 To obtain your current kernel version, enter:
```
uname -r
```

Write down the version number so you can use it in Step 4. This example uses version 2.6.13-15-smp from a SLES 9 SP2 installation.

2 To create a new directory, enter:
```
mkdir /bin/orig
```

3 To move the `uname` binary to the `/bin/orig` directory that you just created, enter:
```
mv /bin/uname /bin/orig/uname
```

4 Use a Linux editor (such as vi) to create the `/bin/uname` file that contains the following lines:
```
#!/bin/sh
if [ $KRNLVERSION"a" = "a" ] ; then
        if [ $(/bin/orig/uname -r) = "2.6.13-15-smp" ] ; then
                export KRNLVERSION=2.6.13-15-smp
        else
                export KRNLVERSION=2.4.31
        fi
fi
if [ $1"a" = "-ra" ] ; then
        echo $KRNLVERSION
else
        /bin/orig/uname $*
```

```
fi
```

IMPORTANT: Replace the string "2.6.13-15-smp" with the version you found in Step 1.

5 To make the new `uname` command script executable, enter:

```
chmod +x /bin/uname
```

6 Enter the following to cause the `uname -r` command to return a specific version, such as when compiling a module:

```
export KRNLVERSION="2.6.5-7.191"
```

7 Following the manufacturer's directions, compile the module using the appropriate `make` command.

8 Reset `uname` so that it returns actual values:

```
unset KRNLVERSION
```

65.7 Variables and Parameters

The following sections describe the variables and parameters used in updating resource files:

65.7.1 Imaging Script Variables

The following environment variables are used in imaging scripts and must not be modified:

Table 65-1 *Imaging Script Variables*

Variable	Definition
ACTIVEPARTITION	Device of the active OS partition.
CDBOOT	YES = Booted from a CD.
DISABLEZEN	1 = Disable the ZENworks partition.
ENABLEZEN	1 = Re-enable the ZENworks partition.
ZENDEVICE	Device name of the ZENworks partition.
ZENPARTBOOT	YES = Booted from ZENworks partition.

The following environment variables can be modified or set in the `settings.txt` file:

Table 65-2 *Environment Variables*

Variable	Definition
HDPARM	NO = Do not set hdparm parameters.
IMGCMD	Imaging command to run instead of the `img a` command.

Variable	Definition
MANUALREBOOT	YES = Do not automatically reboot.
PARTITIONSIZE	Size in MB to create the ZENworks partition.
PROXYADDR	IP/DNS address of the ZENworks Imaging server.
PROMPT	Go to the bash prompt after imaging is complete.

65.7.2 Linuxrc Parameters Specified in Settings.txt

Table 65-3 *Linuxrc Parameters*

Variable	Definition
netsetup	dhcp = Use DHCP.
	1 = Static IP.
HostIP	Static IP address to use.
NetMask	Network mask.
Gateway	Network gateway.
HostName	Host name to assign.
Nameserver	DNS name server.
Domain	Domain suffix.
NetDevice	ethx = Define which network device to configure.

65.7.3 Image Engine Variables

Table 65-4 *Image Engine Variables*

Variable	Definition
DEVELOPER_LOG	"A" creates a verbose `imglog` debug file.
ZENIMGLOG	"A" creates a less verbose `imglog` debug file.
ZEN_IGNORE_GEO_MISMATCH	Ignore geometry device mismatches when restoring raw image formats.
NOABORTBUTTON	If defined, do not display the Abort button during imaging.

65.8 Troubleshooting Linux Driver Problems

65.8.1 Troubleshooting During the Boot Process

While booting ZENworks imaging, there are several things that you can do to help troubleshoot if there is a problem:

- Press Esc to see the kernel messages. Usually, messages are shown for failures.
- Screen 3 (press Alt+F3) is used to show the progress of the linuxrc process. It lists progress results, what linuxrc is doing, which modules are loaded, and so on.
- Screen 4 (press Alt+F4) is used to show output from the modules during the linuxrc process.
- Screens 1 (press Alt+F1), 3, and 4 can be used to help determine which part of the process is failing or causing a problem.
- Screens 3 and 4 indicate which drivers are loaded.
- If a drive is loaded properly but fails in some way, view screen 4 to see if there is an outdated driver.

If the boot process fails, the first command line parameter to use is acpi=off.

65.8.2 Troubleshooting at the Bash Prompt

When the bash prompt is displayed, there are a few tools that you can use to gather information about the hardware:

- **hwinfo:** This utility is used by linuxrc to load hardware. You can use `hwinfo -pci` to determine exactly what hardware was recognized.

  Pipe to "less," because `hwinfo` can create a lot of output. For example, `hwinfo -pci | less`.

  If you need to contact Novell Support for help, you should capture the output from `hwinfo -pci` to a file for their use. You can gather the most information with this command:
  ```
  hwinfo –pci –log /logfilename
  ```
  where *logfilename* is the name of the file that you should send.

