



8 1/4"

5 7/8"

# ***Red Hat Linux Advanced Server*** **2.1**

## **The Official Red Hat Linux Advanced Server Installation Guide**

**For the Itanium® Processor**



# Red Hat Linux Advanced Server 2.1: For the Itanium® Processor

Copyright © 2002 by Red Hat, Inc.



Red Hat, Inc.

1801 Varsity Drive  
Raleigh NC 27606-2072 USA  
Phone: +1 919 754 3700  
Phone: 888 733 4281  
Fax: +1 919 754 3701  
PO Box 13588  
Research Triangle Park NC 27709 USA

rhl-ig-as-itanium(EN)-2.1-HTML-RHI (2001-10-24T18:41-0400)

Copyright © 2002 by Red Hat, Inc. This material may be distributed only subject to the terms and conditions set forth in the Open Publication License, V1.0 or later (the latest version is presently available at <http://www.opencontent.org/openpub/>). Distribution of substantively modified versions of this document is prohibited without the explicit permission of the copyright holder.

Distribution of the work or derivative of the work in any standard (paper) book form for commercial purposes is prohibited unless prior permission is obtained from the copyright holder.

The admonition graphics (note, tip, and so on) were created by Marianne Pecci <[goddess@ipass.net](mailto:goddess@ipass.net)>. They may be redistributed with written permission from Marianne Pecci and Red Hat, Inc..

Red Hat, Red Hat Network, the Red Hat "Shadow Man" logo, RPM, Maximum RPM, the RPM logo, Linux Library, PowerTools, Linux Undercover, RHmember, RHmember More, Rough Cuts, Rawhide and all Red Hat-based trademarks and logos are trademarks or registered trademarks of Red Hat, Inc. in the United States and other countries.

Linux is a registered trademark of Linus Torvalds.

Motif and UNIX are registered trademarks of The Open Group.

Intel and Pentium are registered trademarks of Intel Corporation. Itanium and Celeron are trademarks of Intel Corporation.

AMD, AMD Athlon, AMD Duron, and AMD K6 are trademarks of Advanced Micro Devices, Inc.

Netscape is a registered trademark of Netscape Communications Corporation in the United States and other countries.

Windows is a registered trademark of Microsoft Corporation.

SSH and Secure Shell are trademarks of SSH Communications Security, Inc.

FireWire is a trademark of Apple Computer Corporation.

All other trademarks and copyrights referred to are the property of their respective owners.

The Red Hat Linux Product Documentation Team consists of the following people:

**Sandra A. Moore, Product Documentation Manager** — Primary Writer/Maintainer of the *Official Red Hat Linux x86 Installation Guide*; Contributing Writer to the *Official Red Hat Linux Getting Started Guide*

**Tammy Fox, Product Documentation Technical Lead** — Primary Writer/Maintainer of the *Official Red Hat Linux Customization Guide*; Contributing Writer to the *Official Red Hat Linux Getting Started Guide*; Writer/Maintainer of custom DocBook stylesheets and scripts

**Edward C. Bailey, Technical Writer** — Contributing Writer to the *Official Red Hat Linux x86 Installation Guide*

**Johnny Fuller, Technical Writer** — Primary Writer/Maintainer of the *Official Red Hat Linux Reference Guide*

**John Ha, Technical Writer** — Contributing Writer to the *Official Red Hat Linux Getting Started Guide*

# Table of Contents

<b>Introduction.....</b>	<b>v</b>
1. Document Conventions.....	v
2. How to Use This Manual .....	vii
2.1. We Need Feedback! .....	vii
<b>1. Steps to Get You Started.....</b>	<b>9</b>
1.1. Do You Have the Right Components?.....	9
1.1.1. Where to Find Other Manuals.....	9
1.1.2. Registering Your Product .....	10
1.1.3. No Boxed Set? No Problem!.....	10
1.2. Is Your Hardware Compatible?.....	10
1.3. Do You Have Enough Disk Space?.....	10
1.3.1. Installation Disk Space Requirements .....	11
1.4. Which Installation Class is Best For You?.....	11
1.4.1. Advanced Server Installations .....	12
1.4.2. Custom Installations .....	12
<b>2. Before You Begin the Installation Process .....</b>	<b>15</b>
2.1. Installation Overview .....	15
2.1.1. Disk Space Requirements .....	15
2.2. The EFI Shell .....	15
2.2.1. EFI Device Names .....	15
2.2.2. EFI System Partition .....	16
2.2.3. Booting the Installation Program.....	16
<b>3. Installing Red Hat Linux Advanced Server .....</b>	<b>19</b>
3.1. The Graphical Installation Program User Interface .....	19
3.1.1. A Note about Virtual Consoles .....	19
3.2. The Text Mode Installation Program User Interface .....	20
3.2.1. Using the Keyboard to Navigate .....	21
3.2.2. Displaying Online Help .....	22
3.3. Starting the Installation Program .....	22
3.3.1. Booting the Installation Program .....	22
3.4. Selecting an Installation Method .....	24
3.5. Installing from CD-ROM .....	25
3.5.1. What If the IDE CD-ROM Was Not Found? .....	26
3.6. Preparing for a Network Installation.....	26
3.6.1. Setting Up the Server .....	26
3.7. Installing via NFS .....	27
3.8. Installing via FTP.....	28
3.9. Installing via HTTP.....	29
3.10. Welcome to Red Hat Linux.....	29
3.11. Language Selection.....	29
3.12. Keyboard Configuration.....	30
3.13. Mouse Configuration .....	31
3.14. Install Options .....	33
3.15. Disk Partitioning Setup.....	33
3.16. Automatic Partitioning.....	34
3.17. Partitioning Your System.....	35
3.17.1. Graphical Display of Hard Drive(s).....	36
3.17.2. <b>Disk Druid's</b> Buttons .....	36
3.17.3. Partition Fields .....	37
3.17.4. Recommended Partitioning Scheme .....	37
3.17.5. Adding Partitions .....	37
3.17.6. Editing Partitions .....	39

