V

Workstation Imaging

The following sections provide information on Novell® ZENworks® Desktop Management Workstation Imaging procedures and features.

50 Common Imaging Deployment Strategies

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

- "Installing a Standard Image Before Deploying New Workstations" on page 571
- "Enabling Existing Workstations for Future Reimaging" on page 572
- "Reimaging Corrupted Workstations" on page 573
- "Restoring Lab or Classroom Workstations to a Clean State" on page 573

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 Desktop Management Workstation Imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 647.

   These images should include the Desktop Management Agent, which includes the Imaging Agent. ZENworks Desktop Management lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup requires the Novell Client, you should install the Desktop Management Agent after the Novell Client installation to ensure that you are running the latest Imaging Agent. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 6.5 Desktop Management Installation Guide*.

3. If you are using Preboot Services, install Desktop Management Preboot Services (PXE Support) on your Imaging server. For more information, see "Using Preboot Services (PXE)" on page 577.

   or

   If you are using a bootable CD, bootable diskettes (SP1 only), or a hard-disk partition, create a boot CD or diskettes that point to the Desktop Management Workstation Imaging server where the model images are stored. For more information, see "Preparing an Imaging Boot Method" on page 577.

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 "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 633.

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 "Using Preboot Services (PXE)" on page 577.

2. Physically connect the workstation to the network.

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

   or

   If you are not using Preboot Services, boot the workstation with the imaging boot CDs or diskettes (SP1 only) and consider installing the Desktop Management Workstation Imaging (Linux*) partition to enable auto-imaging without needing to supply the CD or diskettes. For more information, see Step 6 on page 632 of "Enabling a Workstation for Auto-Imaging Operations" on page 630. After you have installed the partition, reboot the workstation from the Desktop Management Workstation Imaging 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 "Automatic Workstation Import and Removal" on page 77.

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. Upgrade each workstation to the latest Novell Client, using Automatic Client Update. Or, install the Desktop Management Agent. ZENworks Desktop Management lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup requires the Novell Client, you should install the Desktop Management Agent after the Novell Client installation to ensure that you are running the latest Imaging Agent. For more information, see "Installing and Configuring the Desktop Management Agent" in *Novell ZENworks 6.5 Desktop Management Installation Guide*.

2. Install the Desktop Management Imaging Agent on each workstation by distributing an Application object. For more information, see Step 4 on page 631 of "Enabling a Workstation for Auto-Imaging Operations" on page 630.

3. Register each workstation as a Workstation object in eDirectory. For more information, see "Automatic Workstation Import and Removal" on page 77.

4. If the workstations are PXE capable, make sure PXE is enabled (see "Using Preboot Services (PXE)" on page 577) and make sure that Desktop Management Preboot Services (PXE Support) has been installed on your Imaging server (see Chapter 53, "Using ZENworks Desktop Management Preboot Services," on page 591).

   or

   Prepare a few sets of imaging boot diskettes (SP1 only) or CDs that users can use when they run into trouble (see "Preparing an Imaging Boot Method" on page 577). These devices could point to an Imaging server that contains the same clean images used for new workstations.

5. If a user runs into trouble, use the strategy for reimaging corrupted workstations. For more information, see "Reimaging Corrupted Workstations" on page 573.

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 "Defining an Imaging Policy for Registered Workstations (Workstation Policy)" on page 635.

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 ConsoleOne® to receive an image the next time it boots. For more information, see "Performing an Automatic Imaging Creation or Restoration" on page 644.

4. If it's a newer workstation (with a Desktop Management imaging partition or PXE-enabled), the user should boot the workstation from the Desktop Management imaging partition or Imaging/Preboot Services server. If you are using Preboot Services, make sure that Desktop Management Preboot Services (PXE Support) has been installed on your Imaging server. For more information, see Chapter 53, "Using ZENworks Desktop Management Preboot Services," on page 591.

   or

   If it's an older workstation (without a Desktop Management Workstation Imaging (Linux) partition), the user should boot the workstation with the imaging boot CD or diskettes (SP1 only).

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

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 Desktop Management Workstation Imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 647.

   Upgrade each workstation to the latest Novell Client, if needed, using Automatic Client Update. Or, install the Desktop Management Agent. ZENworks Desktop Management lets ZENworks work with or without an installation of the Novell Client on the workstation. If your setup requires the Novell Client, you should install the Desktop Management Agent after the Novell Client installation to ensure that you are running the latest Imaging Agent. For more information, see "Installing and Configuring the Desktop Management Agent" in the *Novell ZENworks 6.5 Desktop Management Installation Guide* guide.

2. If you are using Preboot Services, make sure that Desktop Management Preboot Services (PXE Support) has been installed on your imaging server. For more information, see Chapter 53, "Using ZENworks Desktop Management Preboot Services," on page 591.

3. If you are using Preboot Services and the workstations are PXE capable, make sure that PXE is enabled. For more information, see "Using Preboot Services (PXE)" on page 577.

or

If you are not using Preboot Services or the Linux partition, create an imaging boot CD or diskettes (SP1 only) that point to the Desktop Management Workstation Imaging server where the clean image is stored. For more information, see "Preparing an Imaging Boot Method" on page 577.

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 "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 633.

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 Imaging/Preboot Services server.

or

If you are not using Preboot Services, boot the workstation with the imaging boot CD or diskettes (SP1 only) and install the Desktop Management Workstation Imaging (Linux) partition. For more information, see Step 6 on page 632 of "Enabling a Workstation for Auto-Imaging Operations" on page 630. After you have installed the partition, reboot the workstation from the Desktop Management Imaging partition.

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

51 Preparing an Imaging Server

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.

If you want to deploy images based on specific workstations, you should also install the Automatic Workstation Import component to ease the management of these deployments.

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

1. Make sure your server meets the requirements specified in "Preparation" in the *Novell ZENworks 6.5 Desktop Management Installation Guide*.

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

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

     Although the System Account should already have Full Control rights to the folder that you will store image files in, you should ensure 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 Imaging server, see "Using a CD or DVD for Disconnected Imaging Operations" on page 655 and "Using a Hard Disk or Jaz Drive for Disconnected Imaging Operations" on page 657.

2. 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®).

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

4. When prompted for the components to install, choose Automatic Workstation Import and Imaging.

5. When prompted for the import/removal role, choose Import.

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

7. When the installation is done, restart your server.

52 Preparing an Imaging Boot Method

The Novell® ZENworks® Desktop Management 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 Imaging engine, and network drivers installed.

The following sections contain additional information:

- "Using Preboot Services (PXE)" on page 577
- "Preparing Imaging Boot CDs or DVDs" on page 578
- "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580
- "Creating an Imaging Hard-Disk Partition" on page 587
- "Additional Information About Booting to Linux" on page 587

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 imaging server.
- Enable PXE on the workstation.
- Have a standard DHCP server, either on your Imaging server or on another network server.

For information about the requirements and installation of Preboot Services, see the *Novell ZENworks 6.5 Desktop Management Installation Guide*. For information about deployment and administration of Preboot Services, see Chapter 53, "Using ZENworks Desktop Management Preboot Services," on page 591.

If You Have Previously Installed a Desktop Management Workstation Imaging (Linux) 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 Desktop Management imaging partition on the workstation, you can disable or delete the partition.

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

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

For more information on disabling or deleting a partition, see Step 9 in "Creating a Workstation Image Object" on page 642.

IMPORTANT: After you have deleted the Desktop Management imaging partition, you need to make sure that the image you put on the workstation was made on a workstation without a Desktop Management imaging partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation will fail to boot. In addition, if you remove the Desktop Management imaging partition from a Windows NT, Windows 2000, or Windows XP machine, Windows will no longer be able to boot. You should only remove the Desktop Management imaging partition if you are going to restore an image to the workstation.

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:

- "Creating a Boot CD or DVD with Additional Files" on page 578
- "Creating a Boot CD or DVD without Additional Files" on page 579

For information on how to use the CD or DVD to perform disconnected imaging operations, see "Setting Up Disconnected Imaging Operations" on page 655.

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 "Imaging Configuration Parameters (Settings.txt)" on page 695.

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, use 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.

(SP1 only) Use the Add Linux Drivers button in the Imaging Boot Disk Creator (zimgboot.exe) to copy the Linux drivers to a diskette, then copy the a:\drivers directory from the diskette to the /addfiles directory in the bootcd.iso image.

(SP1 and earlier only) For more information about adding Linux drivers, see the online help for the Imaging Boot Disk Creator (zimgboot.exe) or see "Using Zimgboot.exe to Add Linux Drivers" on page 693.

(SP2 only) For information on adding Linux drivers in ZENworks 6.5 SP2, see Chapter 62, "Adding Linux Drivers in ZENworks 6.5 SP2," on page 723.

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.

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 "Imaging Configuration Parameters (Settings.txt)" on page 695.

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.

Using the ZENworks Imaging Floppy Boot Disk Creator Utility

With the release of ZENworks 6.5 Support Pack 2 (SP2), there are now two versions of zimgboot.exe:

Using zimgboot.exe in ZENworks 6.5 SP1 and Earlier

You can do the following with the zimgboot.exe that shipped with ZENworks 6.5:

Create Imaging Boot Diskettes

Imaging boot diskettes are easy to prepare. Five diskettes are required, six if you need to image workstations that have non-English keyboards.

To create imaging boot diskettes:

1 Format five high-density diskettes, or use preformatted blank diskettes.

If you need the imaging boot diskettes to include support for booting workstations with a non-English keyboard, you need a sixth diskette.

2 Browse to the SYS:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server) and run zimgboot.exe.

TIP: You can also start zimgboot.exe in ConsoleOne by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.
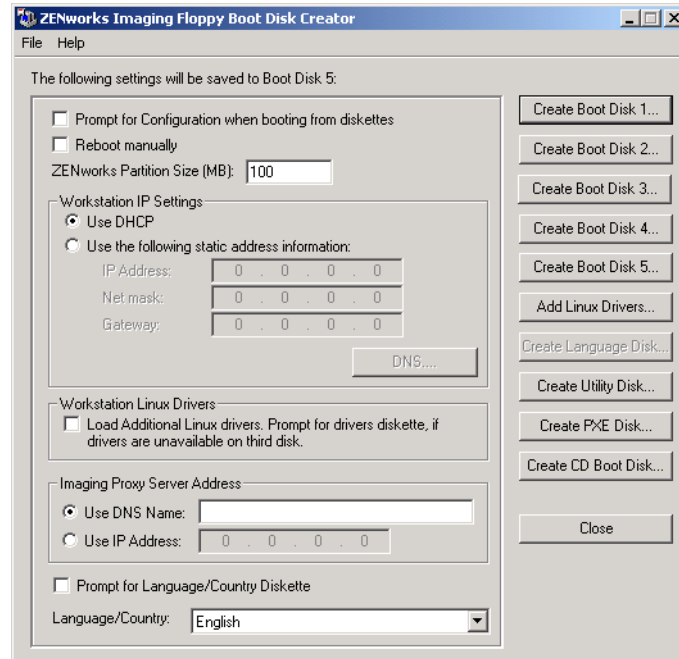
3 In the ZENworks Imaging Floppy Boot Disk Creator dialog box, near the bottom under Imaging Proxy Server Address, specify either the fixed IP address or the full DNS name of your Imaging server.

4 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 include support for a non-English keyboard. Click Help for details on specific settings.

5 Click Create Boot Disk 1, insert the first diskette, then click OK.

6 When the first diskette has been created, click Create Boot Disk 2, insert the second diskette, then click OK.

7 When the second diskette has been created, click Create Boot Disk 3, insert the third diskette, then click OK.

8 When the third diskette has been created, click Create Boot Disk 4, insert the fourth diskette, then click OK.

9 When the fourth diskette has been created, click Create Boot Disk 5, insert the fifth diskette, then click OK.

10 (Conditional) If you need the imaging boot diskettes to include support for a non-English keyboard: When the fifth diskette has been created, click Create Language Disk, insert the sixth diskette, then click OK.

For more information, see "Booting with a Non-English Keyboard" on page 589.

11 When the last (fifth or sixth) diskette has been created, click Close.

After you have created the diskettes, you can customize them for the particular imaging tasks for which you will use them, such as one set of diskettes for connecting to a server that holds Windows 2000 images, another set for connecting to a server that holds Windows XP images, and another set for installing Desktop Management Workstation Imaging (Linux) partitions. To customize the diskettes, edit the settings.txt file on the fifth diskette as explained in "Imaging Configuration Parameters (Settings.txt)" on page 695.

When you boot a workstation using imaging boot diskettes, you are prompted when to insert the second, third, fourth, and fifth diskettes, and when to insert the language diskette (if you created one).

NOTE: You can also use the Imaging Boot Disk Creator (zimgboot.exe) to create a diskette that contains Linux utilities. See the Help in the Boot Disk Creator for more information.
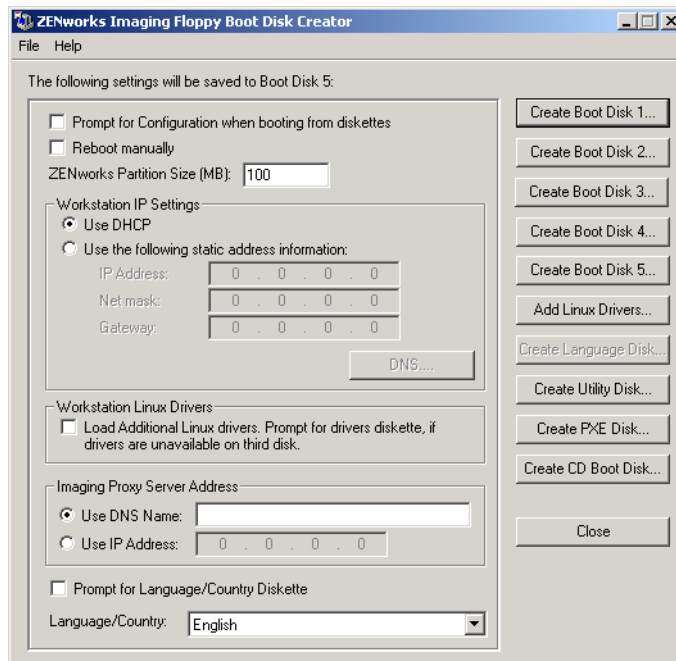
Prepare a CD Boot Diskette

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 Browse to the SYS:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server) and run zimgboot.exe.

TIP: You can also start zimgboot.exe in ConsoleOne by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.

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

4 When the diskette has been created, 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.
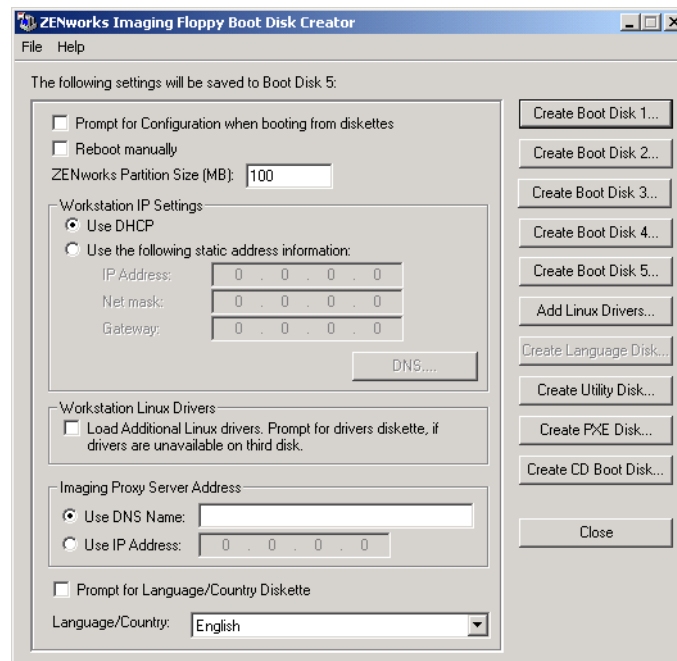
Configure the Settings.txt File

The settings.txt file is required for imaging workstations. A default copy is provided with Desktop Management that you can use to 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 Browse to the SYS:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server) and run zimgboot.exe.

> **TIP:** You can also start zimgboot.exe in ConsoleOne by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.

3 Click Load Settings from Disk.

This allows you to browse for the settings.txt file. Then, it populates the fields in this dialog from information in the settings.txt file after you locate it in the next step, which you can modify 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 folder on your imaging server.

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

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 "Imaging Configuration Parameters (Settings.txt)" on page 695.

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.

Add Linux Device Drivers

For information, see "Adding Linux Device Drivers" on page 587.

Create A Language Disk

For information, see "Booting with a Non-English Keyboard" on page 589.

Create A Utility Disk

You can use the Boot Disk Creator to create a diskette that contains Linux utilities, such as df (shows disk usage), fdisk, less, more, host (performs DNS lookups in order to convert DNS names to IP addresses), ldd (shows shared library dependencies), pico (text editor), sed (stream file editor), and touch (changes file time stamps). These utilities are not needed to perform imaging, but they might be useful to you for debugging purposes when imaging is booted to manual or maintenance mode.

To create the utility disk:

1 Insert an empty, formatted, high-density diskette;

2 Click Create Utility Disk.

When created, the utility disk contains a tar file, utility.tgz.

3 To decompress the utility.tgz file and extract it to the root file system, enter **utility.s** at the Linux bash prompt.

Configure PXE-on-Disk

For information, see "Creating a PXE-on-Disk Diskette" on page 617.

Using zimgboot.exe in ZENworks 6.5 SP2 and Later

You can do the following with the new zimgboot.exe:

- ◆ "Prepare a CD Boot Diskette" on page 585
- ◆ "Configure PXE-on-Disk" on page 585
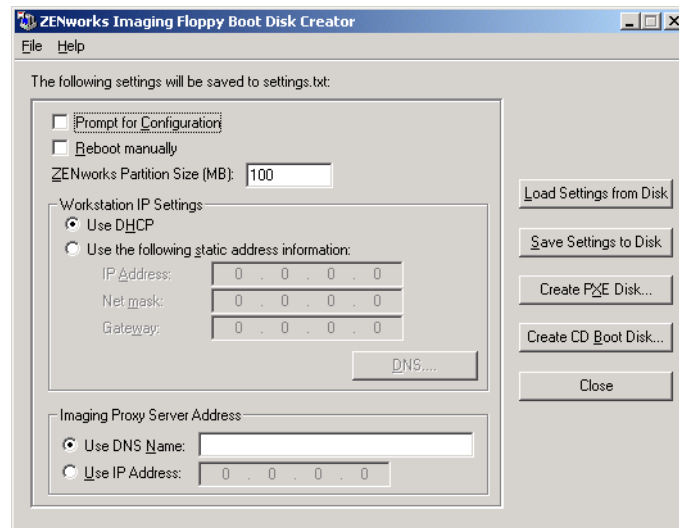- ◆ "Configure the Settings.txt File" on page 585

Prepare 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 Browse to the SYS:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server) and run zimgboot.exe.

   TIP: You can also start zimgboot.exe in ConsoleOne by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.