  You can then mount a device, such as a thumb drive or other USB device, and save the output file for later use. You might also be able to use FTP to save the file where it can be available.

- **ethtool:** This is a valuable tool (contained in a ZENworks distribution) that can be used to change the configuration on most Ethernet network devices. See the online help for information on using the ethtool utility.

Supported Ethernet Cards 66

Novell® ZENworks® 7 Desktop Management provides the Ethernet card drivers contained in the Linux kernel (2.6) that ships with ZENworks 7.

To determine which Linux kernel you are using, enter `uname -r` at the bash prompt.

If your workstation or laptop computer uses a different card that is not supported, you must supply your own Ethernet driver.

Accessing IP Addresses for Devices Running Dual NICs

67

To automatically obtain an IP address for a device running dual NICs, you can modify the `/srv/tftp/z_auto.cfg` or the `/srv/tftp/z_maint.cfg` file (or both) by adding the following line at the end of the *Append* command:

```
netdevice=eth0
```

This eliminates the need to manually select a NIC's IP address.

Documentation Updates

K

This section contains information on documentation content changes that were made in this *Administration Guide* after the initial release of Novell® ZENworks® 7 Desktop Management. The information can help you to keep current on updates to the documentation.

All changes that are noted in this section are also made in the documentation. The documentation is provided on the Web in two formats: HTML and PDF. The HTML and PDF documentation are both kept up-to-date with the documentation changes listed in this section.

The documentation update information is grouped according to the date the changes are published. Within a dated section, the changes are alphabetically listed by the names of the main table of contents sections in the guide.

If you need to know whether a copy of the PDF documentation you are using is the most recent, the PDF document contains its publish date on the front title page.

The documentation was updated on the following dates:

K.1 December 14, 2007

The following changes were made:

Location	Change
Section 56.4, "Deploying Desktop Management Preboot Services in a Routed or Subneted Network Environment," on page 665.	Changed the title from *Deploying Desktop Management Preboot Services in a Network Environment* to *Deploying Desktop Management Preboot Services in a Routed or Subneted Network Environment*.
"Accessing the Preboot Services Menu Editor" on page 695.	Corrected the steps to access the Menu Editor.

Location	Change
"Using Uname" on page 807.	Corrected the shell script by removing #Uname from the first line of the script.

K.2 September 7, 2007 (Support Pack 1, Interim Release 1)

The following changes were made:

Location	Change
Part VI, "Workstation and Server Imaging," on page 633	Because the Linux kernel for Imaging has been updated to version 2.6.16.46-0.12 (based on SUSE Linux Enterprise Server 10 SP1), all documentation references to lilo have been replaced with grub.
Section 65.5.2, "Building Drivers," on page 805	Updated the information for the new SLES 10 SP1 distro (2.6.16.46-0.12).

K.3 June 15, 2007

Updates were made to the following guide sections:

- Section K.3.1, "Imaging Utilities and Components," on page 816

K.3.1 Imaging Utilities and Components

The following changes are made in this section:

Location	Change
Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766	Modified the configuration instructions and the example for the netsetup parameter in the settings.txt file.

K.4 March 23, 2007

Updates were made to the following guide sections:

- Section K.4.1, "ZENworks Imaging Engine Commands," on page 816

K.4.1 ZENworks Imaging Engine Commands

The following changes are made in this section:

Location	Change
"Obtaining the Linux Source Code Tree" on page 806	Updated the URL to the Linux source code tree file.

K.5 February 9, 2007

Updates are made to the following guide sections:

- Section K.5.1, "Using ZENworks Desktop Management Preboot Services," on page 817
- Section K.5.2, "Updating ZENworks Imaging Resource Files," on page 817

K.5.1 Using ZENworks Desktop Management Preboot Services

The following changes are made in this section:

Location	Change
Section 56.4.2, "Network Configuration," on page 668	Modified Step 4j on page 675 to identify the path to the `/tftp` folder and to delete references to some files that are no longer included in the product.

K.5.2 Updating ZENworks Imaging Resource Files

The following changes are made in this section:

Location	Change
Section 65.4.2, "Adding Files to the Initrd or Root File Systems," on page 802	Updated the instructions for adding files to `initrd`. Also removed the section on the `driverupdate` file, as it is not currently applicable.

K.6 December 29, 2006

Updates are made to the following guide sections:

- Section K.6.1, "ZENworks Imaging Engine Commands," on page 817

K.6.1 ZENworks Imaging Engine Commands

The following changes are made in this section:

Location	Change
Section 64.6.2, "Using the Bash Prompt," on page 792	Added the example for creating partitions by a percentage, which is useful with scripting images.