3.17.7. Deleting a Partition .....	39
3.18. Partitioning with <b>parted</b> .....	40
3.19. Network Configuration .....	40
3.20. Firewall Configuration .....	42
3.21. Language Support Selection .....	44
3.22. Time Zone Configuration .....	45
3.23. Account Configuration .....	46
3.23.1. Setting the Root Password .....	47
3.23.2. Setting Up User Accounts .....	48
3.24. Package Group Selection .....	48
3.24.1. Selecting Individual Packages .....	49
3.24.2. Unresolved Dependencies .....	50
3.25. X Configuration — Video Card .....	51
3.25.1. Video Card Configuration .....	51
3.26. Preparing to Install .....	52
3.27. Installing Packages .....	52
3.28. X Configuration — Monitor and Customization .....	53
3.28.1. Configuring Your Monitor .....	53
3.28.2. Custom Configuration .....	54
3.29. Installation Complete .....	55
3.30. Booting Your Machine and Post-Installation Setup .....	55
3.30.1. Post-Installation Boot Loader Options .....	56
3.30.2. Booting Red Hat Linux Advanced Server Automatically .....	56
<b>A. Additional Resources about Itanium and Linux .....</b>	<b>59</b>
<b>B. Troubleshooting Your Installation of Red Hat Linux Advanced Server .....</b>	<b>61</b>
B.1. You are Unable to Boot Red Hat Linux Advanced Server .....	61
B.1.1. Is Your System Displaying Signal 11 Errors? .....	61
B.1.2. Are You Unable to Boot from a Network Boot Disk? .....	61
B.2. Trouble Beginning the Installation .....	61
B.2.1. Is Your Mouse Not Detected? .....	61
B.2.2. Problems with Booting into the Graphical Installation .....	62
B.3. Trouble During the Installation .....	62
B.3.1. Partition Creation Problems .....	62
B.3.2. Other Partitioning Problems .....	62
B.3.3. Are You Seeing Python Errors? .....	63
B.4. Problems After Installation .....	64
B.4.1. Problems with Server Installations and X .....	64
B.4.2. Problems When You Try to Log In .....	64
B.4.3. Your Printer Will Not Work Under X .....	64
B.4.4. Problems with Sound Configuration .....	64
<b>C. An Introduction to Disk Partitions .....</b>	<b>67</b>
C.1. Hard Disk Basic Concepts .....	67
C.1.1. It is Not What You Write, it is How You Write It .....	67
C.1.2. Partitions: Turning One Drive Into Many .....	69
C.1.3. Partitions within Partitions — An Overview of Extended Partitions .....	72
C.1.4. Making Room For Red Hat Linux Advanced Server .....	73
C.1.5. Partition Naming Scheme .....	77
C.1.6. Disk Partitions and Other Operating Systems .....	78
C.1.7. Disk Partitions and Mount Points .....	78
C.1.8. How Many Partitions? .....	79
<b>Index .....</b>	<b>81</b>



# Introduction

Welcome to the *Official Red Hat Linux Advanced Server Installation Guide*. This guide contains useful information to assist you during the installation of Red Hat Linux Advanced Server. From fundamental concepts such as installation preparation to the step-by-step installation procedure, this book will be a valuable resource as you install Red Hat Linux Advanced Server.

This manual will walk you through a typical installation using the Red Hat Linux Advanced Server CD-ROMs. Once you have completed the installation as outlined in this manual, you will have a fully functioning system.