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

4 When the diskette has been created, 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.

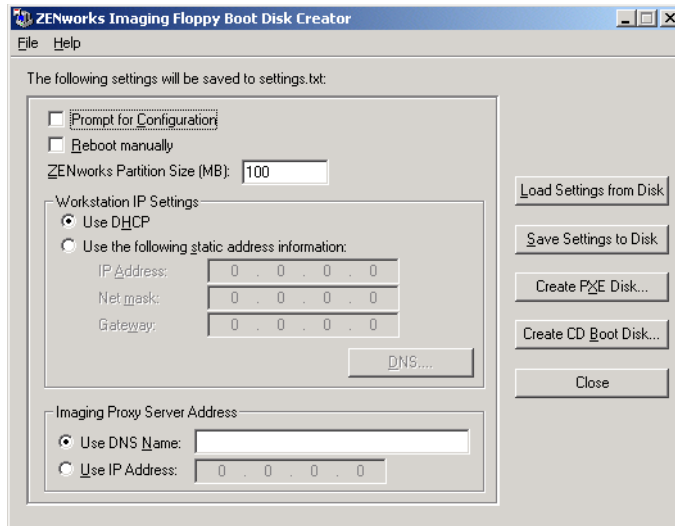### Configure PXE-on-Disk

For information, see .

Configure the Settings.txt File

The settings.txt file is required for imaging workstations. A default copy is provided with Desktop Management that you can use to 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 Browse to the SYS:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server) and run zimgboot.exe.

   TIP: You can also start zimgboot.exe in ConsoleOne by clicking Tools > ZENworks Utilities > Imaging > Create or Modify Boot Diskette.

3 Click Load Settings from Disk.

This allows you to browse for the settings.txt file. Then, it populates the fields in this dialog from information in the settings.txt file after you locate it in the next step, which you can modify 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 folder on your imaging server.

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

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 "Imaging Configuration Parameters (Settings.txt)" on page 695.

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.

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 Desktop Management Workstation Imaging (Linux) 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.

IMPORTANT: Installing the Desktop Management Imaging partition will destroy all data on that hard drive.

To create a Desktop Management Imaging partition:

1 Do one of the following to create the imaging boot device to boot the workstation from:

   ◆ (only SP1 or earlier) Create imaging boot diskettes (see "Create Imaging Boot Diskettes" on page 580)

   ◆ Create an imaging CD/DVD (see "Preparing Imaging Boot CDs or DVDs" on page 578)

2 Proceed with Step 5 of "Enabling a Workstation for Auto-Imaging Operations" on page 630.

   These steps include booting the workstation and installing the partition on it.

Additional Information About Booting to Linux

IMPORTANT: This section applies only to ZENworks 6.5 SP1 and earlier.

For information on adding Linux drivers in ZENworks 6.5 SP2, see Chapter 62, "Adding Linux Drivers in ZENworks 6.5 SP2," on page 723.

The following sections contain additional information:

◆ "Adding Linux Device Drivers" on page 587

◆ "Booting with a Non-English Keyboard" on page 589

Adding Linux Device Drivers

(SP1 and earlier only) If you need to, you can add Linux device drivers to your boot method.

◆ "Obtaining Linux Drivers" on page 587

◆ "Adding Linux Drivers to Your Boot Method" on page 588

Obtaining Linux Drivers

To obtain a Linux driver for your particular hardware, you should visit the Web site of the hardware vendor and check for a download location.

There are also some other Web sites where you can obtain drivers:

◆ Network drivers can be downloaded from the Scyld Computing Corporation* (http://www.scyld.com). Click Network Drivers.

◆ PCMCIA drivers can be downloaded from the Linux PCMCIA Information Page (http://pcmcia-cs.sourceforge.net).

To learn more about drivers, including the loading parameters you need to specify, see the Linux Documentation Project (http://en.tldp.org) and visit the following HOWTO (http://en.tldp.org/HOWTO/HOWTO-INDEX/howtos.html) sites:

◆ Hardware

◆ PCMCIA

◆ SCSI

◆ Ethernet

Adding Linux Drivers to Your Boot Method

You can add Linux drivers to the following boot methods:

◆ "Adding Linux Drivers for Use with Preboot Services (PXE)" on page 588

◆ "Adding Linux Drivers for Use with a CD or DVD" on page 589

◆ "Adding Linux Drivers for Use with Diskettes" on page 589

◆ "Adding Linux Drivers for Use with a Hard-Disk Partition" on page 589

Adding Linux Drivers for Use with Preboot Services (PXE)

To add Linux drivers for use with Preboot Services, you must have a working Linux workstation capable of mounting a loop device. Most Linux distributions have this ability compiled in the distribution kernel.

1 On the TFTP server on your Imaging/Preboot Services server, locate the linux.2 file in \public\zenworks\imaging\tftp. Make a backup copy of this file.

2 On the Linux workstation, create a working directory for linux.2.

3 Using a transfer method such as FTP, transfer linux.2 to the directory created in Step 2 on page 588.

4 Enter the following to rename linux.2 to linux.gz:

mv linux.2 linux.gz

5 Enter the following to extract linux.gz:

gzip -d linux.gz

This replaces the linux.gz file with a file named linux. This file is a complete file system that can be mounted and changed.

6 Enter the following to create a mount point:

mkdir /mnt/loop

7 Enter the following to mount the file system:

mount -o loop linux /mnt/loop

8 Copy the driver files to the appropriate directory in the /mnt/loop directory structure.

9 Enter the following to unmount the updated file system:

umount /mnt/loop

10 Enter the following to zip the file:

gzip -9c linux > linux.gz

11 Enter the following to rename the file:

`mv linux.gz linux.2`

12 Using a transfer method such as FTP, transfer linux.2 to the TFTP server.

Adding Linux Drivers for Use with a CD or DVD

For information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

Adding Linux Drivers for Use with Diskettes

For information, see "Using Zimgboot.exe to Add Linux Drivers" on page 693.

Adding Linux Drivers for Use with a Hard-Disk Partition

It is unlikely that you will need to add Linux drivers if you are using a Desktop Management Workstation Imaging partition. If you want to update the Linux drivers, however, follow this procedure:

1 Boot the workstation using imaging boot diskettes, an imaging boot CD, or if it is PXE-enabled, boot it from the Imaging/Preboot Services server.

2 Enter **`manual`** at the boot prompt or select Start ZENworks Imaging in Maintenance Mode from the PXE menu.

3 Enter the following to mount the hard drive:

`mount /dev/hda1 /mnt/harddisk`

4 Enter the following to mount the diskette that contains the driver files:

`mount /dev/fd0 /mnt/floppy`

5 Enter the following to copy the files to the appropriate directory on the Desktop Management Imaging partition:

`cp /mnt/floppy/*.o /mnt/harddisk/lib/modules/2.4.22/drivers/ net`

6 Type **`reboot`**, then press Enter.

Booting with a Non-English Keyboard

If you image workstations that have non-English keyboards, the imaging boot method must include additional language support, in the form of a language diskette. When you boot a workstation from the imaging method, you will be prompted for this diskette. For information on preparing this diskette, see the online help in the "Imaging Boot Disk Creator (Zimgboot.exe)" on page 692.

If the Language/Country drop-down list in the Imaging Boot Disk Creator utility doesn't have the keyboard language you need, you can close the utility and reconfigure it to support the additional language. This assumes you can find Linux keyboard support files somewhere on the Web.

Adding Support for Another Keyboard Language

1 Get the Linux .gz files that contain the keyboard mappings, fonts, and Unicode* mappings for the language that you want to add.

2 From the folder containing the zimgboot.exe file, browse to the bootdisk folder, then copy the .gz files for the new language to the following subfolders:

- The keyboard map file goes in the keymaps folder.

- The font file goes in the consolefonts folder.

- The Unicode map file goes in the consoletrans folder.

3 Add a section to the zimglang.ini file using the format illustrated for German in "Imaging Bootup Languages (Zimglang.ini)" on page 701.

3a For the bracketed section heading, specify the language or country name that you want shown in the Imaging Boot Disk Creator utility.

3b In the KEYMAP, FONT, and ACM parameters, specify the names and locations (relative to the bootdisk folder) of the keyboard map, font, and Unicode map files, respectively.

4 Save your changes to the zimglang.ini file.

5 Restart the Imaging Boot Disk Creator utility and verify that the new language appears in the Language/Country drop-down list.

53 Using ZENworks Desktop Management Preboot Services

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

There are four methods that you can use for imaging: Preboot Services, a bootable CD or DVD, bootable diskettes (SP1 only), or a Linux hard-disk partition. For more information, see "Preparing an Imaging Boot Method" on page 577.

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

The following sections contain additional information:

Understanding Desktop Management Preboot Services

This section contains information that will help you to understand Desktop Management Preboot Services, including:

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 Desktop Management imaging boot diskettes (SP1 only), 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 imaging server.

- Enable PXE on the workstation.

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

For information about requirements, installing Desktop Management and Preboot Services on your Imaging server, enabling PXE on a workstation, and configuring your DHCP server, see .

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 Preboot Services/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 (linux.1, linux.2, and loadlin.exe in ZENworks 6.5 Desktop Management SP1 and earlier; initrd, linux, and root in ZENworks 6.5 Desktop Management SP2 and later) 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.

Preboot Services Process Diagrams

The following diagrams show the interaction between a Preboot Services (PXE) client workstation and a Preboot Services/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 Preboot Services/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)

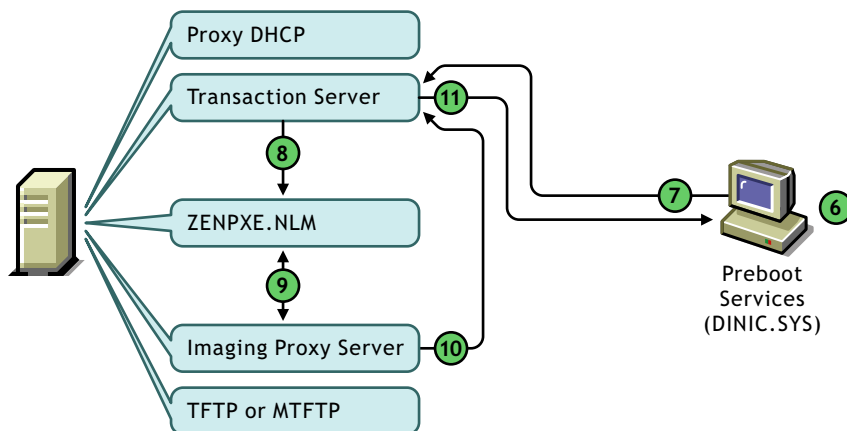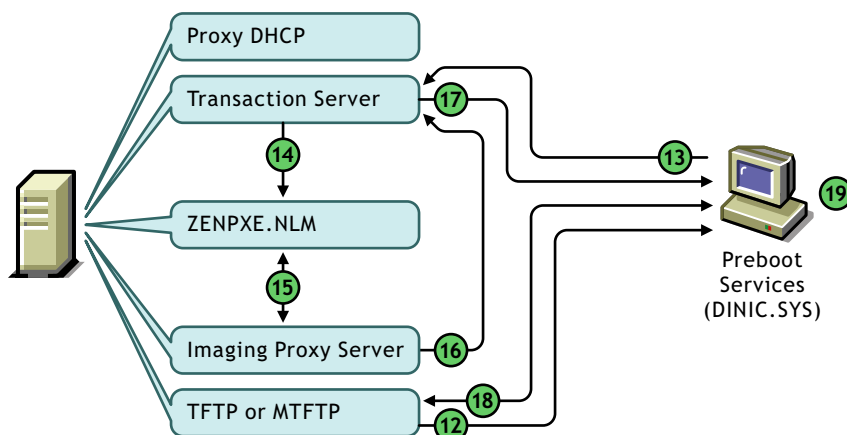| Step	Explanation
①	The workstation is turned on and begins to boot up. PXE (triggered by the BIOS, network interface card, or PXE-on-Disk boot diskette) sends a DHCP request to the network. The DHCP request includes PXE extensions.
②	The DHCP server responds with an IP address for the workstation to use. This step may 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. 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 "Installing and Setting Up Desktop Management Preboot Services" on page 595. 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)

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.
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 during bootup.
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)

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.
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 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 (linux.1, linux.2, and loadlin.exe in ZENworks 6.5 Desktop Management SP1 and earlier; initrd, linux, and root in ZENworks 6.5 Desktop Management SP2 and later).
19	The workstation boots to the Desktop Management Imaging environment and proceeds with the imaging work.

Installing and Setting Up Desktop Management Preboot Services

For information about the hardware requirements for the Preboot Services server, see "Preboot Services Hardware Requirements" in the *Novell ZENworks 6.5 Desktop Management Installation Guide*.

For information about the requirements for workstations using Preboot Services, see "User Workstation Hardware Requirements" in the *Novell ZENworks 6.5 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 6.5 Desktop Management Installation Guide*.

Checking the Preboot Services Server Setup

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

- "Overview of Preboot Services Components" on page 596

Overview of Preboot Services Components

The following components are installed as part of Preboot Services:

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 (linux.1, linux.2, and loadlin.exe in ZENworks 6.5 Desktop Management SP1 and earlier; initrd, linux, and root in ZENworks 6.5 Desktop Management SP2 and later).

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

By default, TFTP is used 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.

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 Configuration" on page 599.

If the 2000/XP/2003 server where the Preboot Services components were installed is also a DHCP server, see "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000 Advanced Server" on page 597.

Setting up Standard DHCP and Proxy DHCP Services on a 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.

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 614.

If the Preboot Services components were installed to a NetWare® 6.x server that is also a standard DHCP server, see "Setting Up Standard DHCP and Proxy DHCP Services on a NetWare 6.x DHCP Server" on page 598.

Setting Up Standard DHCP and Proxy DHCP Services on a 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 to . 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: at the system console, enter **load NAMED**.

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.

Deploying Desktop Management Preboot Services In a Network Environment

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

Deploying Desktop Management Preboot Services (PXE) in a single segment is a relatively simple process that only requires configuring the Imaging/Preboot Services server. However, Preboot Services deployment in a routed environment is far more complex and might require configuration of both the Imaging/Preboot Services 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 will need 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:

- "Server Configuration" on page 599
- "Network Configuration" on page 600

Server Configuration

The Preboot Services environment requires a standard DHCP server, Proxy DHCP server, TFTP or MTFTP boot server, and 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 599
- "Proxy DHCP Server" on page 600
- "TFTP and MTFTP Servers" on page 600
- "Transaction Server" on page 600

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 612 or "Configuring Preboot Services Servers in NetWare" on page 614.

DHCP Server

The standard DHCP server must be configured with an active scope that will allocate 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 "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000

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 612 or "Configuring Preboot Services Servers in NetWare" on page 614.

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 "Installing and Setting Up Desktop Management Preboot Services" on page 595.

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

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 .

Only one Proxy DHCP server should be installed per DHCP server scope.

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 will ensure that a client does not need to connect to its TFTP server through a slow WAN link.

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

Information	Details for This Setup
Scope	Only PXE workstations in the LAN will 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

Information	Details for This Setup
Scope	Only PXE workstations in the LAN will 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 "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000 Advanced Server" on page 597 and "Setting Up Standard DHCP and Proxy DHCP Services on a NetWare 6.x DHCP Server" on page 598.
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.

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" on page 603

◆ "WAN or VLAN Environment With Preboot Services and DHCP Running on the Same Server" on page 604

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

Information	Details for This Setup
Scope	PXE workstations over the entire WAN/VLAN will 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/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 will receive 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 "Installing and Setting Up Desktop Management Preboot Services" on page 595.
Disadvantages	The network equipment (routers/switches) must be configured with additional IP helpers. Some network equipment may 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 607

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

Information	Details for This Setup
Scope	PXE workstations over the entire WAN/VLAN will 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/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 "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000 Advanced Server" on page 597 and "Setting Up Standard DHCP and Proxy DHCP Services on a NetWare 6.x DHCP Server" on page 598.
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 604

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 "Configuring Filters on Switches and Routers" on page 609.

This section includes the following topics:

- ◆ "Implementation" on page 604
- ◆ "Installing the Proxy DHCP Server and the TFTP Server on the DHCP Server" on page 606

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 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 "Installing the Proxy DHCP Server and the TFTP Server on the DHCP Server" on page 606.

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 "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000 Advanced Server" on page 597 and "Setting Up Standard DHCP and Proxy DHCP Services on a NetWare 6.x DHCP Server" on page 598.

7 Configure the Proxy DHCP service to redirect PXE workstations to the Preboot Services server that you set up in Step 1.

   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 Step 1.

   For NetWare, open pdhcp.ini and edit the TRANSACTION_SERVER_IP entry to the IP address of the server that you set up in Step 1.

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 will now be 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 Preboot Services/Imaging server, or from the *ZENworks Desktop Management Program* CD.

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

2 Copy all 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 will need to be logged in to the server with administrator rights.

This example assumes you copied all 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 will start the Proxy DHCP configuration application.

4f Set the VSP Host IP to the IP address of the Imaging/Preboot Services 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 (dinic.sys, boot.dnx, bootzen2.bin, bootzen5.bin) as well as other files.

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 "Configuring Filters on Switches and Routers" on page 609.

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

- "Configuring Cisco Equipment" on page 608
- "Configuring Nortel Network Equipment" on page 608
- "Configuring Bay Network Equipment" on page 609

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 the 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 Ensure that IP is routable.

3 Enable Bootp on the PXE workstation subnet/VLAN.

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

5 Edit the circuit.

6 Click Protocols.

7 Click Add/Delete.

8 Ensure there is a check in the Bootp check box.

9 Press OK.

10 Click Protocols > IP > Bootp > Relay Agent Interface Table.

   The interface where Bootp was enabled will be visible in the list.

11 Click Preferred Server.

12 Change the Pass Through Mode value to Bootp and DHCP.

13 Set up the relay agents:

   13a Click Add.

   13b In the Relay Agent IP Address box, type the local LAN IP address.

   13c In the Target Server IP Address box, type the DHCP server IP address.

   13d Click OK.

   13e Change the Pass Through Mode value to Bootp and DHCP.

   13f Perform Step 1 to Step 5 on page 608 again and enter the Proxy DHCP server IP address at Step 3 on page 608.

   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.

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:

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

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).

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.

This section includes the following information:

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 will prompt you to press Control+S during the boot process to allow you to configure the PXE functionality. Other network adapters might prompt you to press Control+Alt+B or another key combination to configure PXE.

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

Verifying That PXE Is Enabled on a Workstation

After you have activated PXE, it will become 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.

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 will PXE-enable 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 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 .