K.7 October 30, 2006

Updates are made to the following guide sections:

- "Updating ZENworks Imaging Resource Files" on page 818

K.7.1 Updating ZENworks Imaging Resource Files

The following changes are made in this section:

Location	Change
Section 65.2, "Understanding Device Boot Processes in a ZENworks Imaging Environment," on page 798	Corrected a table entry. For the *PXE boot* entry in the Preboot Loader row and ZENworks 7 Linux Servers column, replaced `linld.com` with `/srv/tftp/pxelinux.0`.
Section 65.2.3, "Forcing a Reboot in an Imaging Script," on page 800	Added this section, which explains how to use the `reboot -f` command.
Section 65.5.3, "Loading Existing Drivers," on page 806	Added this section, which explains how to add existing drivers. Also updated the next section (Section 65.5.4, "Loading Drivers with Parameters," on page 807), which is related to the information in this new section.

K.8 August 16, 2006

Updates are made to the following guide sections:

K.8.1 Imaging Utilities and Components

The following changes are made in this section:

Location	Change
Section 63.6, "Imaging Boot Parameters"	Removed this section, as the boot parameters listed there do not apply to ZENworks 7.

K.8.2 Preparing an Imaging Boot Method

The following changes are made in this section:

Location	Change
Section 55.2, "Preparing Imaging Boot CDs or DVDs," on page 642	Updated this section by splitting it into two subsections to cover the issues for creating boot CDs/DVDs with or without other files than the imaging boot ISO provided with ZENworks.

K.8.3 Updating ZENworks Imaging Resource Files

The following changes are made in this section:

Location	Change
Section 65.4.2, "Adding Files to the Initrd or Root File Systems," on page 802	Replaced the `cp` command with `mv` in Step 3 and Step 10 because the files should be renamed, not copied.
"Obtaining the Linux Source Code Tree" on page 806	Updated the method for obtaining the necessary source code and `config.gz` file to a URL where the `.tgz` file can be downloaded. Also removed references to TID 10091818 as it no longer applies.

K.9 July 14, 2006 (Support Pack 1)

Many updates too numerous to mention here concerning the use of Linux servers in Preboot Services imaging are made to the Workstation and Server Imaging section of this *Administration Guide.* The following sections detail some of those changes.

Updates are made to the following guide sections:

- Imaging Utilities and Components
- Multicasting Images
- Preparing an Imaging Boot Method
- Preparing a ZENworks Imaging Server
- Server Imaging
- Using ZENworks Desktop Management Preboot Services

K.9.1 Imaging Utilities and Components

The following changes are made in this section:

Location	Change
Section 63.5, "Imaging Configuration Parameters (Settings.txt)," on page 766	Removed the following information from the end of this section and replaced it with the new information contained in Chapter 67, "Accessing IP Addresses for Devices Running Dual NICs," on page 813:
	If you have problems obtaining an IP address for a workstation running dual NICs, put the following line in the `settings.txt` file:
	export VALIDATE_NIC=$PROXYADDR
	This line in the `settings.txt` file validates the NICs; you might notice a small performance decrease in the time it takes to obtain an IP address for the workstation.

Location	Change
Section 63.6.1, "Initiating the Imaging Processes on Linux Imaging Servers," on page 769	Added this section.

K.9.2 Multicasting Images

The following changes are made in this section:

Location	Change
"Initiating a Multicast Session from a Linux ZENworks Imaging Server" on page 738	Added this section.

K.9.3 Preparing an Imaging Boot Method

The following changes are made in this section:

Location	Change
Section 55.3, "Using the ZENworks Imaging Boot Disk Creator," on page 643	Updated this section.
Section 55.4, "Creating an Imaging Hard-Disk Partition," on page 646	Updated this section.

K.9.4 Preparing a ZENworks Imaging Server

The following changes are made in this section:

Location	Change
Section 54.1, "Imaging Server Prerequisites," on page 639	Added the following bullet:
	◆ **Proxy DHCP server (Linux imaging servers only):** 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.

K.9.5 Server Imaging

The following changes are made in this section:

Location	Change
"Workstation and Server Imaging" on page 633	Deleted the "Server Imaging" section, updating and moving its information into the main introduction for ZENworks imaging.

K.9.6 Using ZENworks Desktop Management Preboot Services

The following changes are made in this section:

Location	Change
Section 56.1.3, "Illustrating the Preboot Services Processes for Linux Imaging Servers," on page 650	Added this section.
"Preboot Services Components for Linux Imaging Servers" on page 661	Added this section.
"Checking the Setup on a Linux Server" on page 662	Added this section.
"Linux DHCP Server" on page 664	Added this section.
"Linux Server Configuration" on page 666	Added this section.
Section 56.4.2, "Network Configuration," on page 668	Updated this section.
Section 56.6.1, "Configuring Preboot Services Servers in Linux," on page 680	Added this section.

K.10 December 9, 2005

Page design is reformatted to comply with revised Novell documentation standards.

Updates are made to the following guide sections:

 * Updating ZENworks Imaging Resource Files

K.10.1 Updating ZENworks Imaging Resource Files

The following changes are made in this section:

Location	Change
Chapter 65, "Updating ZENworks Imaging Resource Files," on page 797	This is a new section. This includes documentation on adding Linux drivers.