## 1. Document Conventions

When you read this manual, you will see that certain words are represented in different fonts, typefaces, sizes, and weights. This highlighting is systematic; different words are represented in the same style to indicate their inclusion in a specific category. The types of words that are represented this way include the following:

### command

Linux commands (and other operating system commands, when used) are represented this way. This style should indicate to you that you can type the word or phrase on the command line and press [Enter] to invoke a command. Sometimes a command contains words that would be displayed in a different style on their own (such as filenames). In these cases, they are considered to be part of the command, so the entire phrase will be displayed as a command. For example:

Use the `cat testfile` command to view the contents of a file, named `testfile`, in the current working directory.

### filename

Filenames, directory names, paths, and RPM package names are represented this way. This style should indicate that a particular file or directory exists by that name on your Red Hat Linux system. Examples:

The `.bashrc` file in your home directory contains bash shell definitions and aliases for your own use.

The `/etc/fstab` file contains information about different system devices and filesystems.

Install the `webalizer` RPM if you want to use a Web server log file analysis program.

### application

This style should indicate to you that the program named is an end-user application (as opposed to system software). For example:

Use Netscape **Navigator** to browse the Web.

### [key]

A key on the keyboard is shown in this style. For example:

To use [Tab] completion, type in a character and then press the [Tab] key. Your terminal will display the list of files in the directory that start with that letter.

### [key]-[combination]

A combination of keystrokes is represented in this way. For example:

The [Ctrl]-[Alt]-[Backspace] key combination will exit your graphical session and return you to the graphical login screen or the console.

### text found on a GUI interface

A title, word, or phrase found on a GUI interface screen or window will be shown in this style. When you see text shown in this style, it is being used to identify a particular GUI screen or an element on a GUI screen (such as text associated with a checkbox or field). Example:

Select the **Require Password** checkbox if you would like your screensaver to require a password before stopping.

### top level of a menu on a GUI screen or window

When you see a word in this style, it indicates that the word is the top level of a pulldown menu. If you click on the word on the GUI screen, the rest of the menu should appear. For example:

Under **Settings** on a GNOME terminal, you will see the following menu items: **Preferences**, **Reset Terminal**, **Reset and Clear**, and **Color selector**.

If you need to type in a sequence of commands from a GUI menu, they will be shown like the following example:

Click on **Programs=>Applications=>Emacs** to start the Emacs text editor.

### button on a GUI screen or window

This style indicates that the text will be found on a clickable button on a GUI screen. For example:

Click on the **Back** button to return to the webpage you last viewed.

### computer output

When you see text in this style, it indicates text displayed by the computer on the command line. You will see responses to commands you typed in, error messages, and interactive prompts for your input during scripts or programs shown this way. For example:

Use the `ls` command to display the contents of a directory:

```
$ ls
Desktop          axhome          logs            paulwesterberg.gif
Mail             backupfiles    mail            reports
```

The output returned in response to the command (in this case, the contents of the directory) is shown in this style.

### prompt

A prompt, which is a computer's way of signifying that it is ready for you to input something, will be shown in this style. Examples:

```
$
#
[stephen@maturin stephen]$
leopard login:
```

### user input

Text that the user has to type, either on the command line, or into a text box on a GUI screen, is displayed in this style. In the following example, **text** is displayed in this style:

To boot your system into the text based installation program, you will need to type in the **text** command at the `boot :` prompt.

Additionally, we use several different strategies to draw your attention to certain pieces of information. In order of how critical the information is to your system, these items will be marked as note, tip, important, caution, or a warning. For example:

**Note**

Remember that Linux is case sensitive. In other words, a rose is not a ROSE is not a rOsE.

**Tip**

The directory `/usr/share/doc` contains additional documentation for packages installed on your system.

**Important**

If you modify the DHCP configuration file, the changes will not take effect until you restart the DHCP daemon.

**Caution**

Do not perform routine tasks as root — use a regular user account unless you need to use the root account for system administration tasks.

**Warning**

If you choose not to partition manually, a server installation will remove all existing partitions on all installed hard drives. Do not choose this installation class unless you are sure you have no data you need to save.

## 2. How to Use This Manual

This manual focuses on a CD-ROM based installation, so it is ideal for users (both new and old) who want a quick and simple installation solution. It will help you prepare your system, walk you through the installation, and assist you in the configuration of Red Hat Linux Advanced Server.

If you are an experienced user who wants to perform a Red Hat Linux Advanced Server CD-ROM installation, and you do not need a review of the basics, you can skip ahead to Chapter 3 to begin the installation process.