Administering Desktop Management Preboot Services

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

It includes the following topics:

- "Configuring Preboot Services Servers in Windows" on page 612
- "Configuring Preboot Services Servers in NetWare" on page 614
- "Configuring IP Port Usage" on page 616

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 612
- "Configuring the MTFTP Server" on page 612
- "Configuring the Proxy DHCP Server" on page 613
- "Configuring the DHCP Server" on page 614

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 > ZEN Preboot Services > ZEN 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 will look 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 > ZEN Preboot Services > ZEN Preboot Services Configuration > MTFTP Configuration to display the MTFTP Configuration dialog box.
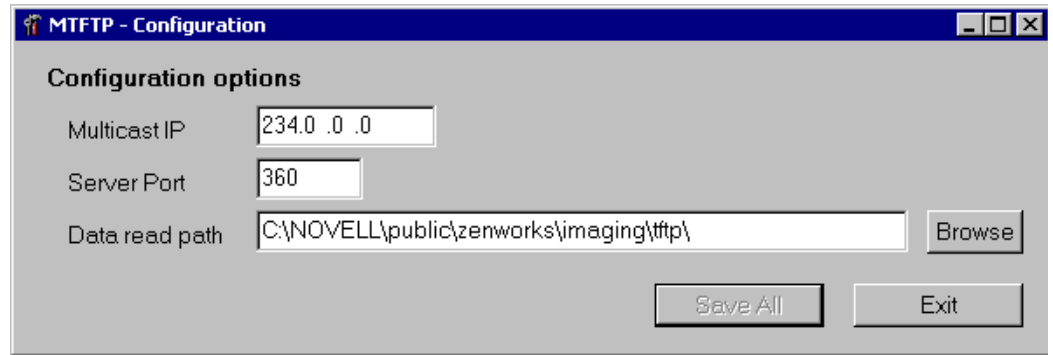
2 Fill in the fields:

Multicast IP: Specify the address to be used as a destination during multicast transfers. Ensure 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 > ZEN Preboot Services > ZEN Preboot Services Configuration > Proxy DHCP Configuration to display the Proxy DHCP Configuration dialog box.
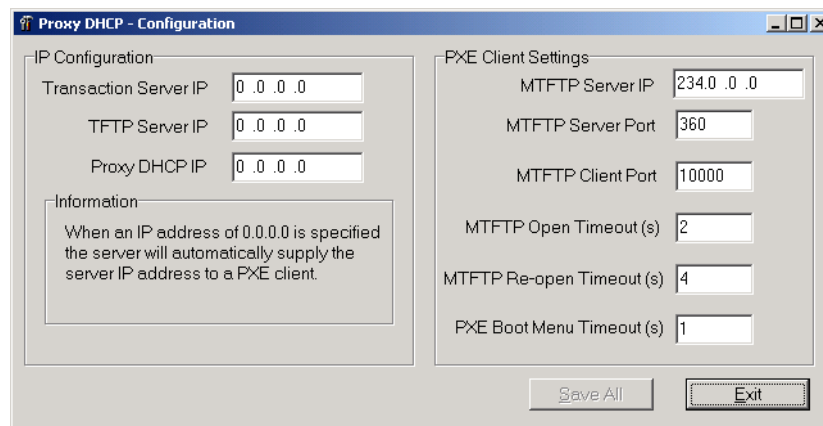
2 Check the fields:

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 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 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 "Setting up Standard DHCP and Proxy DHCP Services on a Windows 2000 Advanced Server" on page 597.

Configuring Preboot Services Servers in NetWare

After Desktop Management Preboot Services has been 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 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 "Setting Up Standard DHCP and Proxy DHCP Services on a NetWare 6.x DHCP Server" on page 598.

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. For further information about configuring routers, see "Deploying Desktop Management Preboot Services In a Network Environment" on page 599.

The following sections contain additional information:

- "Available Ports" on page 616
- "Changing Port Usage in Windows Server" on page 617
- "Changing Port Usage in NetWare" on page 617

Available Ports

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.iisc.ernet.in/collection/rfc/rfc1057.html) for a description of this server.

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.

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 > ZEN Preboot Services > ZEN 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.

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.

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

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

NOTE: If you upgraded to ZENworks Desktop Management from a previous version of ZENworks for Desktops, you can access the ZENworks PXE-on-Disk Manual from the Start menu. However, in order to access the latest information about this utility, you should use the information in this *ZENworks Desktop Management Administration Guide*.

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

Creating a PXE-on-Disk Diskette

This section contains the following information:

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 > ZEN 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.
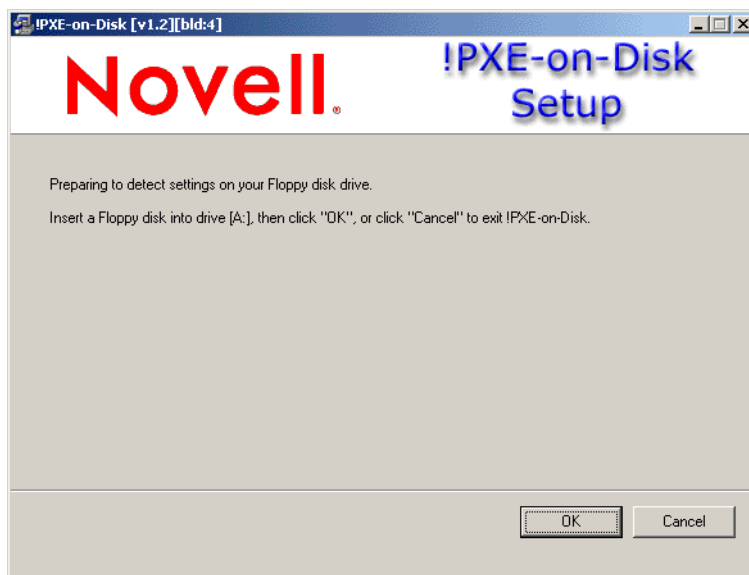
2 Insert an empty, formatted, high-density diskette in the disk drive.

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.

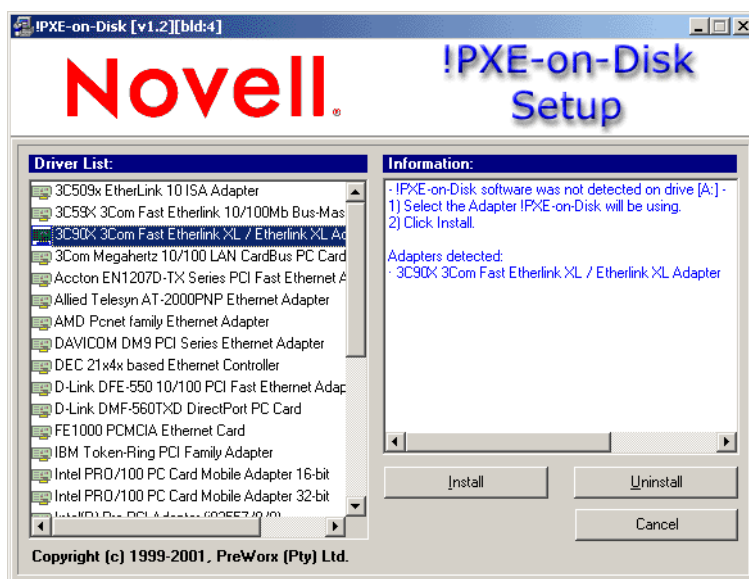**5** Insert an empty, formatted, high-density diskette in the disk drive, then click Install to start creating a PXE-on-Disk diskette.

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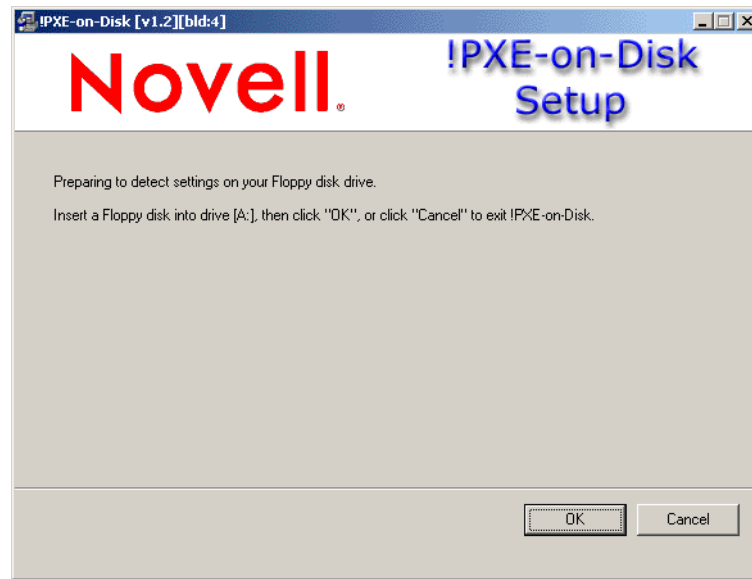
4 From the Driver List, select the name of the network adapter driver (or its nearest equivalent) that is installed on the client workstation you want to connect to the Preboot Services server.

Some driver types may 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.
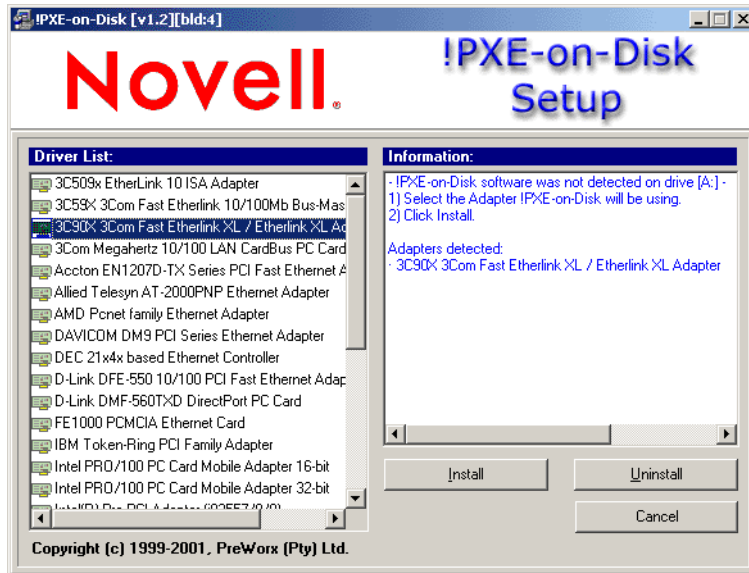
6 Click Close to complete the creation of the PXE-on-Disk diskette.

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 has been installed on a network server. This is the server that will communicate 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 6.5 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 will:

1. Establish a connection with the Desktop Management Preboot Services server.

2. Execute any imaging work to be performed.

3. Continue its boot cycle.

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 617.

Using the Desktop Management Preboot Services Menu Editor Utility

This section contains information that will help you understand and use the ZENworks Desktop Management Preboot Services Menu Editor utility.

- "What Is the Preboot Services (PXE) Menu?" on page 621
- "What Is the Preboot Services Menu Editor?" on page 621
- "Using the Preboot Services Menu Editor" on page 622

NOTE: If you upgraded to ZENworks Desktop Management from a previous version of ZENworks for Desktops, you can access the ZENworks Preboot Services Menu Editor Manual from the Start menu. However, in order to access the latest information about this utility, you should use the information in this *ZENworks Desktop Management Administration Guide*.

What Is the Preboot Services (PXE) 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 check 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 displaying the following options:

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

What Is the 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.

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.

The following sections contain additional information:

- "Installing the Preboot Services Menu Editor" on page 622
- "Accessing the Preboot Services Menu Editor" on page 622
- "Understanding the Preboot Services Menu Editor Interface" on page 622

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 6.5 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 > ZEN Preboot Services > ZEN Preboot Services Menu Editor.

If you need to access the Menu Editor from a NetWare server, locate the files on the *ZENworks Desktop Management Program* CD in the \menu editor folder, then copy them to your NetWare server. Then, from a Windows machine, you can map a drive to the location on the server and 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.

Using the Preboot Services Menu Editor

Although you will probably 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 623
- "Creating a New Preboot Services (PXE) Menu" on page 625
- "Creating a Submenu" on page 626
- "Creating Functions Within the Menu" on page 627

Modifying the Default Menu

There may be circumstances that require you to limit the options on the Desktop Management Preboot Services (PXE) menu. For example, you may 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 > ZEN Preboot Services > ZEN Preboot Services Menu Editor to display the following dialog box:
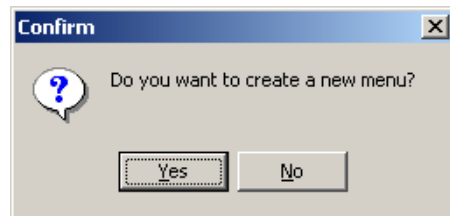
2 Click No to display the menu files that reside in the directory from which meditor.exe is running.
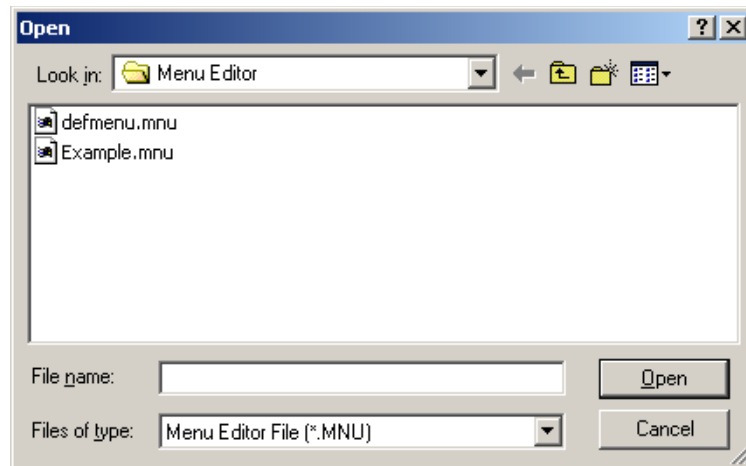
3 Select (or browse to) the defmenu.mnu you want to change, then click Open.
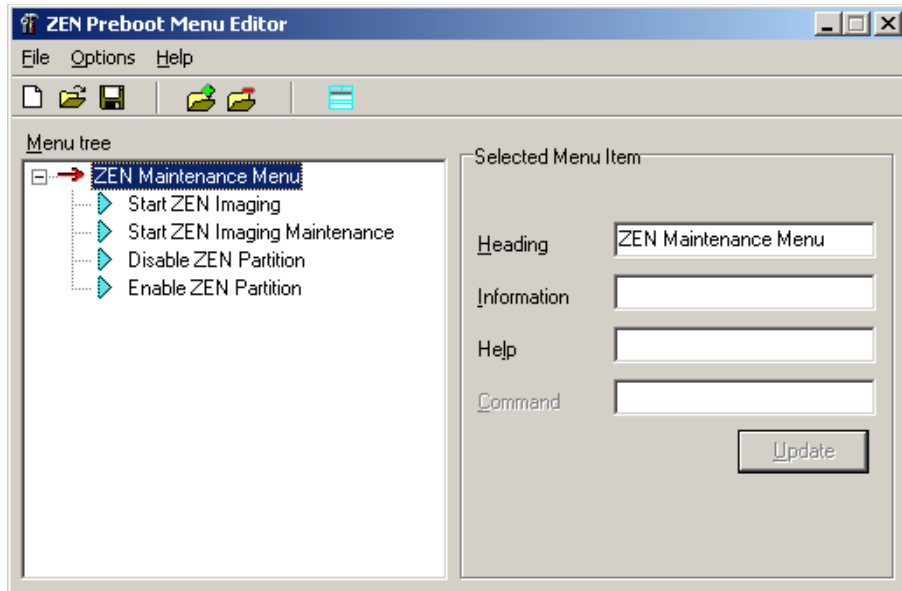
4 Select the menu item that you want to delete, click Options, then click Delete to display a message similar to the following:

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

5 Click Yes to return to the Menu Editor.

6 Click File > Save to open the Save As dialog box.
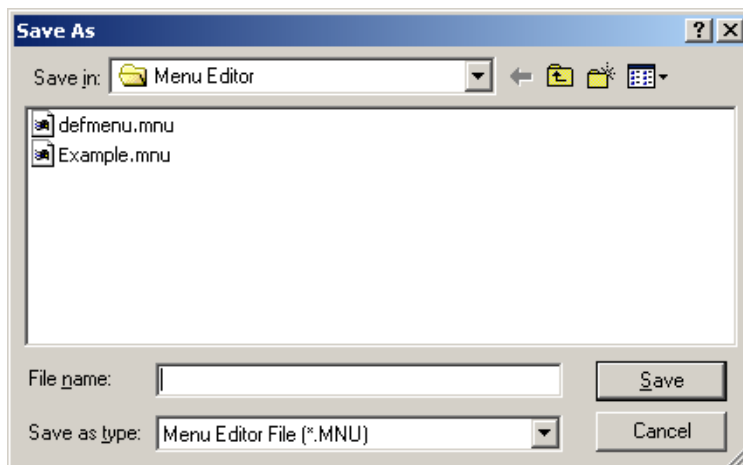
7 Select defmenu.mnu to enter this filename in the File Name field, then click Save. The following prompt is displayed:

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

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

You have now modified the defmenu.mnu menu template.

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

10 In the Save As Type drop-down list, select ZEN Preboot Menu file (*.DAT).

11 Select defmenu.dat to enter this filename in the File Name field, then click Save. The following prompt is displayed:

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

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

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

13 Copy the new defmenu.dat file to the /tftp folder 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 > ZEN Preboot Services > ZEN Preboot Services Menu Editor to display the following dialog box:
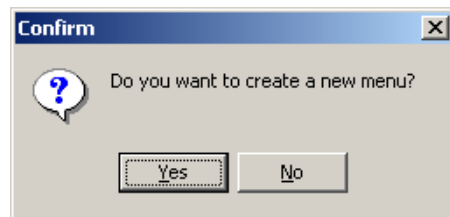
2 Click Yes to display the Create Menu dialog box.
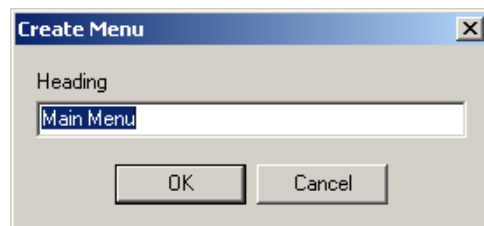
3 Enter the name of menu you want to create, then click OK to display the ZEN Preboot Menu Editor window.
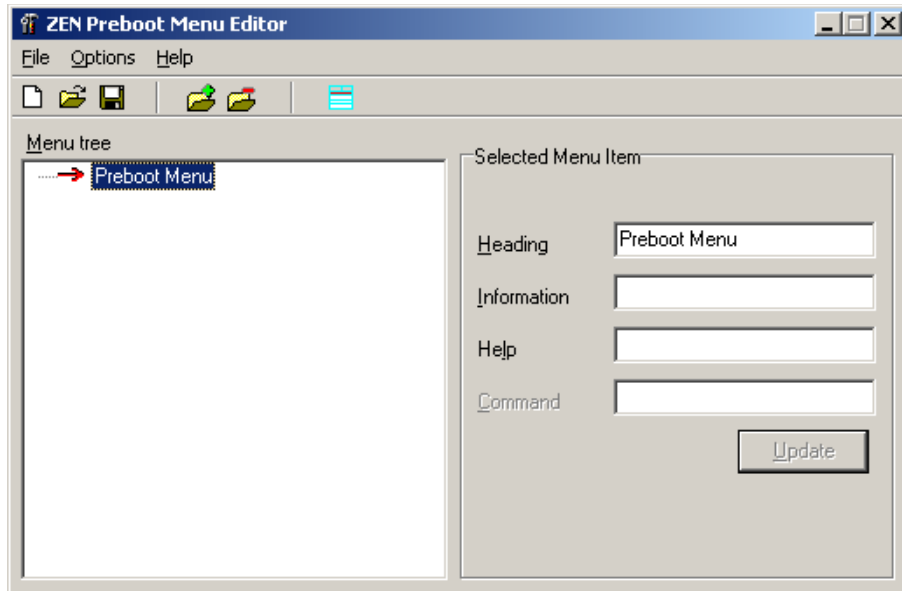
Creating a Submenu

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.
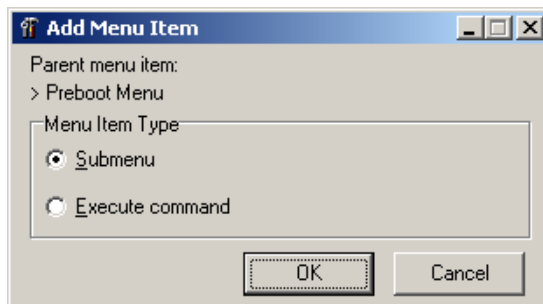
2 Select Submenu, then click OK to display the Add Menu dialog box.