**Tip**

Refer to the **Red Hat Frequently Asked Questions** for answers to questions and problems that may occur before, during, or after the installation. You will find the FAQ online at:

[http://www.redhat.com/support/docs/faqs/rhl\\_general\\_faq/](http://www.redhat.com/support/docs/faqs/rhl_general_faq/)



## 2.1. We Need Feedback!

If you spot a typo in the *Official Red Hat Linux Advanced Server Installation Guide*, or if you have thought of a way to make this manual better, we would love to hear from you! Please submit a report against the component *rhel-ig-as-itanium* in Bugzilla at:

<http://bugzilla.redhat.com/bugzilla/>

When submitting a bug report, be sure to mention the manual's identifier:

`rhel-ig-as-itanium(EN)-2.1-HTML-RHI (2001-10-24T18:41-0400)`

If you have a suggestion for improving the documentation, try to be as specific as possible when describing it. If you have found an error, please include the section number and some of the surrounding text so we can find it easily.

If you have a support question (for example, if you need help configuring X, or if you are not sure how to partition your hard drive[s]), use the online support system by registering your product at:

<http://www.redhat.com/apps/activate/>



## Chapter 1.

# Steps to Get You Started



### Note

Although this manual reflects the most current information possible, you should read the to Red Hat Linux Advanced Server Release Notes for information that may not have been available prior to our documentation being finalized. The Release Notes can be found on the Red Hat Linux CD #1 and online at:

<http://www.redhat.com/docs/manuals/linux>

Before you install to Red Hat Linux Advanced Server, you should perform the following steps:

### 1.1. Do You Have the Right Components?

If you have purchased the Official Red Hat Linux Advanced Server boxed set, you are ready to go. However, mistakes occasionally happen, so now is a good time to double-check the contents of your product.

A black, red, and white Registration Information card is included with your product. A list of the contents of your boxed set version is on the back of the card. Please read over the list and check to make sure that you have all the CDs and manuals that are included with the version of Red Hat Linux Advanced Server that you purchased.

If you have purchased the Official Red Hat Linux Advanced Server boxed set from Red Hat, Inc. (or one of our distributors), and you are missing one or more of the items listed, please let us know. Contact information is also available on the Registration Information card.

*How to identify our official boxed set:* The bottom of our box has an ISBN number next to one of the bar codes. That ISBN number should be in this form:

1-58569-x-y

(The *x* and *y* will be unique numbers.)

Red Hat partners with companies (international and domestic) so that we can make Red Hat Linux Advanced Server available to you in the most convenient form. Because of these partnerships, you might find that your Red Hat Linux Advanced Server product may not have been actually produced by Red Hat.

If your product has a different ISBN number (or none at all), you will need to contact the company that produced it. Normally, third-party producers will include their logo and/or contact information on the outside of their box; an official Red Hat Linux Advanced Server boxed set lists only our name and contact information.

### 1.1.1. Where to Find Other Manuals

If your particular product did not include all of the printed Red Hat Linux Advanced Server manuals, you can find them online or on the Red Hat Linux Advanced Server Documentation CD included with your official Red Hat Linux Advanced Server product.

To find the manuals in both HTML and PDF formats online, go to:

<http://www.redhat.com/docs>

### 1.1.2. Registering Your Product

If you have purchased the Official Red Hat Linux Advanced Server boxed set, you should register your product. Registration offers many useful services, such as access to Red Hat Network and more. To register your product, go to:

<http://www.redhat.com/apps/activate/>

You will find your *Product ID* on the Registration Information card in your Official Red Hat Linux Advanced Server boxed set. Once registered, you will have access to all the extras that Red Hat provides to its registered users.

### 1.1.3. No Boxed Set? No Problem!

Of course, not everyone purchases a Red Hat Linux Advanced Server boxed set. It is entirely possible to install Red Hat Linux Advanced Server using a CD created by another company, or even via FTP. In these cases, you may need to create one or more diskettes to get started.

For information on downloading and installing Red Hat Linux Advanced Server, refer to [http://www.redhat.com/download/howto\\_download.html](http://www.redhat.com/download/howto_download.html).

For people installing Red Hat Linux Advanced Server from a CD-ROM not from Red Hat, you may need a boot disk. It may also be able to start the installation directly from the CD. We will discuss this in more detail when we outline the various installation methods.

For information on making diskettes, see Section 2.2.3.2.

## 1.2. Is Your Hardware Compatible?

Hardware compatibility is particularly important if you have an older system or a system that you built yourself. Red Hat Linux Advanced Server 2.1 should be compatible with most hardware in systems that were factory built within the last two years. However, hardware specifications change almost daily, so it is hard to guarantee that your hardware will be 100% compatible.

The most recent list of supported hardware can be found at:

<http://hardware.redhat.com/hcl/>

## 1.3. Do You Have Enough Disk Space?

Nearly every modern-day operating system (OS) uses *disk partitions*, and Red Hat Linux Advanced Server is no exception. When you install Red Hat Linux Advanced Server, you may have to work with disk partitions. If you have not worked with disk partitions before (or need a quick review of the basic concepts) read Appendix C before proceeding.

The disk space used by Red Hat Linux Advanced Server must be separate from the disk space used by other OSes you may have installed on your system. At least three partitions (`/`, `/boot/efi`, and `swap`) must be dedicated to Red Hat Linux Advanced Server.

Before you start the installation process, one of the following conditions must be met:

- Your computer must have enough *unpartitioned*<sup>1</sup> disk space for the installation of Red Hat Linux Advanced Server.
- You must have one or more partitions that may be deleted, thereby freeing up enough disk space to install Red Hat Linux Advanced Server.

### 1.3.1. Installation Disk Space Requirements



#### Note

These recommendations are based on an installation that only installs one language (such as English). If you plan to install multiple languages to use on your system, you should increase the disk space requirements.

#### Advanced Server

An advanced server installation requires 1 GB for a minimal installation without X (the graphical environment), at least 1.3 GB of free space if all components (package groups) other than X are installed, and at least 2.0 GB to install all packages including GNOME and KDE.

#### Custom

A Custom installation requires 1.1 GB for a minimal installation and at least 3.7 GB of free space if every package is selected.

If you are not sure that you meet these conditions, or if you want to know how to create free disk space for your Red Hat Linux Advanced Server installation, please refer to Appendix C.

## 1.4. Which Installation Class is Best For You?

Usually, Red Hat Linux Advanced Server is installed on its own disk partition or set of partitions, or over another installation of Linux.



#### Warning

Installing Red Hat Linux Advanced Server over another installation of Linux (including Red Hat Linux Advanced Server) does *not* preserve any information (files or data) from a prior installation. Make sure you save any important files! To preserve the current data on your existing system, you should back up your data and/or consider performing an upgrade instead.

Red Hat Linux Advanced Server provides the following different types, of installations:

1. Unpartitioned disk space means that available disk space on the hard drive(s) you are installing to has not been divided into sections for data. When you partition a disk, each partition will behave like a separate disk drive.

### Advanced Server

Red Hat Linux Advanced Server includes technology and services appropriate for enterprise servers hosting mission critical applications. Ideal for high-availability and failover solutions, Advanced Server is a reliable and powerful server that delivers the best Red Hat innovations while protecting the stability of your server applications. Advanced Server is intended for the continuous operation of reliable, constant load internet and intranet applications (such as databases), especially supported third-party software solutions.

### Custom

A custom installation allows you the greatest flexibility during your installation. You choose your boot loader, which packages you want, and more. Custom installations are most appropriate for those users more familiar with Red Hat Linux installations and for those afraid of losing complete flexibility.

These classes give you the option of simplifying the installation process (with some potential for loss of configuration flexibility), or retaining flexibility with a slightly more complex installation process. Next, take a detailed look at each class, so you can see which one is right for you.

## 1.4.1. Advanced Server Installations

An Advanced Server installation will install your choice of the GNOME or KDE desktop environments, or both, and the X Window System (the graphical software on which the desktop environments are based).

Below are the minimum recommended disk space requirements for a workstation installation where only one language (such as English) will be installed.

- Advanced Server choosing GNOME or KDE : 1.5 GB
- Advanced Server choosing both GNOME and KDE, and games: 1.8 GB

If you plan to choose all package groups (for example, GNOME is a group of packages), as well as select additional individual packages, you may want to allow yourself 2.1 GB or more of disk space.

### 1.4.1.1. What an Advanced Server Installation Will Do

If you choose automatic partitioning, a workstation installation will create the following partitions:

- A 100 MB partition (mounted as `/boot/efi` and formatted as type `vfat`) in which the Linux kernel, the ELILO configuration files, and other related files reside.

- 

The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.

- A root partition (mounted as `/`) in which all other files are stored (the exact size of this partition is dependent on your available disk space).

## 1.4.2. Custom Installations

The *custom installation* allows you the most flexibility during your installation. The workstation and server installations automatically go through the installation process for you and omit certain steps.

During a custom installation, you have complete control over the packages that will be installed on your system.

The recommended disk space requirements for a custom installation are as follows:

- Custom (minimum): 1.1 GB
- Custom (choosing everything): 3.7 GB

#### 1.4.2.1. What a Custom Installation Will Do

As you might guess from the name, a custom installation puts the emphasis on flexibility. You have complete control over which packages will be installed on your system.

If you choose automatic partitioning, a custom installation will create the following partitions:

- A 100 MB partition (mounted as `/boot/efi` and formatted as `vfat`) in which the Linux kernel, ELILO configuration files, and other related files reside.

- 

The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.

- A root partition (mounted as `/`) in which all other files are stored (the exact size of this partition is dependent on your available disk space).