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 Enter descriptive and 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 will appear 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.
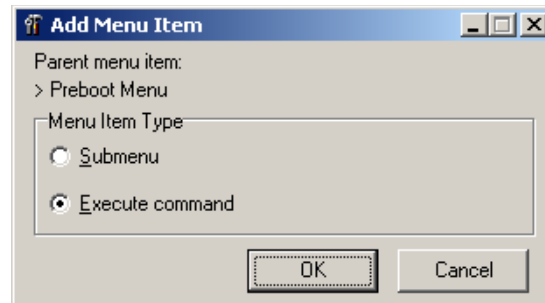
2 Select Execute Command, then click OK.

3 In the Execute Command dialog box, specify 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

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 folder (the same folder 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 ZEN Preboot Menu file (*.dat).

4 In the file Name 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 workstation.

**5** Copy the defmenu.dat file to the /tftp folder on the Preboot Services Server.

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

54 Setting Up Workstations for Imaging

The following sections cover procedures to prepare workstations for imaging. The procedures that are applicable to you depend on your imaging deployment strategy. For more information, see Chapter 50, "Common Imaging Deployment Strategies," on page 571.

If you are using Preboot Services (PXE) as your imaging method, you need to enable PXE on the workstation. For more information, see "Using Preboot Services (PXE)" on page 577.

If you are using a Linux hard-disk partition as your imaging method, you need to create the partition on the workstation. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

The following sections contain additional information:

- "Workstation Requirements" on page 629
- "Enabling a Workstation for Auto-Imaging Operations" on page 630

Workstation Requirements

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

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:

Workstation Must Have	Because
A supported Ethernet card	The workstation must connect with the imaging server to store or retrieve the images. This connection is made when the workstation is under the control of the Desktop Management Workstation 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 63, "Supported Ethernet Cards," on page 735.
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 Desktop Management Workstation Imaging (Linux) partition to be installed on the workstation hard disk, so that the imaging engine can gain control on bootup. The default partition size is 150 MB, and the minimum partition size is 50 MB. This partition is not required if you are performing manual imaging operations using bootable CDs, DVDs, or diskettes (SP1 only).

Workstation Must Have	Because
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 "Using Preboot Services (PXE)" on page 577 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 Imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

Enabling a Workstation for Auto-Imaging Operations

The following procedure explains how to register the workstation as an object in your eDirectory tree, install a Desktop Management Imaging Agent on the workstation, and install a permanent Desktop Management Workstation Imaging (Linux) 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 imaging server, this procedure is not a prerequisite to performing unattended imaging operations. For more information, see "Using Preboot Services (PXE)" on page 577.

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, install the Novell Client™ on the workstation. For more information, see Chapter 1, "Understanding the Novell Client," on page 31.

Desktop Management works with or without an installation of the Novell Client on the workstation. If your setup does not require the Client, then the Desktop Management Management Agent must be installed. For more information, see Chapter 2, "Understanding the Desktop Management Agent," on page 35.

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

When you boot a Windows workstation from an imaging device or method and allow the bootup process to proceed in auto-imaging mode, the imaging engine runs on the workstation and contacts a Desktop Management Workstation Imaging server. In order for the workstation to be imaged, you must first either define an eDirectory policy for the Desktop Management Workstation Imaging server (for more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 633), 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 "Automatic Workstation Import and Removal" on page 77.

You don't need to complete all 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 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.

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

For more information, see "Performing an Automatic Imaging Creation or Restoration" on page 644.

4 Install the Desktop Management Imaging Agent on the workstation.

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 Desktop Management Imaging 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 Imaging 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.

The Desktop Management Imaging Agent has already been installed on the workstation if in Step 1 you did a custom Novell Client installation and chose the Imaging Services option. If this is the case, skip to Step 5. Or, you can choose to install the Imaging Agent by running the ZISD-9x or ZISD-NT application object on the workstation. Otherwise, proceed with Step 4a to install the Desktop Management Imaging Agent.

4a Browse to the sys:\public\zenworks\imaging folder in your ZENworks Desktop Management installation (on the Imaging server).

4b 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 folder.
	2. Run ziswin.exe from the novell\zenis folder.
	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 subfolder or the appropriate language subfolder) to your winnt\system32 folder.
	2. From a command prompt, change to your winnt\system32 folder, type **ziswin -install**, then press Enter.
Windows XP	1. Copy ziswin.exe and ziswinr.dll (in the nls\english subfolder or the appropriate language subfolder) to your windows\system32 folder.
	2. From a command prompt, change to your windows\system32 folder, type **ziswin -install**, then press Enter.

4c Reboot the workstation.

5 Take an image of the workstation as instructed in "Manually Taking an Image of a Workstation" on page 647.

> **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.

6 When the image has been created, reboot the workstation with the first imaging boot diskette (or other imaging boot method), type **install** at the boot prompt, then press Enter.

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

If the Desktop Management imaging partition already exists, it will be upgraded, and your existing Windows partitions will be left intact. For information on updating Linux device drivers (SP1 only) in your hard-disk partition, see "Adding Linux Drivers to Your Boot Method" on page 588.

7 If prompted, reinsert the first imaging boot diskette, then press Enter.

8 (Optional) When the Desktop Management imaging partition has been created and the bash prompt reappears, type **img dump**, then press Enter.

This displays a list of the partition slots on the workstation. Unless you were upgrading your Desktop Management imaging partition, each partition slot should be empty and none should be active. The Desktop Management imaging 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.

9 At the bash prompt, restore the image you took in Step 5. Use the img restorep command or select Restore an Image, then select Proxy Image from the menu as instructed in Step 7 of "Manually Putting an Image on a Workstation" on page 651.

10 (Optional) When the image has been restored and the bash prompt reappears, 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 were restored and activated. There should still be one less partition slot than before because the Desktop Management imaging partition is still hidden (and will continue to be).

11 At the bash prompt, type **lilo.s**, then press Enter.

12 When the bash prompt reappears, remove the diskette and reboot the workstation.

The workstation should boot to Windows. If the bash prompt reappears, enter the **lilo.s** command again and reboot a second time.

From this point on, whenever the workstation is rebooted, the imaging engine takes control and checks the 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 imaging engine simply exits and automatically reboots the workstation to Windows.

55 Setting Up Imaging Policies

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 50, "Common Imaging Deployment Strategies," on page 571.

The following sections contain additional information:

- "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 633
- "Defining an Imaging Policy for Registered Workstations (Workstation Policy)" on page 635
- "Allowing Overwriting Filenames and Restricting Save Location of Image Files (Imaging Server Settings)" on page 637

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 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 imaging engine), the 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 Imaging server sends down the new base image and any add-on images specified by the policy, and the imaging engine puts these images down on the workstation.

WARNING: If you configure an 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 imaging engine reports to the Imaging server that data is missing from the workstation's image-safe area, the Imaging server obtains the missing data from the Imaging Server policy and sends it to the imaging engine, which then saves the data to the image-safe area.

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

1 Prepare the various workstation images that the policy can prescribe. For details, see Chapter 56, "Creating and Restoring Images," on page 639.

2 If a Server Package hasn't already been created to hold the policies for the target imaging servers, create one as instructed in Chapter 10, "Creating Policy Packages," on page 103.

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

4 Enable the Imaging Server policy, then click Properties to display the Rules page.
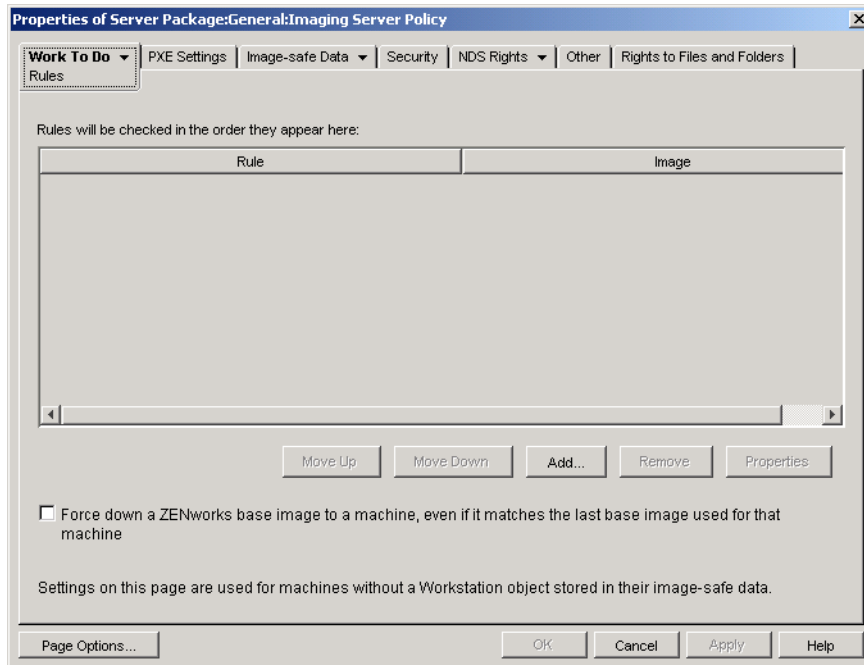
5 Click Add to display the New Image Selection Rule dialog box.
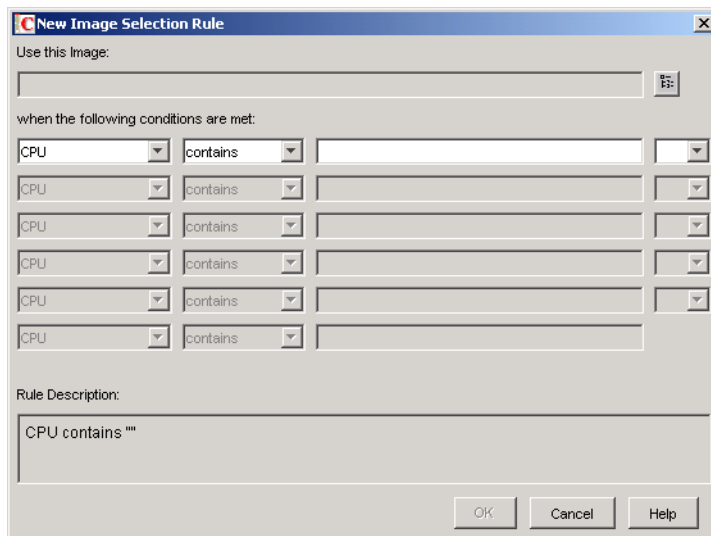
6 Click the browse button next to the Use This Image field to select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 642), use the drop-down fields and operators to specify the conditions under which the selected image should be used (click Help for details), then click OK.

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

These rules are used by your 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 Imaging engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot diskettes (SP1 only) 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 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 Desktop Management Workstation Imaging (Linux) partition, you can disable the Desktop Management imaging 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 displays 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 Imaging servers. For details on these pages, click Help.

11 Click OK to save the policy.

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

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

Defining an Imaging Policy for Registered Workstations (Workstation Policy)

If a Windows workstation has been registered as a Workstation object in eDirectory and you boot that workstation from an imaging method in auto-imaging mode, the 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 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 56, "Creating and Restoring Images," on page 639.

2 If a Workstation Package hasn't already been created to hold the policies for the target workstations, create one as instructed in Chapter 10, "Creating Policy Packages," on page 103.

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

4 Enable the Workstation Imaging policy, then click Properties to display the Rules page.
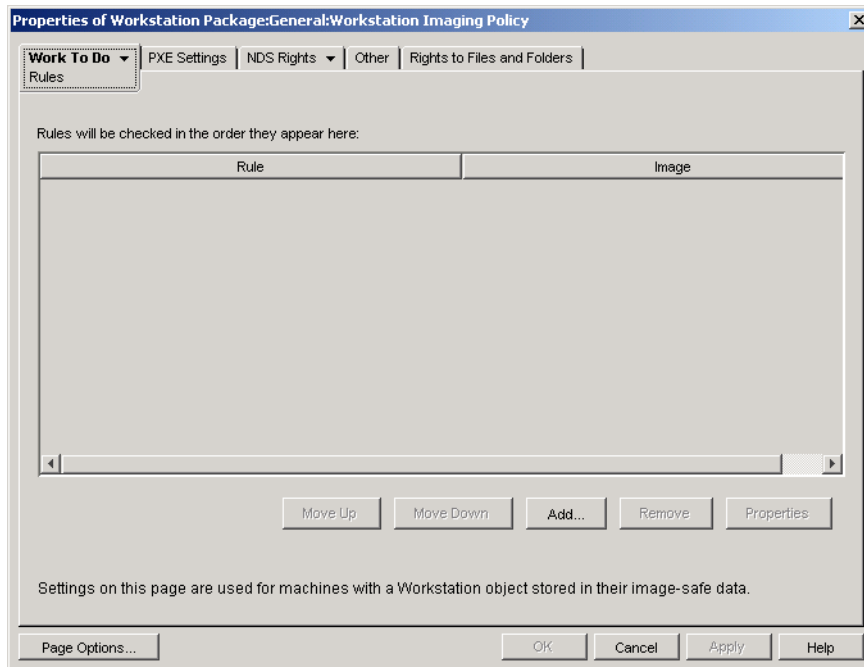
5 Click Add to display the New Image Selection Rule dialog box.
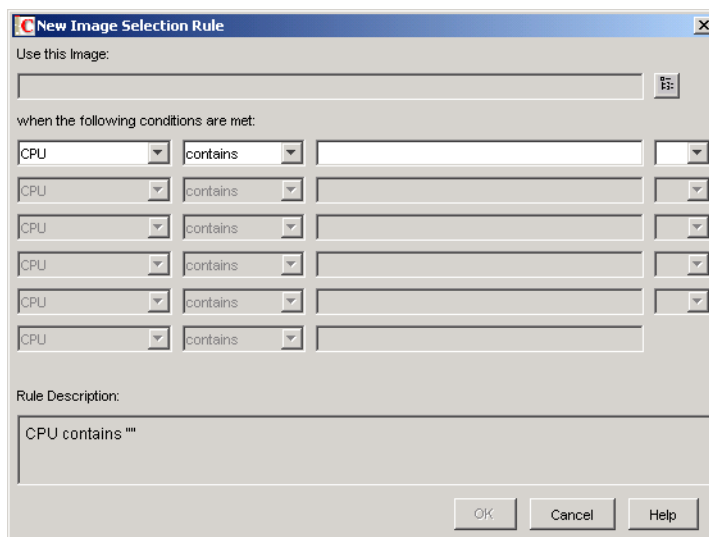
6 Click the browse button next to the Use This Image field to select a Workstation Image object (for more information, see "Creating a Workstation Image Object" on page 642), use the drop-down fields and operators to specify the conditions under which the selected image should be used (click Help for 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 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 Imaging engine on the workstation. To see this data for a particular workstation, boot it with the imaging boot diskettes (SP1 only) 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 Desktop Management Workstation Imaging (Linux) partition, you can disable the Desktop Management imaging 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 displays 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 Imaging server unless you (or another administrator) flag a Workstation object to receive an image on the next boot.

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

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

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

- 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 Imaging servers:

1 If a Server Package hasn't already been created to hold the policies for the target Imaging servers, create one as instructed in Chapter 10, "Creating Policy Packages," on page 103.

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/or server objects that represent the target set of Imaging servers.

7 Click OK to save the association.

56 Creating and Restoring Images

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 that meet the minimum requirements for workstations. For more information, see "User Workstation Hardware Requirements" in the Novell ZENworks 6.5 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 will prevent the workstation from communicating with the Imaging server. If you are using boot managers in your environment, you should disable or remove them before performing imaging operations.

The following sections explain how to perform these tasks:

- "Creating a Workstation (Base) Image" on page 639
- "Creating an Add-On Image" on page 640
- "Using Image Explorer to Customize an Image" on page 640
- "Making an Image Available for Automatic Imaging" on page 641
- "Performing an Automatic Imaging Creation or Restoration" on page 644

Creating a Workstation (Base) Image

A *base* image is an image of all the 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 Imaging engine to take an image of the workstation.

   You can do this manually or automatically. In manual mode, you interrupt the bootup process and issue an imaging command at the Linux prompt. For more information, see "Manually Taking an Image of a Workstation" on page 647. In automatic mode, you set a flag in the workstation's Workstation object using ConsoleOne® and then let the bootup process proceed without interruption. For more information, see "Performing an Automatic Imaging Creation or Restoration" on page 644.

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 "Image Explorer (imgexp.exe)" on page 673.

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 Imaging Agent is installed on the workstation. For more information, see "Using Image Explorer to Customize an Image" on page 640.

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. Balanced is a compromise between compression time and image file size. This option is used by default when an image is created.

(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.)

Desktop Management provides the following compression methods:

◆ **Compress:** Use this option to compress an image file that you currently have open in Image Explorer. For more information, see "Compressing an Open Image" on page 677.

- **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 677.

- **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 a Workstation Image" on page 677.

- **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 imaging engine will make the partition when the image is restored. For more information, see "Resizing a Partition in an Image" on page 678.

- **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 675.

- **Exclude individual files and folders from the image:** In doing this, you create variants of the image by specifying which of ten possible *filesets* (variants) to exclude a given file or folder from. The variants 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 675.

  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 variants. To change this, you must explicitly exclude the file or folder from one or more variants. For more information, see "Adding a File or Folder to an Open Image" on page 675.

- **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 Imaging Agent has been installed on the workstation.

  As with any other file or folder that you add, a .reg file is included in all variants of the image unless you explicitly exclude it from one or more variants. For more information, see "Adding Specific Windows Registry Settings That Are to Be Applied After the Open Image is Laid Down" on page 675.

For information on starting Image Explorer, see "Image Explorer (imgexp.exe)" on page 673.

Making an Image Available for Automatic Imaging

When you boot a workstation from an imaging method and allow the bootup 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 variant of an image be used.