## Before You Begin the Installation Process

### 2.1. Installation Overview

Installing Red Hat Linux Advanced Server on an Itanium system is different from installing Red Hat Linux Advanced Server on an x86 or Alpha machine. In general, the sequence of steps to a successful installation are the following:

1. Boot into the Extensible Firmware Interface (EFI) Shell.
2. If you cannot boot from the CD-ROM, make an LS-120 diskette from the boot image file provided with Red Hat Linux Advanced Server.
3. Using the EFI Shell and the ELILO boot loader, load and run the kernel, and boot into the Red Hat Linux Advanced Server installation program.

#### 2.1.1. Disk Space Requirements

Before you begin the installation, be aware that you will need certain amounts of free disk space to install Red Hat Linux Advanced Server.

- At minimum, you will need 512 MB of RAM and 1 GB of free hard disk space to install Red Hat Linux Advanced Server.
- You should have 1024 MB of RAM and 4 GB or more of free hard disk space on your machine for a full installation of Red Hat Linux Advanced Server.

Depending upon what type of installation you are performing, you may need an LS-120 diskette.

### 2.2. The EFI Shell

Before you start to install Red Hat Linux Advanced Server on an Itanium, you will need a basic understanding of the EFI Shell, what it does, and the information it can provide.

The EFI Shell is a console interface used to launch applications (such as the Red Hat Linux Advanced Server installation program), load EFI protocols and device drivers, and execute simple scripts. It is similar to a DOS console and can access media that is FAT16 (vfat) or FAT32 formatted.

The EFI Shell also contains common utilities that can be used on the EFI system partition. These utilities include `edit`, `type`, `cp`, `rm`, and `mkdir`. To see a list of utilities and other commands, type `help` at the EFI Shell prompt.

The EFI Shell comes with a boot loader called `elilo`. Additional information on EFI can be found at the following URL:

<http://developer.intel.com/technology/efi/index.htm>



### 2.2.1. EFI Device Names

The `map` command can be used to list all devices and file systems that EFI can recognize. When your Itanium system boots into the EFI shell, it probes your system in the following order:

1. LS-120 or LS-240 drive (if it contains media)
2. IDE hard drives on the primary IDE interface
3. IDE hard drives on the secondary IDE interface
4. SCSI hard drives on the SCSI interface
5. CD-ROM drives on the IDE interface
6. CD-ROM drives on the SCSI interface

To view the results of this system poll, type the following command at the EFI Shell prompt:

```
Shell>map
```

The output is listed in the order the system was probed. So, all FAT16 file systems are listed first, then IDE hard drives, then SCSI hard drives, then IDE CD-ROM drives, and finally SCSI CD-ROM drives.

For example, output of the `map` command might look like the following:

```
Device mapping table
fs0  : VenHw(Unknown Device:00)/HD(Part1,Sig00000000)
fs1  : VenHw(Unknown Device:80)/HD(Part1,Sig00000000)
fs2  : VenHw(Unknown Device:FF)/CDROM(Entry1)/HD(Part1,Sig00000000)
blk0 : VenHw(Unknown Device:00)
blk1 : VenHw(Unknown Device:00)/HD(Part1,Sig00000000)
blk2 : VenHw(Unknown Device:80)
blk3 : VenHw(Unknown Device:80)/HD(Part1,Sig00000000)
blk4 : VenHw(Unknown Device:80)/HD(Part2,Sig00000000)
blk5 : VenHw(Unknown Device:80)/HD(Part3,Sig00000000)
blk6 : VenHw(Unknown Device:80)/HD(Part3,Sig00000000)/HD(Part1,Sig725F7772)
blk7 : VenHw(Unknown Device:FF)
blk8 : VenHw(Unknown Device:FF)/CDROM(Entry1)
blk9 : VenHw(Unknown Device:FF)/CDROM(Entry1)/HD(Part1,Sig00000000)
```

In this example, there is an LS-120 diskette in the LS-120 drive as well as a CD-ROM in the CD-ROM drive. All the listings beginning with `fs` are FAT16 file systems that EFI can read. All the listings beginning with `blk` are block devices that EFI recognizes. Both the file systems and block devices are listed in the order they are probed. Therefore, `fs0` is the system partition on the LS-120, `fs1` is the system partition on the hard drive, and `fs2` is the system partition on the CD-ROM.

For additional information on how to determine which devices EFI recognizes, visit this website:

[http://developer.intel.com/software/idap/tech/video/efi/efi\\_shell\\_3.htm](http://developer.intel.com/software/idap/tech/video/efi/efi_shell_3.htm)

### 2.2.2. EFI System Partition

When partitioning your hard drive for Linux, you must create a system partition that is FAT16 (vfat) or FAT32 formatted and has a mount point of `/boot/efi`. This partition will contain the installed Linux kernel(s) as well as the `elilo` configuration file (`elilo.conf`). The `elilo.conf` file contains a list of kernels from which you can boot your system.

### 2.2.3. Booting the Installation Program

Your Itanium system will probably be able to boot the Red Hat Linux Advanced Server installation program directly from the Red Hat Linux Advanced Server CD 1. If your Itanium cannot boot the installation program from the CD-ROM (or if you want to perform a hard drive, NFS image, FTP, or HTTP installation) you must boot from a diskette. See Section 2.2.3.2 for more information on booting from a diskette.

#### 2.2.3.1. Booting the Installation Program from the CD-ROM

To boot from Red Hat Linux Advanced Server CD 1 follow these steps:

1. Remove all media except Red Hat Linux Advanced Server CD 1.
2. From the **Boot Option** menu choose **EFI Shell** (or the **cd-rom** entry).



#### Note

On some systems, the EFI shell can be found under a System Utilities submenu.

3. At the `Shell>` prompt, change to the file system on the CD-ROM. For example, in the above sample `map` output, the system partition on the CD-ROM is `fs1`. To change to the `fs1` file system, you would type `fs1:` at the prompt.
4. Type `elilo linux` to boot into the installation program.
5. Go to Chapter 3 to begin the installation.

#### 2.2.3.2. Booting the Installation Program from an LS-120 Diskette

If your Itanium will not boot from Red Hat Linux Advanced Server CD 1, you may need to boot from an LS-120 diskette. If you want to perform a hard drive, NFS image, FTP, or HTTP installation, you may need to boot from a boot LS-120 diskette.



#### Tip

The installation program also supports passing the `askmethod` boot command to the installation program. This command asks you to select the installation method you would like to use when booting from the Red Hat Linux Advanced Server CD.

You will need to create an LS-120 boot image file diskette from the boot image file on CD 1: `images/boot.img`. To create this diskette in Linux, insert a blank LS-120 diskette and type the following command at a shell prompt:

```
dd if=boot.img of=/dev/hda bs=180k
```

Replace `boot.img` with the full path to the boot image file and `/dev/hda` with the correct device name for the LS-120 diskette drive.

If you are not using the Red Hat Linux Advanced Server CD, the installation program will start in text mode. You will need to choose a few basic options for your system and then you will need to select which installation method you would like to use. See Section 3.24 for more information on the different installation methods.

If you are using the CD-ROM to load the installation program, follow the instructions contained in Chapter 3 to install Red Hat Linux Advanced Server.

To boot from an LS-120 diskette follow these steps:

1. Insert the LS-120 diskette you made from the boot image file `boot.img`. If you are performing a local CD-ROM installation but booting off the LS-120 diskette, insert the Red Hat Linux Advanced Server CD 1 also. If you are performing a hard drive, NFS image, FTP, or HTTP installation, you do not need the CD-ROM.
2. From the **Boot Option** menu choose **EFI Shell**.

**Note**

On some systems, the EFI shell can be found under a System Utilities submenu.

3. At the `Shell>` prompt, change the device to the LS-120 drive by typing the command `fs0:`, using the example `map` output above.
4. Type `elilo linux` to boot into the installation program.
5. Go to Chapter 3 to begin the installation.

### 2.2.3.3. Boot Loader Options

To pass options to the boot loader, enter the following at the EFI Shell prompt:

```
Shell>elilo linux option
```

Acceptable options that can be passed to the installation program are as follows:

- `text` — use text mode installation program
- `lowres` — use 640 x 480 resolution
- `dd` — use a driver disk
- `expert` — expert mode
- `askmethod` — select the installation method you would like to use when booting from the CD

## Installing Red Hat Linux Advanced Server

This chapter explains how to install Red Hat Linux Advanced Server from the CD-ROM using the graphical, mouse-based installation program. The following topics are discussed:

- Getting familiar with the installation program's user interface
- Starting the installation program
- Selecting an installation method
- Configuration steps during the installation (language, keyboard, mouse, etc.)
- Finishing the installation

### 3.1. The Graphical Installation Program User Interface

If you have used a *graphical user interface (GUI)* before, you will be familiar with this process; simply use your mouse to navigate the screens, "click" buttons, or enter text fields. You can also navigate through the installation using the [Tab] and [Enter] keys.



#### Note

If you do not wish to use the GUI installation program, the text mode installation program is also available. To start the text mode installation program, type the following command at the EFI Shell prompt:

```
Shell> elilo linux text
```

#### 3.1.1. A Note about Virtual Consoles

The Red Hat Linux Advanced Server installation program offers more than the dialog boxes of the installation process. Several different kinds of diagnostic messages are available to you, in addition to providing a way to enter commands from a shell prompt. The installation program displays these messages on five *virtual consoles*, among which you can switch using a single keystroke combination.