The sections that follow give instructions for performing these tasks:

-
-
-

Creating a Workstation Image Object

1 Create the base image that the Workstation Image object will refer to. For more information, see .

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 Desktop Management Workstation 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 online help for examples of how you can use scripts. Skip to .

NOTE: 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 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 will consist only of add-on images, leave the Base Image File field blank, and skip to of .

9 (Conditional) If you are using Preboot Services but formerly booted from Desktop Management Workstation Imaging (Linux) partitions on workstations, you can delete the Desktop Management imaging 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 Desktop Management imaging partition only when the workstation is booted from an imaging boot device or method other than the Desktop Management imaging partition.

IMPORTANT: After you have deleted the Desktop Management imaging partition, you need to make sure that the image you put on the workstation was made on a workstation without a Desktop

Management imaging partition. Otherwise, the wrong MBR (Master Boot Record) is restored, and the workstation will fail to boot. In addition, if you remove the Desktop Management imaging partition from a Windows 2000/XP machine, Windows cannot boot. You should only remove the Desktop Management imaging partition if you are going to restore an image to the workstation.

10 Click OK to save the Workstation Imaging object.

Associating an Add-On Image with a Base Image

1 Create the add-on image that you will associate with the base image. For more information, see "Creating an Add-On Image" on page 640.

2 Copy the image file to a Desktop Management Workstation 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 642.

4 Right-click the object, then click Properties.

5 Under Add-on Image Files, click the Add button, select the 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.

Using a Variant of an Image

As explained in "Using Image Explorer to Customize an Image" on page 640, you can exclude individual files and folders from any of 10 possible *filesets* (variants) of an image. The variants exist merely as internal attributes of the same image archive.

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

Type of imaging operation	How to specify the variant to use
Automatic (eDirectory-based)	In the Workstation Image object, specify the number of the variant in the Use File Set field. All eDirectory policies and settings that specify that Workstation Image object use the specified variant.
	You can create multiple Workstation Image objects that point to the same base image but to different variants.

Type of imaging operation	How to specify the variant to use
Manual (command-line or menu)	Use the `s` parameter on the `img restore` command. For example, to specify variant number 3: `img restorel dellnt4.zmg s3` or You can 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 "Imaging Engine (Img: Command Line and Menu)" on page 707.

Performing an Automatic Imaging Creation or Restoration

The following procedure explains how to set a flag in the Workstation object in ConsoleOne® that says 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 Imaging server. For more information, see "Manually Taking an Image of a Workstation" on page 647.

    1b In ConsoleOne, create a Workstation Image object in your Novell 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 642. 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 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 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 has been put down, or if one of the add-on images fails, the 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 imaging server must report to Linux that the image was successful.

If any add-on images were 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 were 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).

57 Performing Manual Imaging Operations

The following sections provide instructions for these basic imaging operations:

- "Manually Taking an Image of a Workstation" on page 647
- "Manually Putting an Image on a Workstation" on page 651

These instructions assume that you have already prepared the imaging server (see Chapter 51, "Preparing an Imaging Server," on page 575), prepared workstations for imaging (see Chapter 54, "Setting Up Workstations for Imaging," on page 629), and set up imaging policies (Chapter 55, "Setting Up Imaging Policies," on page 633).

Desktop Management Imaging supports devices that physically connect to the network that meet the minimum requirements for workstations. For more information, see "User Workstation Hardware Requirements" in the *Novell ZENworks 6.5 Desktop Management Installation Guide*. Desktop Management Imaging does not support imaging operations (creating or restoring images) using wireless connectivity.

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 Imaging server.

If you want to store an image locally rather than on an imaging server, see "Using a CD or DVD for Disconnected Imaging Operations" on page 655 and "Using a Hard Disk or Jaz Drive for Disconnected Imaging Operations" on page 657.

Ensure that your imaging server has enough disk space for the image. Otherwise, you receive a "Failed to write to proxy" error.

The following sections contain additional information:

- "Manually Taking an Image of a Workstation Using the Bash Prompt" on page 647
- "Manually Taking an Image of a Workstation Using the ZENworks Imaging Engine Menu" on page 649

Manually Taking an Image of a Workstation Using the Bash Prompt

1 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

- Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

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 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 Imaging server. This can be any server running the Imaging Proxy service.

  The UNC path to the image file to retrieve, including image filename and .zmg extension (case-sensitive). 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 cmd line, the servername portion of this path is replaced with the value in the address portion of the path.

  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.

  NOTE: 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 Imaging server.

For more information on the parameters you can use and usage examples, see "Make Mode (img make)" on page 709.

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 When the image has been created and the bash prompt reappears, remove any diskettes from the drive and reboot the workstation.

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

Manually Taking an Image of a Workstation Using the ZENworks Imaging Engine Menu

1 Boot the workstation using one of the following methods:

- ◆ If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

- ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- ◆ (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

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 will 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 has been created, exit from the ZENworks Imaging Engine menu, remove any diskettes from the drive, then reboot the workstation.

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

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 Imaging server.

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

The following sections contain additional information:

◆ "Manually Putting an Image on a Workstation Using the Bash Prompt" on page 651

◆ "Manually Putting an Image on a Workstation Using the ZENworks Imaging Engine Menu" on page 653

Manually Putting an Image on a Workstation Using the Bash Prompt

1 If you haven't already done so, create the image to put on the workstation, as instructed in "Manually Taking an Image of a Workstation" on page 647.

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

IMPORTANT: If you are putting an image on a workstation without a Desktop Management Workstation Imaging (Linux) partition, make sure the image was made on a workstation without a Desktop Management imaging 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 Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

◆ (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

◆ Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

4 Enter **manual** at the boot prompt.

5 (Conditional; SP1 only) If you are prompted for a language diskette, insert it, then press Enter.

6 (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.

7 Enter a command at the bash prompt using one of the following formats:

- To restore an image from the Imaging server and put it down on a 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 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 imaging server.

If you want to manually restore an image from a folder that uses extended or double-byte characters in its name, you should perform an automatic image restoration using ConsoleOne®. For more information, see "Performing an Automatic Imaging Creation or Restoration" on page 644.

For more information on the parameters you can use and usage examples, see "Restore Mode (img restore)" on page 711.

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.)

8 (Optional) When the image has been put down and the bash prompt reappears, 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 were created and activated by the image that you just put down.

9 At the bash prompt, type **lilo.s**, then press Enter.

10 Remove any diskettes from the drive and reboot the workstation. Verify that it boots to the operating system that was installed by the new image.

Manually Putting an Image on a Workstation Using the ZENworks Imaging Engine Menu

1 If you haven't already done so, create the image to put on the workstation, as instructed in "Manually Taking an Image of a Workstation" on page 647.

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

IMPORTANT: If you are putting an image on a workstation without a Desktop Management Workstation Imaging (Linux) partition, make sure the image was made on a workstation without a Desktop Management imaging 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 Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

- Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

4 Enter **manual** at the boot prompt.

or

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

5 (Conditional; SP1 only) If you are prompted for a language diskette, insert it, then press Enter.

6 Enter **img** to display the ZENworks Imaging Engine menu.

7 (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.

8 Click Imaging, then click Restore Image.

9 In the Restore Image Wizard window, specify the source location of the image (Local or Server), then click Next.

10 Browse to and specify the path to the image archive.

11 (Optional) Specify a file set.

12 (Optional) Specify any advanced options, such as *sfileset* or *apartition:ppartition*.

For details on this and other related img command parameters, see Chapter 61, "Imaging Engine (Img: Command Line and Menu)," on page 707.

13 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.)

14 (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 were created and activated by the image that you just put down.

15 Exit the ZENworks Imaging Engine menu.

16 Run `lilo.s` from the bash prompt.

17 Remove any diskettes from the drive and reboot the workstation. Verify that it boots to the operating system that was installed by the new image.

58 Setting Up Disconnected Imaging Operations

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 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 imaging engine (in Linux).

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 that will 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.

The following sections contain additional information:

Putting Down an Image Using the Bash Prompt

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

2 Boot the workstation using one of the following methods:

3 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 When 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 **lilo.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 reappears), enter the **lilo.s** command again and reboot the workstation a second time.

Putting Down an Image Using the ZENworks Imaging Engine Menu

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

2 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

- Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

3 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 61, "Imaging Engine (Img: Command Line and Menu)," on page 707.

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 When 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 `lilo.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 reappears), enter the `lilo.s` command again and reboot the workstation a second time.

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 Desktop Management Workstation Imaging (Linux) partition if one is installed. Any target partition must have sufficient space.

When you create an image, the partition where you will store the image is itself excluded from the image. When you put down an image, the source partition is not altered.

The following sections contain additional information:

- "Creating an Image on a Hard Disk or Jaz Drive" on page 657
- "Putting Down an Image from a Hard Disk or Jaz Drive" on page 659

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.

The following sections contain additional information:

- "Creating an Image on a Hard Disk or Jaz Drive" on page 657
- "Creating an Image Using the ZENworks Imaging Engine Menu" on page 658

Creating an Image Using the Bash Prompt

1 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.
- Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- ◆ (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

2 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 Desktop Management imaging partition is used.

For details on other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 707.

Creating an Image Using the ZENworks Imaging Engine Menu

1 Boot the workstation using one of the following methods:

- ◆ If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

- ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

- ◆ (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

- ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

2 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 has been created, exit from the ZENworks Imaging Engine menu, remove any diskettes from the drive, then reboot the workstation.

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

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.

The following sections contain additional information:

-
-

Putting Down an Image Using the Bash Prompt

1 Boot the workstation using one of the following methods:

- If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see .

- Boot the workstation using an Imaging boot CD or DVD. For more information, see .

- (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see .

- Boot the workstation from the Imaging hard-disk partition. For more information, see .

2 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 Desktop Management imaging partition is used.

For details on other related img command parameters, see "Imaging Engine (Img: Command Line and Menu)" on page 707.

5 When 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 **lilo.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 reappears), enter the **lilo.s** command again and reboot the workstation a second time.

Putting Down an Image Using the ZENworks Imaging Engine Menu

1 Boot the workstation using one of the following methods:

   ◆ If the workstation is PXE-enabled, boot it from the Imaging/Preboot Services server. For more information, see "Using Preboot Services (PXE)" on page 577.

   ◆ Boot the workstation using an Imaging boot CD or DVD. For more information, see "Preparing Imaging Boot CDs or DVDs" on page 578.

   ◆ (SP1 only) Boot the workstation using Imaging boot diskettes. For more information, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580.

   ◆ Boot the workstation from the Imaging hard-disk partition. For more information, see "Creating an Imaging Hard-Disk Partition" on page 587.

2 Enter **manual** from the boot prompt. (SP1 only:) Insert the second, third, fourth, and fifth diskettes if you are prompted for them.

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 61, "Imaging Engine (Img: Command Line and Menu)," on page 707.

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 When 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 `lilo.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 reappears), enter the `lilo.s` command again and reboot the workstation a second time.

59 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.

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 the 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.

The following sections contain additional information:

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 will be setting up multicasting by visiting each workstation, you will also need imaging boot diskettes (SP1 only), an imaging boot CD or DVD, or the workstations must be PXE-enabled. For more information, see Chapter 52, "Preparing an Imaging Boot Method," on page 577.

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.

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 will cause conflicts if deployed on the network without change.

For a handful of workstations, this might not be a problem. But for a larger number, if the workstations have Windows, you should install the Desktop Management Imaging Agent on them before doing the multicast. (See Step 4 of "Enabling a Workstation for Auto-Imaging Operations" on page 630.) The Imaging Agent saves the workstation's network identity settings before the multicast session and restores them afterwards.

Performing a Multicast Session

The following sections contain additional information:

- "Initiating an Automatic Multicast Session in ConsoleOne" on page 664
- "Performing a Manual Multicast Session" on page 667

Initiating an Automatic Multicast Session in ConsoleOne

When you initiate an automatic multicast session in 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 Desktop Management Imaging Agent on each of the participating workstations.

IMPORTANT: If you do not install the Desktop Management Imaging Agent on each participating machine, those machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 664.

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 displays.
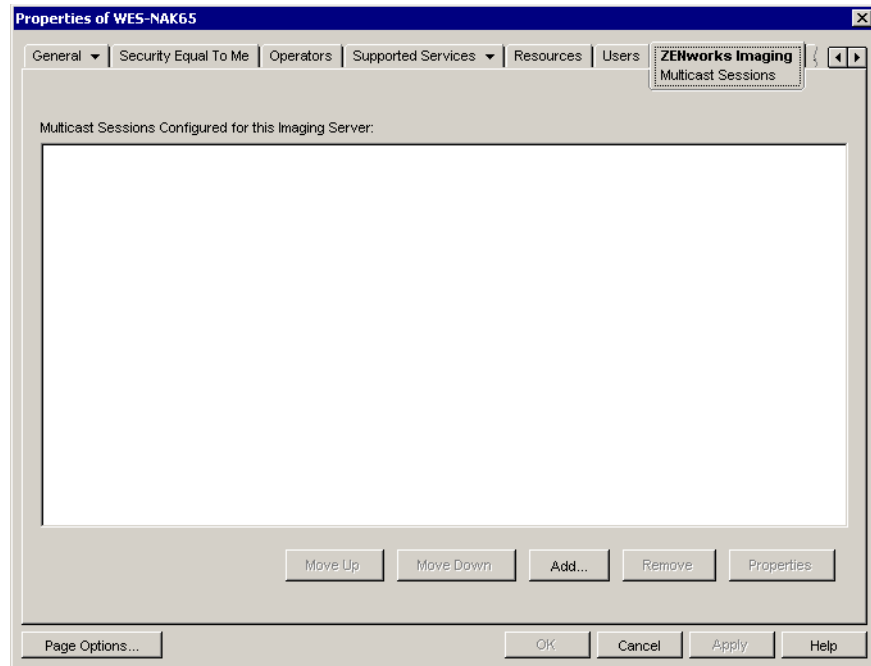
3 Click Add, type a name for the multicast session, then click OK.
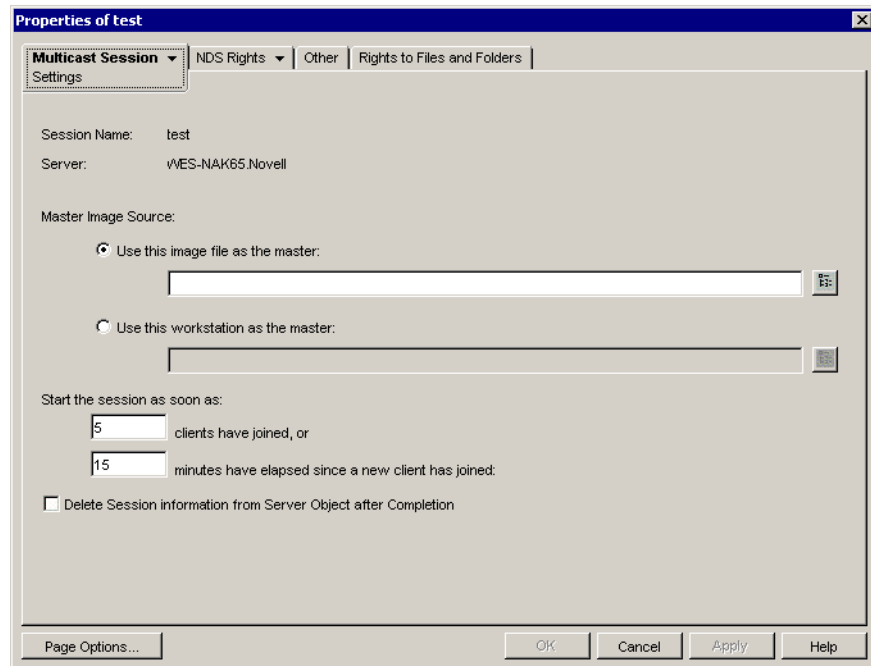
4 Specify the Master Image Source.

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 will begin if a participating workstation boots up and a certain amount of time passes without another participating workstation booting up. 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.
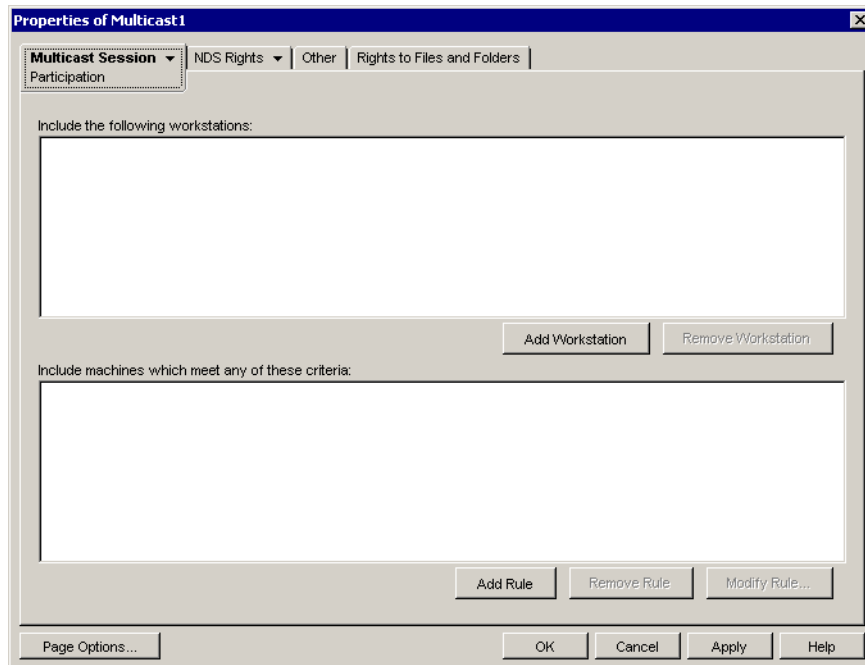
9 Click Add Workstation under Include the Following Workstations to explicitly add the workstation objects that you want to include in this multicast session.

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.
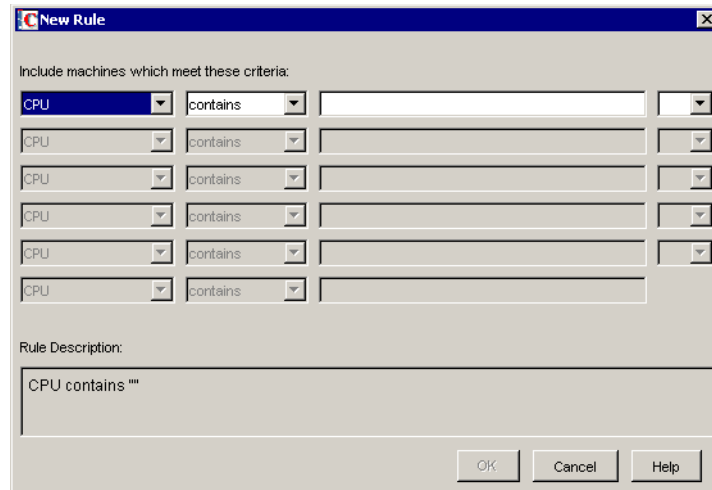
12 (Optional) If you want to change the position of a session in the list, select the multicast session name, then click Move Up or Move Down.

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.

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 (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 either a NetWare® or Windows ZENworks Imaging server to initiate a multicast session. The following sections contain additional information:

**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 type the full path to the image file you want to use, or you can press Insert 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. Type 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 up. 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 "Initiating a Multicast Session from Each Client" on page 669.

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 program.
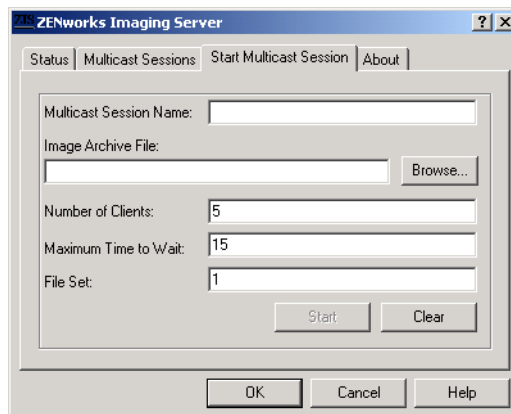
2 Click the Start Multicast Session tab.
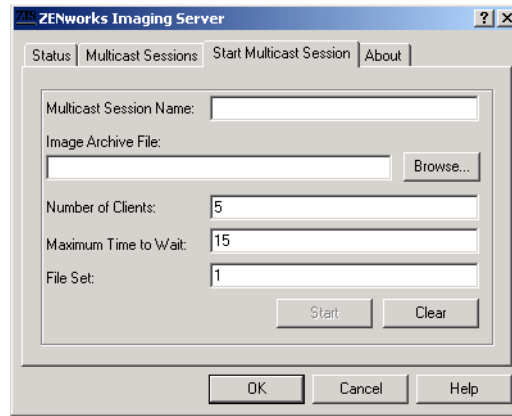
3 Type the name for the multicast session.

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 up. 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 669.

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.

The following sections contain additional information:

* "Using the Bash Prompt to Perform the Multicast Session" on page 670
* "Using the ZENworks Imaging Engine Menu to Perform the Multicast Session" on page 671

Using the Bash Prompt to Perform the Multicast Session

1 (Optional) Install the Desktop Management Imaging Agent on each of the participating workstations.

If you do not install the Desktop Management Imaging Agent on each participating machine, the machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 664.

2 Create a set of imaging boot diskettes (SP1 only) or an imaging boot CD or DVD for each person who will assist 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 577.

3 At each workstation, including the master workstation (unless you will be starting the multicast session from the imaging server), access a Linux prompt by using the imaging boot diskettes (SP1 only), imaging boot CD or DVD, or if it is PXE-enabled, boot it up.

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 Imaging server (as long as you specify the session name used by the Imaging server).

Example: img session doug

The img session command can take other parameters that allow you to designate the master workstation and the imaging start time beforehand. See Chapter 61, "Imaging Engine (Img: Command Line and Menu)," on page 707 for details.

6 (Conditional) If you have not already done so, start the multicast session from the master workstation or from the Imaging server.

Master Workstation: To start the multicast session from the master workstation, after all 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 Imaging server, the session master must be a previously saved image file.

The 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 Imaging server, follow the steps under "Initiating a Multicast Session from the ZENworks Imaging Server" on page 667.

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 **lilo.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 reappears), enter the `lilo.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 Desktop Management Imaging Agent on each of the participating workstations.

If you do not install the Desktop Management Imaging Agent on each participating machine, the machines will have duplicate network identities. For more information, see "Limitations of Multicasting Images" on page 664.

2 Create a set of imaging boot diskettes (SP1 only) or an imaging boot CD or DVD for each person who will assist 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 577.

3 At each workstation, including the master workstation (unless you will be starting the multicast session from the imaging server), access a Linux prompt by using the imaging boot diskettes (SP1 only), imaging boot CD or DVD, or if it is PXE-enabled, boot it up.

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 Type 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 Imaging server (as long as you specify the session name used by the Imaging server).

8 Select a Session Role option:

Master: Select this option if this is the session master.

Client: Select this option if this is a participating 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 it would 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 it would 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 click 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 `lilo.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 reappears), enter the `lilo.s` command again and reboot the workstation a second time.

60 Imaging Utilities and Components

The following sections provide reference information on Novell® ZENworks® Desktop Management imaging utilities, commands, configuration settings, and log formats.

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.

Imgexp.exe is located in the sys:\public\zenworks\imaging folder in your Desktop Management installation (on the Imaging server).

To start the Image Explorer as a standalone utility (from Windows), double-click the imgexp.exe file. There are no command line parameters.

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

Non-Windows partitions, such as NetWare® partitions, are visible when you open an image, but their contents are not.

To use Image Explorer to open images larger than 4 GB that are stored on a NetWare server, the workstation must be running the Novell Client™ 4.9 or newer and the NetWare server must be running NetWare 5 or newer with Novell Storage Services® (NSS) installed.

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. The following list describes key differences between how the ZENworks Image Explorer and Microsoft Windows Explorer function:

◆ **Replacing Files in an Image:** During the lifecycle of an image, files might be deleted or updated using Image Explorer. When you replace an existing file in an image 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 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.

◆ **Dragging Files from Image Explorer:** You cannot drag files from Image Explorer in order to extract them.

The following sections describe the tasks that you can perform using the Image Explorer:

Opening Image Explorer (Imgexp.exe)

1 To start the Image Explorer as a Windows standalone utility, double-click the imgexp.exe file (located in the zenworks\imaging folder on the Imaging server).

or

To start the utility from ConsoleOne if you are running it from the server, click Tools > ZENworks Utilities > Imaging > Image Explorer.

Opening an Image

1 Open Image Explorer (imgexp.exe).

2 Click 🖼 on the toolbar, browse for the image (.zmg) file, then click Open.

Large image files might take a few moments to open.

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 folder 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.

Creating a Folder in an Open Image

1 Open Image Explorer (imgexp.exe).

2 In the left pane, browse to the partition or folder where you want to create the folder, click ▣, type the name of the folder, then click OK.

Adding Specific Windows Registry Settings That Are to Be Applied After the Open Image is Laid Down

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.

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 filesets (variants of the image) that you want the file or folder to be excluded from.

This image has 10 possible variants, labeled Set 1, Set 2, and so on. The files and/or folders that you selected in the main window will be excluded only from the variants that you select in this dialog box.

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.

NOTE: Deleting a file in the Image Explorer merely marks it for deletion, it can still be retrieved. A deleted file is not purged from the image, but it is not added to the restored image.

Purging Files and Folders Marked for Deletion from the Open Image

1 Open Image Explorer (imgexp.exe).

2 Ensure that the open image has been saved, click File, then click Purge Deleted Files.

3 Browse to the image filename or specify a new image filename, then click Save

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 the File menu, click Extract, click As Files, browse to and select a folder, then click OK.

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 Extract, click As Add-on Image, type the name of the new add-on image, then click OK.

Viewing a File from the Open Image in its Associated Application

1 Open Image Explorer (imgexp.exe).

2 Click the file, click the File menu, then click Extract and View.

Saving Your Changes to the Open Image

1 Open Image Explorer (imgexp.exe).

2 Click 💾 on the toolbar.

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.

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.

Compressing a Workstation 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 Imaging server. You can compress an uncompressed image (including images created by previous versions of ZENworks Desktop Management) by 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 677

- "Compressing Any Image without Waiting for the File to Fully Load into Image Explorer" on page 677

Compressing an Open Image

1 Open Image Explorer (imgexp.exe).

2 Click File > Compress Image.

3 Browse to a folder, 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.

4 Click Compress.

Files marked for deletion in the image will be 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.

To use QuickCompress:

1 Open Image Explorer (imgexp.exe).

2 Click Tools > click QuickCompress.

3 Browse to the image file, browse to a folder, 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 will take longer to compress.

4 Click Compress.

If you have used Delete to hide files in the image, they are removed from the image during compression.

Splitting a Workstation Image

You can split an image file into separate files so that you can span the entire image across several CDs or DVDs.

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, 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.

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 has been 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 "Manually Putting an Image on a Workstation" on page 651.

NOTE: Restoring Split Images is a manual task and can only be automated by scripted imaging.

Resizing 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 imaging engine will make the partition when the image is restored.

For example, suppose you create a workstation (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 imaging engine will expand the partition when the image is restored so that you will be able to 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 that what is in the Minimum Size text box.

NOTE: The Original Size field is not applicable for add-on images and cannot be modified.

ZENworks Imaging Windows Agent (Ziswin.exe)

When you install the ZENworks Imaging Windows Agent (ziswin) 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.

The following sections contain additional information:

- "Understanding the ZENworks Imaging Windows Agent (Ziswin.exe)" on page 679
- "Running the ZENworks Imaging Windows Agent in Interactive Mode" on page 680
- "Running the ZENworks Imaging Windows Agent in Service Mode" on page 685
- "Running the ZENworks Imaging Windows Agent in Installation Mode" on page 688
- "Running the ZENworks Imaging Windows Agent in Uninstallation Mode" on page 688

Understanding the ZENworks Imaging Windows Agent (Ziswin.exe)

The ZENworks Imaging Windows Agent is an extension to the Windows bootup 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 6.5 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 (Ziswin.exe)" on page 680.

The ZENworks Imaging Windows Agent (ziswin.exe) is also installed on the 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 communicate on the network using the same 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 automatically.

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 has been 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 (Ziswin.exe)

The ZENworks Imaging Windows Agent (ziswin.exe) 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.

The following sections contain additional information:

- ◆ "Manually Installing Ziswin.exe on a Windows 98 Workstation:" on page 680
- ◆ "Manually Installing Ziswin.exe on a Windows 2000/XP Workstation:" on page 680

Manually Installing Ziswin.exe on a Windows 98 Workstation:

1 From the windows\system folder on the Imaging server, copy the following files to the windows\system folder 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 folder on the Imaging server, copy the ziswin.exe file to the windows\system32 folder on the workstation.

2 From the command prompt, run ziswin -install.

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.

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

1 To run the ZENworks Imaging Windows Agent in interactive mode, manually run ziswin.exe, for example from Explorer, the command line prompt, the Windows > Start > Run command, and so forth.

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 6.5 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 type 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) reads data from the image-safe data store and writes it to the Windows registry. If this option is not selected, the Imaging 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 imaging engine uses this information to prevent the same image from being restored to the workstation, unless you specify in Novell 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 checked, the last imaging operation was a scripted image. If this option is not checked, the last imaging operation was not a scripted image.

- **Script Checksum:** Displays the checksum value representing the last script run. The 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 Novell eDirectory Workstation object for this workstation.

Tree Name: The Novell 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 Windows Imaging Agent (ziswin) to run during the boot process:

Enabled: If this option is checked and the Just Imaged Flag is set (File > Edit > Modify Image-safe Data > Imaging tab), the ZENworks Imaging Windows Agent will read data from the image-safe data store and write it to the Windows registry.

If this option is checked but the Just Imaged Flag is not set, the ZENworks Imaging Windows Agent will read data from the Windows registry and write it to the image-safe data store.

Disabled: If this option is checked, the ZENworks Imaging Windows Agent will run automatically during the boot process, but will exit without doing any work.

- ◆ **Re-enable After _ Boot:** Enable this option and specify the number of boot cycles to take place before the imaging 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):

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 will be created during each boot process. Each new log file will be given a unique name (ziswinx.log, where x represents a number that identifies each log file). Although these log files are small, you may 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) restores image-safe data.

To prevent image-safe data from being restored to the workstation, check the box next to the desired component.

If the check box is enabled (a check mark displays next to an item), that information will not be 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 will be 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) collects data from Windows.

To prevent image-safe data from being overwritten, check the box next to the desired component.

If the check box is enabled (a check mark displays next to an item), that information will not be written to the workstation's image-safe data. Any corresponding existing image-safe data will not be overwritten.

If the check box is not enabled (a check mark does not display next to an item), that information will be collected from the workstation and stored with the workstation's image-safe data. Any corresponding existing image-safe data will be 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 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 during bootup and saved during shutdown. To view a specific history entry's data, select the entry in the ZENworks Imaging Agent History dialog box, then click Details.

Running the ZENworks Imaging Windows Agent in Service Mode

The ZENworks Imaging Windows Agent (ziswin) runs in service mode when no parameters are given on the command line. This will always be 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 will read 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.

The following sections contain more information:

- "Disabled Submode" on page 685
- "Inactive Submode" on page 686
- "Collection Submode" on page 686
- "Restoration Submode" on page 687

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 will 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 the table below), 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:

Component	Value
Workstation Distinguished Name	0x00000001
Workstation Tree	0x00000002
NetBios Name	0x00000004
Workgroup	0x00000008
IP Address	0x00000010
SID	0x00000020
DNS	0x00000100
Workstation ID	0x00000200

The ZENworks Imaging Windows Agent reads the information stored in the image-safe data store and restores that information into the Windows registry.

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 the table below), 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:

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 above mentioned configurations, 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, you would add up all the other components' mask values. The resulting registry value would be 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.

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 Chapter 54, "Setting Up Workstations for Imaging," on page 629.

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 will execute during subsequent bootup 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.

Running the ZENworks Imaging Windows Agent in Uninstallation Mode

The ZENworks Imaging Windows Agent (ziswin.exe) is uninstalled if you uninstall the ZENworks Desktop Management Imaging 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.

Image-Safe Data Viewer and Editor (Zisview and Zisedit)

After booting a workstation from an imaging device, you can enter **zisedit** and **zisview** at the Linux bash prompt to edit and view the image-safe data for that workstation.

The following sections contain additional information:

- "Image-Safe Data Viewer" on page 689
- "Image-Safe Data Editor" on page 691

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 "ZENworks Imaging Windows Agent (Ziswin.exe)" on page 678.

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:

Category	Information
Image-safe Data	◆ **Version:** The version number of the Imaging Agent (ziswin).
	◆ **Just Imaged Flag:** If this is set to False, the Imaging Agent (ziswin) reads data from the Windows registry and write it to the image-safe data store. If this is set to True, the Imaging Agent will read data from the image-safe data store and write 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 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.
Workstation Identity Information	◆ **Workstation Tree:** The Novell 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.
	◆ **Computer Name:** The computer name for the workstation.
	◆ **Workgroup:** The Microsoft network workgroup of the workstation.
	◆ **Windows SID:** The Windows Security ID of the workstation, a unique number that identifies this workstation in Windows.

Category	Information
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 nameservers used for DNS name resolution.
	◆ **DNS Suffix:** The DNS context of the workstation.
	◆ **DNS Hostname:** The DNS local hostname of the workstation.

To use zisview, enter any of the following commands at the Linux bash prompt:

Command	Explanation
zisview	Displays all image-safe data.
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 the image-safe data fields.
zisview -h	Displays help for zisview.

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:

Command	Explanation
zisedit	This displays a screen showing all of the image-safe data fields. You can add or change any of the information in the fields.
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.

Imaging Boot Disk Creator (Zimgboot.exe)

With the release of ZENworks 6.5 SP2, there are now two versions of zimgboot.exe:

Zimgboot.exe for ZENworks 6.5 SP1 and Earlier

Use the Imaging Boot Disk Creator at a Windows workstation to create or update imaging boot diskettes (SP1 only), so you can boot workstations to perform imaging tasks. Also use this utility to create a PXE boot disk to be used with a workstation that cannot be PXE enabled, and to create a diskette that contains Linux utilities.

IMPORTANT: You can update imaging boot diskettes only in the sense that the same physical diskettes can be reused. When updating the second, third, fourth, and fifth diskettes or the optional language diskette, you must reformat the diskette before updating it. The first diskette can be reused without reformatting.

Zimgboot.exe is located in the sys:public\zenworks\imaging folder in your ZENworks Desktop Management installation (on the Imaging server). It is also accessible from the Tools menu of ConsoleOne.

This section includes the following information:

Starting the Imaging Boot Disk Creator

1 To start the boot disk creator as a standalone Windows utility, double-click the zimgboot.exe file (sys:public\zenworks\imaging\zimgboot.exe on the Imaging server). 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.
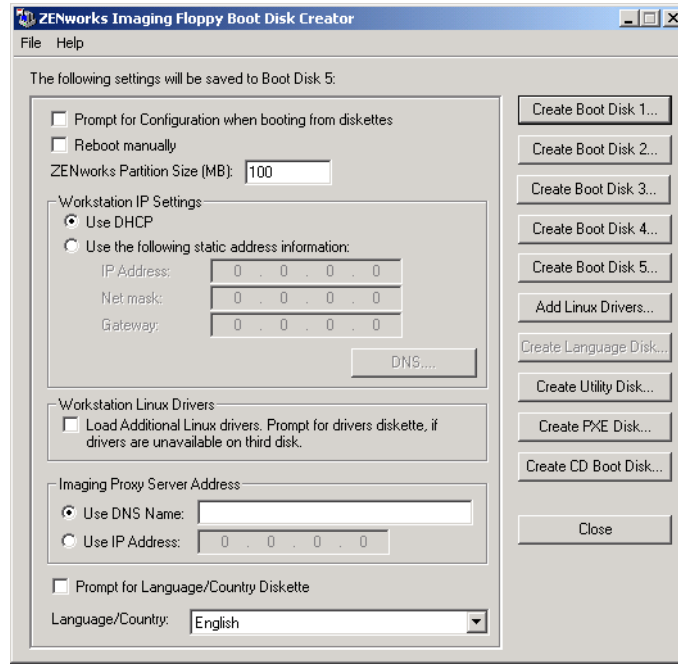
TIP: If the Imaging Boot Disk Creator fills up too much of your screen, change your screen resolution to a setting greater than 800 X 600.

For the process to create imaging boot diskettes, see "Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580. When creating the diskettes, you can configure various aspects of the imaging bootup process, including:

- ◆ How to communicate on the IP network, if necessary

- ◆ How automated the imaging bootup process should be

- ◆ Which Imaging server to contact during automated operations

- ◆ How large the imaging Desktop Management Workstation Imaging (Linux) partition on the hard disk should be, if one will be created

- ◆ Which language support (English or otherwise) to load for the keyboard

For details on these and other configuration options, see the online 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 on the fifth imaging boot diskette. You can edit this file after creating the diskettes if needed. For details on the format of this file, see "Imaging Configuration Parameters (Settings.txt)" on page 695.

If you need to create imaging boot diskettes to boot with a non-English keyboard but the language you need isn't listed in the utility, see "Imaging Bootup Languages (Zimglang.ini)" on page 701.

Using Zimgboot.exe to Add Linux Drivers

IMPORTANT: For information on adding Linux drivers in ZENworks 6.5 SP2, see Chapter 62, "Adding Linux Drivers in ZENworks 6.5 SP2," on page 723.

Use the Add Linux Drivers function to specify the Linux drivers you want to place on the fourth boot diskette (if space allows) or on an additional Linux drivers diskette.

Using this function, you can search for and add the network path to Linux driver files that you have created or downloaded. The dialog box helps you to build a drivers list and categorize it by driver

type (SCSI, Block, Network, PCMCIA, and Miscellaneous). You can also remove unwanted drivers from the list. This master list of driver files can be added to a diskette that you can specify later.

The Add Linux Drivers function also lets you specify the drivers you want to load by default. You do this by selecting the name of a driver on the master list and then clicking the Load button. This moves the driver name to the default load list, where you can change the load order of the default drivers and further specify their individual loading parameters.

When your load list is ready, you can use a function in zimgboot.exe to copy the additional Linux drivers to a diskette. All of the driver files are stored in different subdirectories of the \drivers directory on the diskette:

- Network drivers are stored in \drivers\net

- PCMCIA drivers are stored in \drivers\pcmcia

- Block drivers are stored in \drivers\block

- SCSI drivers are stored in \drivers\scsi

- Miscellaneous drivers are stored in \drivers\misc

These drivers can also be added to an imaging boot CD or DVD, hard-disk partition, or for use with Preboot Services. For more information, see "Preparing an Imaging Boot Method" on page 577 and "Adding Linux Drivers to Your Boot Method" on page 588.

Obtaining Linux Drivers

To obtain a Linux driver for your particular hardware, visit the Web site of the hardware vendor and check for a download location.

There are also some other Web sites where you can obtain drivers:

- Network drivers can be downloaded from the Scyld Computing Corporation (http://www.scyld.com/network.html).

- PCMCIA drivers can be downloaded from the Linux PCMCIA Information Page (http://pcmcia-cs.sourceforge.net).

You can also get additional Linux drivers at the Novell ZENworks Cool Solutions Web Community (http://www.novell.com/coolsolutions/zenworks/features/a_linux_drivers_zw.html).

To learn more about drivers, including the loading parameters you need to specify, see the Linux Documentation Project (http://en.tldp.org) and visit the following HOWTO (http://en.tldp.org/HOWTO/HOWTO-INDEX/howtos.html) sites:

- Hardware

- PCMCIA

- SCSI

- Ethernet

Using Zimgboot.exe to Create a Language Disk

If you use the Boot Disk Creator to create boot diskettes, and if you choose a non-English keyboard in the Language/Country field of the Boot Disk Creator dialog box, you can click Create Language Disk to create a language diskette that will be used to boot the workstation with the imaging

diskettes in the non-English language you chose. The diskette you use must be an empty, formatted, high-density diskette. Do not reuse an old imaging diskette unless you reformat it first.

Using Zimgboot.exe to Create a Utility Disk

You can use the Boot Disk Creator to create a diskette that contains Linux utilities such as df (shows disk usage), fdisk, less, more, host (performs DNS lookups in order to convert DNS names to IP addresses), ldd (shows shared library dependencies), pico (text editor), sed (stream file editor), and touch (changes file time stamps). These utilities are not needed to perform imaging, but they might be useful to you for debugging purposes when imaging is booted to manual or maintenance mode.

For more information, see "Create A Utility Disk" on page 584.

Using Zimgboot.exe to Create 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. Click Create PXE Disk to launch PXE-on-Disk. You need one empty, formatted, high-density diskette.

For more information, see "Using the Desktop Management Preboot Services PXE-on-Disk Utility" on page 617.

Zimgboot.exe for ZENworks 6.5 SP2 and Later

For information, see "Using zimgboot.exe in ZENworks 6.5 SP2 and Later" on page 584.

Imaging Configuration Parameters (Settings.txt)

With the release of ZENworks 6.5 SP2, there are now two versions of the settings.txt file for the different zimgboot.exe utilities:

- "Settings.txt for ZENworks 6.5 SP1 and Earlier" on page 695
- "Settings.txt for ZENworks 6.5 SP2 and Later" on page 698

Settings.txt for ZENworks 6.5 SP1 and Earlier

The settings.txt file contains parameters that control how the imaging boot-up process occurs.

Settings.txt is installed to the root of the imaging boot device (CD or DVD, hard-disk partition, the fifth diskette, or on the Imaging/Preboot Services server).

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 bootup process.

The format and function of each parameter in the settings.txt file are described in the following table:

Parameter	Specifies
PROMPT	Specifies whether to prompt for each configuration setting when you boot a workstation from the imaging device. If you leave this parameter commented out or set it to No, the workstation boots using the configuration settings specified in settings.txt and you can't override the settings during bootup unless you type `config` at the boot prompt before the Linux operating system begins to load. If you set this parameter to Yes, you are automatically prompted for each configuration setting during bootup.
PARTITIONSIZE	The number of megabytes to allocate to the ZENworks Desktop Management Workstation Imaging (Linux) 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 Desktop Management imaging partition, such as to enable the workstation to be restored to a certain state without connecting to the network, you might want to specify a larger size on this parameter. Example: `PARTITIONSIZE=500`
IPADDR	The IP address used by a workstation to communicate on the network when you boot the workstation from the imaging device, if a static IP address is needed. Example: `IPADDR=137.65.95.126` If you want DHCP to be used, leave this and the next two parameters 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.
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.
DNSDOMAINSUFFIX	The list of DNS domain suffixes to be used to identify connections used by this workstation. Use a space to separate entries. Example: `DNSDOMAINSUFFIX=example.novell.com example.xyz.org` If DHCP is being used, leave this parameter commented.
DNSNAMESERVER	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: `DNSNAMESERVER=123.45.6.7 123.45.6.9` If DHCP is being used, leave this parameter commented out.

Parameter	Specifies

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 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 imaging engine attempts to log the imaging results to the server specified in this variable.

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 bootup process proceed in automatic mode, the imaging engine starts and checks the 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`
LANGDISK	Specifies whether to prompt for a language diskette when you boot a workstation from the imaging device. Set this parameter to Yes only if the workstation has a non-English keyboard and you have created a language diskette to support that keyboard as explained in the F1 help for the Imaging Boot Disk Creator (Zimgboot.exe) utility. If you need to support a language that's not listed in the Imaging Boot Disk Creator utility, see "Imaging Bootup Languages (Zimglang.ini)" on page 701. Example: `LANGDISK=YES`

Parameter	Specifies
LOADADDITIONALDRIVERS	Specifies whether to prompt for a diskette with a /drivers directory containing additional Linux device drivers. This is a way to add drivers that might not be included, or to update existing drivers.
	Example: `LOADADDITIONALDRIVERS=YES`
	The location of the driver on the diskette depends on the type of driver. For example, a network driver would be in /drivers/kernel/ drivers/net.
	There might also be a drivers.conf in the /drivers directory on the diskette that is used to configure the drivers in a specific way. For more information about adding or updating drivers, see "Adding Linux Device Drivers" on page 587.

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.

Settings.txt for ZENworks 6.5 SP2 and Later

The settings.txt file contains parameters that control how the imaging boot-up process occurs.

Settings.txt is installed to the root of the imaging boot device (CD or DVD, hard-disk partition, a blank diskette, or on the Imaging/Preboot Services server).

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 the following table:

Parameter	Specifies
MANUALREBOOT	Whether you must 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 imaging engine starts and checks the 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 (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
PARTITIONSIZE	The number of megabytes to allocate to the ZENworks Desktop Management Workstation Imaging (Linux) 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 Desktop Management imaging 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" with "1" and uncomment and configure the other three IP address lines (HostIP, NETMASK, and GATEWAY). Example: netsetup=dhcp
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.

Parameter	Specifies
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.

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 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 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 IMGCMD 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.

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.

Imaging Bootup Parameters

This section only applies to ZENworks 6.5 Desktop Management SP1 and earlier. Boot parameters are not used in ZENworks 6.5 Desktop Management SP2 and later.

ZENworks Imaging, by default, loads PCMCIA, SCSI, and USB drivers. When performing imaging work using diskettes, CDs, or DVDs, some computers, particularly laptops, with PCMCIA, SCSI, or USB cards can hang during the boot process. While loading these drivers does not normally cause problems, you can use command line parameters to prevent these drivers from loading. Also, if you have computers that use PCMCIA cards, you can choose to have the PCMCIA driver load earlier in the boot process if these computers experience problems loading the driver during a normal boot process.

You can use the following parameters at the command prompt:

Parameter	Specifics
PCMCIA	Whether to load a PCMCIA device during the boot process. Example: `manual PCMCIA=NO`
PCMCIABOOT	Whether to load a PCMCIA device earlier during the boot process (for example, a PCMCIA CDROM device). Example: `manual PCMCIABOOT=YES`
SCSI	Whether to load a SCSI device during the boot process. Example: manual `SCSI=NO`
USB	Whether to load a USB device during the boot process. Example: manual `USB=NO`

Imaging Bootup Languages (Zimglang.ini)

IMPORTANT: This section applies only to ZENworks 6.5 SP1 and earlier.

The zimglang.ini file defines the non-English keyboards that are supported for the imaging bootup process. You can create language diskettes for each of these languages using the Imaging Boot Disk Creator (Zimgboot.exe) utility. You can add support for additional languages to this file as explained in Chapter 54, "Setting Up Workstations for Imaging," on page 629.

Zimglang.ini is located in the zenworks\imaging folder in your ZENworks Desktop Management installation (on the Imaging server).

This is a standard Windows .ini format file. Each section of the file defines the keyboard support for a single language, including the keyboard mappings, fonts, and Unicode mappings to use. For example, the German keyboard is defined like this:

```
[German]
keymap=keymaps/de.kmap.gz
Font=consolefonts/iso01.f16.psf.gz
ACM=consoletrans/iso01.acm.gz
```

You can add support for additional languages to this file as explained in Chapter 54, "Setting Up Workstations for Imaging," on page 629.

Imaging Server (Imgserv.nlm or .dll or .dlm)

The 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 of the results of an imaging operation
- A multicast imaging session

The imaging server modules are located on a NetWare server in sys:\system or on a Windows server in the folder where eDirectory is installed (such as c:\novell\nds).

In most environments, the Imaging server starts automatically when you reboot the server after installing Desktop Management. With eDirectory 8.5 on Windows, you must start the Imaging server manually as follows: from the folder 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 Imaging Server:

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 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.

Use the imaging server for the following:

Viewing Information About Imaging Requests

After the 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 server console (NetWare) or in a window accessible from the taskbar (Windows). The statistics shown on this screen are explained below. All statistics are reset to zero if you restart the imaging server.

Statistic	Specifies
Update Requests	The number of imaging requests of any kind that have been received by the 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, such as the source, type, date/time, and results, is logged on the Imaging server as explained in "Imaging Server Log (Zimglog.xml)" on page 703.
Images Sent	The number of images that the Imaging server has sent to imaging clients since the Imaging server was started. This includes only images that were retrieved from this Imaging server. See Client Referrals below for more information.
Images Received	The number of new images that have been received and stored on the Imaging server since it was started. This includes images that were received through client referrals as explained below.
Client Referrals	The number of client requests that have been referred (redirected) by the Imaging server to other imaging servers since this Imaging server was started. Such referrals are made only when the client is running in auto-imaging mode and the Imaging server determines from eDirectory that the image to be created or retrieved is on a different Imaging server.
	IMPORTANT: If a client is running in manual imaging mode and it requests to store or retrieve an image on a different 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.

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 669 in Chapter 59, "Multicasting Images," on page 663.

Imaging Server Log (Zimglog.xml)

Zimglog.xml is a chronological record of all the imaging requests that have been received by the 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 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:\).

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 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 Imaging server or other available (local) medium. A *download* is the retrieval of a client image from the 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>
```

The table below 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 the other elements in the entry.

XML Element	Specifies
Outermost_Container	The distinguished eDirectory name of the workstation that requested the imaging operation. This name is read by the 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 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 Imaging server or other available (local) medium. A *download* is the retrieval of a client image from the 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 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 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 Imaging server, including the week day, month, date, 24-hour time (including seconds), and year.

61 Imaging Engine (Img: Command Line and Menu)

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 imaging engine is installed to the \bin folder on the imaging boot device. If the imaging boot device is diskettes (SP1 only), a CD, or DVD, the \bin folder is actually archived in the root.tgz file, which is expanded during the imaging bootup process. If the imaging boot method is Preboot Services, the imaging engine is downloaded to the workstation during bootup.

Because the 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.

Help Mode (img help)

Use Help mode to get information about the img command if you don't have this documentation available.

To use the Help mode:

1 Enter the following:

`img [help [mode]]`

where *mode* is the mode whose command syntax you want help with.

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.

or

Enter **`img`** to display the ZENworks Imaging Engine menu, select Help, then select a mode name.

Auto Mode (img auto)

Use Auto mode to image the workstation automatically, based on any applicable eDirectory™ policies and settings. The imaging engine runs in this mode if you let the imaging bootup process proceed without interruption, or if you type the command below at the Linux prompt.

To use the Auto mode:

1 Enter the following:

`img auto`

or

Enter **`img`** to display the ZENworks Imaging Engine menu, click Imaging, then click Query For Work.

In this mode, the imaging engine queries the Imaging server specified in the PROXYADDR environment variable for any work to do. The 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 imaging engine to perform those tasks. If any tasks involve storing or retrieving images on other Imaging servers, the Imaging server refers the imaging engine to those servers to complete those tasks. After the imaging engine has completed its work, it communicates the results to the original 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 .

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 below.

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 "Manually Taking an Image of a Workstation" on page 647. 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 58, "Setting Up Disconnected Imaging Operations," on page 655.

The image size corresponds roughly to the size of the data in the Windows partitions plus the entire size of any non-Windows partitions (such as NetWare® partitions). ZENworks® Linux 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 will store the image locally or on an Imaging (proxy) server.

The following sections contain additional information:

- "Make Locally (img makel)" on page 709
- "Make on Proxy (img makep)" on page 710

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]
```

Parameter	Specifies
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 Desktop Management imaging 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 will be overwritten.
[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.

Parameter	Specifies
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 will be stored.

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. (Assumes 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 Desktop Management imaging partition. (Assumes the Desktop Management imaging partition has been 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 Desktop Management imaging partition. (Assumes the Desktop Management imaging partition has been installed.)

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]
```

Parameter	Specifies
address	The IP address or DNS name of an imaging server where the image will be stored. This can be any server running the Imaging Proxy service.
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 Upon execution of **img makep** at the cmd line, the servername portion of this path is replaced with the value in the address portion of this syntax. The directories in the path must exist. If the file already exists; the imaging server won't overwrite it unless you enable this behavior in the imaging server's policy in eDirectory. (See "Allowing Overwriting Filenames and Restricting Save Location of Image Files (Imaging Server Settings)" on page 637.) If no folders are specified in the path, the image is created at the root of the volume or drive where the ZENworks Desktop Management Workstation Imaging server software is installed. **IMPORTANT:** Because Linux does not recognize backslashes, you must use forward slashes in the UNC path or enclose the entire path in quotes.

Parameter	Specifies
[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.

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. (Assumes 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. (Assumes img.xyz.com is the DNS name of xyz_server.)
`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. (Assumes 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` would become `//img.xyz.com`

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 "Manually Putting an Image on a Workstation" on page 651. 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 58, "Setting Up Disconnected Imaging Operations," on page 655.

Normally, if the image to be put down is a base image (one created previously by the 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's insufficient space, the last partition is shrunk to fit unless this would result in data loss, in which case the imaging engine denies the requested operation. If there's 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 merely 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 Workstation Imaging.

The syntax of this mode depends on whether you will retrieve the image from a local device or from an Imaging (proxy) server, as explained in the subsections below:

- "Restore from Local (img restorel)" on page 712
- "Restore from Proxy (img restorep)" on page 714

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 58, "Setting Up Disconnected Imaging Operations," on page 655.

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]
```

Parameter	Specifies
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 will not be changed by the imaging operation.
	If you omit the partition number from this parameter, the image is retrieved from the local Desktop Management imaging 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 fileset (variant) to put down. Valid values are 1 through 10. For information on creating variants of an image, see Chapter 56, "Creating and Restoring Images," on page 639.
	If you omit this parameter, fileset 1 is used.

Parameter	Specifies
apartition:*ppartition*	A mapping between a partition in the image archive (*apartition*) and a target physical partition on the local machine (*ppartition*). 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 recreate the partition.
	For *apartition*, use the partition number displayed for the source partition in the Image Explorer (imgexp.exe) utility. For *ppartition*, 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.

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. (Assumes there's sufficient local space and that slot 8 contains a primary FAT16 or FAT32 partition.)
`img restorel /imgs/dellnt.zmg`	Removes all existing local partitions, retrieves the image from imgs/dellnt.zmg in the Desktop Management imaging partition, and puts down the partitions and contents of that image on the available local writable devices (assuming there's sufficient space).
`img restorel /imgs/dellnt.zmg s2`	Removes all existing local partitions, retrieves the image from imgs/dellnt.zmg in the Desktop Management imaging partition, and puts down the partitions and contents of variant 2 of that image on the available local writable devices (assuming there's sufficient space).
`img restorel /imgs/dellnt.zmg a2:p1 a3:p1`	Retrieves the image from imgs/dellnt.zmg in the Desktop Management imaging partition, updates local partition 1 with the data from partitions 2 and 3 of that image, and leaves the other local partitions unchanged. (Assumes there's sufficient space in local partition 1.)

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 "Manually Putting an Image on a Workstation" on page 651.

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 [sfileset] [apartition:ppartition]
```

Parameter	Specifies
address	The IP address or DNS name of the 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_stored_images*/*imagename*.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.
s*fileset*	The number of the image fileset (variant) to put down. Valid values are 1 through 10. For information on creating variants of an image, see Chapter 56, "Creating and Restoring Images," on page 639. If you omit this parameter, fileset 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 recreate 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.

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. (Assumes there's 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 variant 2 of that image on the available local writable devices. (Assumes there's 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. (Assumes there's sufficient space in local partition 1 and that img.xyz.com is the DNS name of xyz_server.)
`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. (Assumes 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`

Dump Mode (img dump)

Use the Dump mode to view information about the storage devices and partitions on the workstation.

To use the Dump mode:

1 Enter the following:

`img dump [geo]`

Parameter	Specifies to
dump	List the existing partitions on all local writable devices, such as hard disks and Jaz drives. For each partition, the type, size, and slot number of the partition are given. **NOTE:** ZENworks Linux and Compaq configuration partitions are not listed.
geo	Display additional information about the geometry (cylinders, heads, and sectors) and capacity of each storage device, including read-only devices such as CD drives.

Example	Explanation
img dump	Lists the current partitions on all local writable devices.
img dump geo	Lists all storage devices, their geometry and capacity, and the current partitions on the writable devices.

or

Enter **`img`** to display the ZENworks Imaging Engine menu, click System Information, then click Drive Information.

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.

To use the Partition mode 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.

See the table below for more information.

To use the Partition mode using the bash prompt:

1 From the bash prompt, enter:

`img poperation`

where *operation* is one of the following:

Operation	Specifies to
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 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.

Example	Explanation
img pc1 fat16	Creates a FAT16 partition in slot 1 using all 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. (Assumes a partition exists in that slot.)

Example	Explanation

`img pc2 extended 2500`
 	
`img pc2 NTFS 2000 cluster=1`
 	
`img pc2 fat16 500`
	Creates an extended partition with a 2000 NTFS logical drive and a 500 MB FAT16 logical drive.

ZENPartition Mode (img zenPartition)

Use the ZENPartition mode to enable, disable, or remove the installed ZENworks Workstation Imaging (Linux) partition.

To use the ZENPartition mode:

1 Enter **img** to display the ZENworks Imaging Engine menu, click Partitioning, then click Disable ZEN Partition, Enable ZEN Partition, or Remove ZEN Partition.

or

From the bash prompt, enter the following:

img zenPartition *operation*

where *operation* is enable, disable, or remove.

2 Enter **lilo.s** to make this change effective.

IMPORTANT: If you remove an installed Desktop Management imaging partition, you must immediately restore a base image with a valid non-LILO MBR (Master Boot Record). If you do not, the workstation will not be able to boot properly.

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 Imaging 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 Imaging server to the imaging engine when the first base Windows image is put down. (For more information, see "Defining an Imaging Policy for Unregistered Workstations (Server Policy)" on page 633.)

- Information about the hardware devices on the workstation

  This information is detected during the imaging bootup process. If the imaging engine runs in auto-imaging mode, this information is sent to the 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]`

Menu item or parameter	Specifies to
System Information > Detected Hardware or info from the bash prompt	List 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	List the data currently stored in the image-safe area on the workstation. The items that comprise this data are listed in "ZENworks Imaging Windows Agent (Ziswin.exe)" on page 678. 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.

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.

For step-by-step instructions of the different ways you can perform multicast sessions, see the following sections:

- "Initiating an Automatic Multicast Session in ConsoleOne" on page 664
- "Using the Bash Prompt to Perform the Multicast Session" on page 670
- "Using the ZENworks Imaging Engine Menu to Perform the Multicast Session" on page 671

For multicasting to work, each participating workstation must boot from an imaging device and run the 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 Imaging server. If you start the session this way, you specify an image file for multicasting rather than a workstation as the session master.

NOTE: 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.

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]]
```

Parameter	Specifies
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 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 `doug` 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 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 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 will begin. The option only applies for session masters.
	If you omit this parameter, the 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.

Example	Explanation
`img session doug`	Starts a multicast session named doug. 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 Imaging server by selecting Manually Start Multicast, providing the required information, then selecting Yes.
`img session doug m`	Starts a multicast session named `doug` and designates this workstation as the master. Each successive workstation that issues `img session doug` before the imaging begins joins the session as a participant. Imaging doesn't start until the master user presses `g`.
`img session doug master clients=5`	Starts a multicast session named doug. Each successive workstation that issues img session doug 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 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 doug master clients=5 time=20`	Starts a multicast session named doug. Each successive workstation that issues img session doug 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 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 will begin.

62 Adding Linux Drivers in ZENworks 6.5 SP2

Beginning with Novell® ZENworks® 6.5 Support Pack 2 (SP2), a new method for adding Linux drivers into ZENworks image resource files is introduced.

The following sections provide concepts and instructions for adding Linux drivers into an image resource file:

The New Linux Distribution for Imaging

ZENworks Imaging uses a small Linux distribution on the client device to perform imaging operations. The distribution shipping with ZENworks 6.5 SP2 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.

Understanding Device Boot Processes in a ZENworks Imaging Environment

The following provides a high-level overview of a Linux boot process and how ZENworks 6.5 SP2 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, or linld.com when using PXE or a single diskette with the CD. If you have a ZENworks partition installed, it uses the lilo 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 6.5 SP2
Preboot loader	Does the following for all methods: ◆ Loads DOS ◆ Uses loadlin	Uses isolinux when booting from a CD; otherwise, uses linld.com.
Linux kernel name	Uses kernel when booting from a CD. Uses linux.1 when booting from PXE. Uses kernel.zen when booting from a diskette.	For CD, uses \boot\loader\linux. For PXE, uses \tftp\boot\linux.
initrd filename	For CD, uses initrd.gz. For PXE, uses linux.2. For diskettes, uses initrd on the second boot diskette.	For CD, uses \boot\loader\initrd. For PXE, uses \tftp\boot\initrd.

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.

   Historical 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.

   Historical 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 imaging beginning with SP2.

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 SP2 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:

- "linuxrc" on page 725
- "zenworks.s" on page 725

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 \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.

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 "Understanding Desktop Management Preboot Services" on page 591.

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 "Adding Files to an Imaging Boot CD" on page 727.

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:

- "The ZENworks Partition" on page 726
- "Command Line Parameters and Variables" on page 726

The ZENworks Partition

To provide additional imaging functionality, ZENworks has changed the way it uses the ZENworks partition. Beginning with ZENworks 6.5 SP2, 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.

In ZENworks 6.5 SP2 and later, 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.

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 6.5 SP2 and later, the boot loader continues to be lilo, which loads Linux as described under "Understanding Device Boot Processes in a ZENworks Imaging Environment" on page 724. 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 "Adding Files to the Initrd or Root File Systems" on page 728.

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.

- **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://support.novell.com/techcenter/search/Docs/SuSE/SuSE_SDB/en/2002/10/ 81_acpi.html).

- **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 /info file that resides 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 \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 "Variables and Parameters" on page 732.

* **Other variables:** Environment variables that you might want in your script can be added in the same manner as described for the ZENworks variables.

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 \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 initrd or root files to the mounted ZENworks partition.

* 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 in the initrd or root file systems:

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 or UNIX, 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.

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. 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.

You can use the following procedure for the root file system by simply replacing "initrd" with "root" in the steps. However, Linux drivers should always be placed in the initrd file system, not the root file system.

To modify the initrd or root file system:

1 Using a Linux machine, 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\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`

6 To mount the initrd file system to the /work directory, enter:

   `mount -o loop initrd work`

7 To copy your files or updated driver to the mounted 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 unmount the initrd file system, enter:

   `umount work`

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 to the \tftp\boot directory on the PXE server.

  ◆ For the CD, copy the updated initrd to the \boot\loader directory on the boot CD.

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:

  ◆ "Obtaining Drivers" on page 729

  ◆ "Building Drivers" on page 729

If you need to load your drivers with specific parameters, see "Loading Drivers with Parameters" on page 731.

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 6.5 SP2 is based on SLES 9 SP2, kernel version 2.6.5-7.191. If the driver is not for this specific version, you must obtain the source and compile it for this version. For more information, see "Building Drivers" on page 729.

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 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 "Using Uname" on page 731.

To build your drivers:

- "Obtaining the Linux Source Code Tree" on page 730
- "Compiling the Module" on page 730

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 obtain the necessary source code:

- If you have ZENworks 6.5 Desktop Management Support Pack 2 installed, download the zenimgk2657191.tgz Linux source code tree file (http://support.novell.com/servlet/filedownload/pub/zenimgk2657191.tgz).

- If you have ZENworks 6.5 Desktop Management Support Pack 2 HP3 (or later) installed, download the zenimgk2657244.tgz Linux source code tree file (http://support.novell.com/servlet/filedownload/pub/zenimgk2657244.tgz).

To use the Linux source code tree:

1 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-2.6.5-7.191
/usr/src/linux-2.6.5-7.191-obj

2 Obtain the proper configuration file from one of the following locations:

- A running ZENworks imaging distribution file (/proc/config.gz).

- The applicable version: zenimgk2657191.tgz (http://support.novell.com/servlet/filedownload/pub/zenimgk2657191.tgz) or zenimgk2657244.tgz (http://support.novell.com/servlet/filedownload/pub/zenimgk2657244.tgz).

3 Copy this configuration file to the directory created in Step 1.

For example, /usr/src/linux-2.6.5-7.191.

4 To create a link to the source tree:

4a Change to the /usr/src directory:

```
cd /usr/src
```

4b If there is a Linux soft link in the directory, delete it.

4c Create the Linux soft link, such as:

```
ln -s linux-2.6.5-7.191 linux
```

You now have the Linux kernel source tree and soft link ready for compiling the module. Continue with "Compiling the Module" on page 730.

Compiling the Module

To manually compile the module:

1 Install the source.

Follow the supplied instructions 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.

Loading Drivers with Parameters

If there is a module 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 file. This file then needs to be updated in the initrd file system.

You might need to load a LAN driver module with specific parameters. You can do this with a line like:

```
insmod="moduleName parm=xxx"
```

This type of line is most commonly used to load a LAN driver with specific parameters, such as full duplex or specific speed.

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 an use it in Step 4. This example uses version 2.6.13-15-smp from a SLES 9 SP2 installation.

2 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
#uname
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 strings "2.6.13-15-smp" with the version you found in .

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 To reset uname so that it returns actual values, enter:

`unset KRNLVERSION`

Variables and Parameters

The following sections describe the variables and parameters used in updating resource files:

-
-
-

Imaging Script Variables

The following environment variables are used in imaging scripts and must not be modified:

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:

Variable	Definition
HDPARM	NO = Do not set hdparm parameters.
IMGCMD	Imaging command to run instead of the img a command.
MANUALREBOOT	YES = Do not automatically reboot.
PARTITIONSIZE	Size in MB to create the ZENworks partition.

Variable	Definition
PROXYADDR	IP/DNS address of the Imaging server.
PROMPT	Go to the bash prompt after imaging is complete.

Linuxrc Parameters Specified in Settings.txt

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.

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.

Troubleshooting Linux Driver Problems

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 linuxrc.

- 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.

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 you will 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.

63 Supported Ethernet Cards

Novell® ZENworks® Desktop Management provides the Ethernet card drivers contained in the Linux kernel that ships with ZENworks 6.5.

ZENworks 6.5 ships with the 2.4.22 SUSE® LINUX kernel, ZENworks 6.5 SP1 ships with the 2.4.28 kernel, and ZENworks 6.5 SP2 ships with the 2.6.5 kernel.

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 as explained in .

64 **Server Imaging**

Novell® ZENworks® Desktop Management support for managing server images has not been fully tested. Although you can make and deploy server images using Desktop Management in certain simple server configurations, Novell does not support these practices.

For more information, see TID 10092081 (http://support.novell.com/cgi-bin/search/ searchtid.cgi?/10092081.htm) in the Novell Knowledgebase.

H Documentation Updates

This section contains information on documentation content changes that have been made in the *Administration Guide* for Imaging since the initial release of ZENworks 6.5 Desktop Management. This information will help you to keep current on updates to the documentation.

All changes that are noted in this section were 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 were published. Within a dated section, the changes are alphabetically listed by the names of the main table of contents sections for Workstation Management.

If you need to know whether a copy of the PDF documentation you are using is the most recent, the PDF document contains the date it was published on the front title page or in the Legal Notices section immediately following the title page.

The documentation was updated on the following dates:

August 16, 2006

Updates were made to the following sections:

- Adding Linux Drivers in ZENworks 6.5 SP2
- Preparing an Imaging Boot Method

Adding Linux Drivers in ZENworks 6.5 SP2

The following updates were made in this section:

Location	Change
"Adding Files to the Initrd or Root File Systems" on page 728	Replaced the cp command with mv in Step 3 and Step 10 because the files should be renamed, not copied.

Location	Change
"Obtaining the Linux Source Code Tree" on page 730	Updated this section with a change in where to obtain the downloads. Also removed references to TID 10091818, as it no longer applies.

Imaging Utilities and Components

The following updates were made in this section:

Location	Change
"Imaging Bootup Parameters" on page 701	Added the following paragraph in this section: This section only applies to ZENworks 6.5 Desktop Management SP1 and earlier. Boot parameters are not used in ZENworks 6.5 Desktop Management SP2 and later.

Preparing an Imaging Boot Method

The following updates were made in this section:

Location	Change
"Preparing Imaging Boot CDs or DVDs" on page 578	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.

November 22, 2005

Updates were made to the following sections:

- Adding Linux Drivers in ZENworks 6.5 SP2

Adding Linux Drivers in ZENworks 6.5 SP2

The following updates were made in this section:

Location	Change
"Adding Linux Drivers in ZENworks 6.5 SP2" on page 723	This is a new section.

September 23, 2005 (Support Pack 2)

Updates were made to the following sections:

- Imaging Utilities and Components
- Preparing an Imaging Boot Method
- Supported Ethernet Cards

IMPORTANT: Throughout this Workstation Imaging section, where information is applicable to only ZENworks 6.5 SP1 and earlier, the parenthetical (SP1 only) is used. Such instances include references to imaging diskettes, language diskettes, and Linux device drivers. For ZENworks 6.5 SP2 and later, the newer zimgboot.exe utility does not support these features.

Imaging Utilities and Components

The following updates were made in this section:

Location	Change
"Restoration Submode" on page 687	In an IMPORTANT note, changed the DWORD value to REG_SZ value to correctly configure the HKEY_LOCAL MACHINE\SOFTWARE\NOVELL\ZENWORKS\ZISWIN registry key to prevent the ZENworks Imaging Windows Agent from causing the workstation to reboot after performing work in Restoration mode.
"Imaging Boot Disk Creator (Zimgboot.exe)" on page 692	Reorganized this section to include information for the newer zimgboot.exe utility that shipped with ZENworks 6.5 SP2.
"Imaging Configuration Parameters (Settings.txt)" on page 695	Reorganized this section to include information for the newer zimgboot.exe utility that shipped with ZENworks 6.5 SP2.

Preparing an Imaging Boot Method

The following updates were made in this section:

Location	Change
"Using the ZENworks Imaging Floppy Boot Disk Creator Utility" on page 580	This section has been renamed from "Preparing Image Boot Diskettes" and has been reorganized and updated.
"Using zimgboot.exe in ZENworks 6.5 SP1 and Earlier" on page 580	This section has been created to include subsections for each task available on the older version of the zimgboot.exe utility.
"Using zimgboot.exe in ZENworks 6.5 SP2 and Later" on page 584	Because Support Pack 2 provides a newer version of the zimgboot.exe utility, this section has been added.
"Additional Information About Booting to Linux" on page 587	This section has been noted to only apply to ZENworks 6.5 SP1 and earlier. These features are not supported in the newer zimgboot.exe utility.

Supported Ethernet Cards

The following updates were made in this section:

Location	Change
Chapter 63, "Supported Ethernet Cards," on page 735	Modified the content of the chapter to correctly identify the SUSE® LINUX kernel shipping versions for SP1 and SP2.

June 17, 2005

Updates were made to the following sections. The changes are explained below.

- "Imaging Engine (Img: Command Line and Menu)" on page 742
- "Performing Manual Imaging Operations" on page 743
- "Using ZENworks Desktop Management Preboot Services" on page 743

Imaging Engine (Img: Command Line and Menu)

The following updates were made in this section:

Location	Change
"Make on Proxy (img makep)" on page 710	Added the following sentence to the "Address" row: "This can be any server running the Imaging Proxy service."
"Make on Proxy (img makep)" on page 710	Added the following text to the "Filepath" row: 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** Upon execution of **img makep** at the cmd line, the servername portion of this path is replaced with the value in the address portion of this syntax.
"Make on Proxy (img makep)" on page 710	Added a new example: `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. (Assumes 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` would become `//img.xyz.com`
"Restore from Proxy (img restorep)" on page 714	Added the following sentence to the "Address" row: This can be any server running the Imaging Proxy service.

Location	Change
"Restore from Proxy (img restorep)" on page 714	Added the following text to the "Filepath" row: The UNC path to the image file to retrieve, including the image filename and the .zmg extension. The format of the UNC path is as follows: *//**servername**/**volume_or_share**/**path_to_stored_images**/ **imagename**.**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.
"Restore from Proxy (img restorep)" on page 714	Added a new example: `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. (Assumes 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`

Performing Manual Imaging Operations

The following updates were made in this section:

Location	Change
"Manually Taking an Image of a Workstation Using the Bash Prompt" on page 647	Added the following text to Step 4 on page 648: The IP address or DNS name should be that of your Imaging server. This can be any server running the Imaging Proxy service. The UNC path to the image file to retrieve, including image filename and .zmg extension (case-sensitive). 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 cmd line, the servername portion of this path is replaced with the value in the address portion of the path.

Using ZENworks Desktop Management Preboot Services

The following updates were made in this section:

Location	Change
"Configuring the Proxy DHCP Module" on page 615	Added information for the USE_DHCP_PORT option.

February 11, 2005 (Support Pack 1)

Updates were made to the following sections. The changes are explained below.

- Imaging Utilities and Components
- Performing Manual Imaging Operations
- Supported Ethernet Cards

Imaging Utilities and Components

The following updates were made in this section:

Location	Change
"Image Explorer (imgexp.exe)" on page 673	Added the following information: 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. The following list describes key differences between how the ZENworks Image Explorer and Microsoft Windows Explorer function: ◆ **Replacing Files in an Image:** During the lifecycle of an image, files might be deleted or updated using Image Explorer. When you replace an existing file in an image 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 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. ◆ **Dragging Files from Image Explorer:** You cannot drag files from Image Explorer in order to extract them.
"Image-Safe Data Editor" on page 691	Added a number 1 to the DNSServer field name. The field name now reads as follows: DNSServer1 (DNSServer1)
"Imaging Configuration Parameters (Settings.txt)" on page 695	In previous versions of ZENworks documentation, this section was entitled Imaging Bootup Parameters (Settings.txt). This section is now entitled Imaging Configuration Parameters (Settings.txt). Also removed information about the PCMCIABOOT and SCSI parameters and moved this information to a new section entitled Imaging Bootup Parameters.
"Imaging Bootup Parameters" on page 701	Added new section to describe command line options to prevent PCMCIA, SCSI, and USB drivers from loading during the boot process. Also added information to describe how to load PCMCIA drivers earlier in the boot process.

Performing Manual Imaging Operations

The following updates were made in this section:

Location	Change
"Manually Taking an Image of a Workstation Using the Bash Prompt" on page 647	Added the following note under Step 4 on page 648:
	NOTE: 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.
	Added the following information under Step 4 on page 648 for the `makep` and `makel` commands:
	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: $ % ' - _ @ { } ~ ` ! # ( )
"Manually Taking an Image of a Workstation Using the ZENworks Imaging Engine Menu" on page 649	Added the following note under Step 6 on page 650:
	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: $ % ' - _ @ { } ~ ` ! # ( )

Supported Ethernet Cards

The following updates were made in this section:

Location	Change
"Supported Ethernet Cards" on page 735	Added information explaining which Linux kernel ships with ZENworks 6.5 (initial release) and with ZENworks 6.5 Support Pack 1 (SP1). Also provided information about determining which Linux kernel you are using.

October 25, 2004

Updates were made to the following sections. The changes are explained below.

- ◆ Imaging Utilities and Components
- ◆ Preparing an Imaging Boot Method
- ◆ Using ZENworks Desktop Management Preboot Services

Imaging Utilities and Components

The following updates were made in this section:

Location	Change
"Restoration Submode" on page 687	Added the following note: **NOTE:** You can use the registry DWORD 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.

Preparing an Imaging Boot Method

The following updates were made in this section:

Location	Change
"Adding Linux Drivers for Use with Preboot Services (PXE)" on page 588	Changed the command to zip a file in Step 10 on page 588 from `gzip --v9c linux` to gzip -9c linux > linux.gz

Using ZENworks Desktop Management Preboot Services

The following updates were made in this section:

Location	Change
"Creating the Diskette in a NetWare Server Environment" on page 619	Removed information about manually copying the PXE-on-Disk files to a NetWare server; the installation program copies these files on the server automatically.