These virtual consoles can be helpful if you encounter a problem while installing Red Hat Linux Advanced Server. Messages displayed on the installation or system consoles can help pinpoint a problem. Please see Table 3-1 for a listing of the virtual consoles, keystrokes used to switch to them, and their contents.

Console	Keystrokes	Contents
1	[Ctrl]-[Alt]-[F1]	installation dialog
2	[Ctrl]-[Alt]-[F2]	shell prompt
3	[Ctrl]-[Alt]-[F3]	install log (messages from installation program)
4	[Ctrl]-[Alt]-[F4]	system-related messages

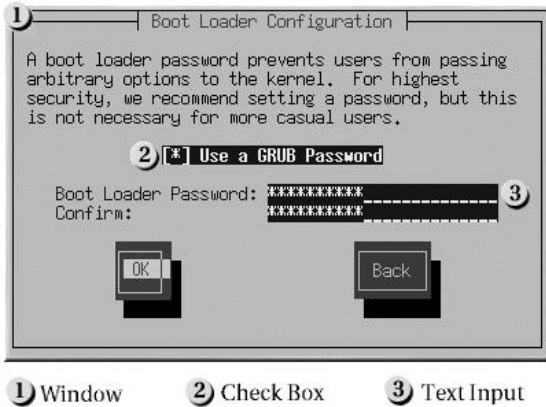
Console	Keystrokes	Contents
5	[Ctrl]-[Alt]-[F5]	other messages
7	[Ctrl]-[Alt]-[F7]	X graphical display

**Table 3-1. Console, Keystrokes, and Contents**

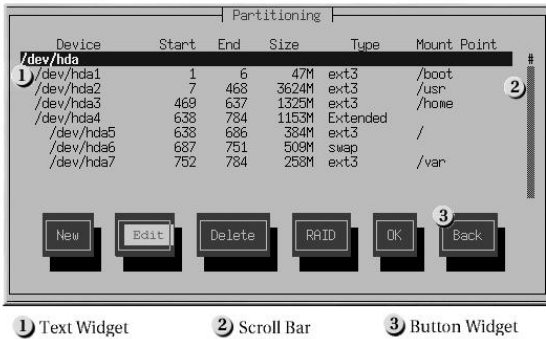
Generally, there is no reason to leave the default console (virtual console #7) unless you are attempting to diagnose installation problems.

### 3.2. The Text Mode Installation Program User Interface

The Red Hat Linux Advanced Server text mode installation program uses a screen-based interface that includes most of the on-screen "widgets" commonly found on graphical user interfaces. Figure 3-1, and Figure 3-2, illustrate the screens you will see.



**Figure 3-1. Installation Program Widgets as seen in Boot Loader Configuration**



**Figure 3-2. Installation Program Widgets as seen in Disk Druid**

Here is a list of the most important widgets shown in Figure 3-1, and Figure 3-2:

- **Window** — windows (usually referred to as *dialogs* in this manual) will appear on your screen throughout the installation process. At times, one window may overlay another; in these cases, you can only interact with the window on top. When you are finished in that window, it will disappear, allowing you to continue working in the window underneath.
- **Text Input** — text input lines are regions where you can enter information required by the installation program. When the cursor rests on a text input line, you may enter and/or edit information on that line.
- **Checkbox** — checkboxes allow you to select or deselect a feature. The box displays either an asterisk (selected) or a space (unselected). When the cursor is within a checkbox, press [Space] to select an unselected feature or to deselect a selected feature.
- **Text widget** — text widgets are regions of the screen for the display of text. At times, text widgets may also contain other widgets, such as checkboxes. If a text widget contains more information than can be displayed in the space reserved for it, a scroll bar appears; if you position the cursor within the text widget, you can then use the [Up] and [Down] arrow keys to scroll through all the information available. Your current position is shown on the scroll bar by a # character, which moves up and down the scroll bar as you scroll.
- **Button widget** — button widgets are the primary method of interacting with the installation program. You progress through the windows of the installation program by navigating these buttons, using the [Tab] and [Enter] keys. Buttons can be selected when they are highlighted.
- **Cursor** — although not a widget, the cursor is used to select (and interact) with a particular widget. As the cursor is moved from widget to widget, it may cause the widget to change color, or you may only see the cursor itself positioned in or next to the widget. In Figure 3-1, the cursor is positioned on the **OK** button. Figure 3-2, shows the cursor on the **Edit** button.

### 3.2.1. Using the Keyboard to Navigate

Navigation through the installation dialogs is performed through a simple set of keystrokes. To move the cursor, use [Left], [Right], [Up], and [Down] arrow keys. Use [Tab], and [Alt]-[Tab] to cycle forward or backward through each widget on the screen. Along the bottom, most screens display a summary of available cursor positioning keys.

To "press" a button, position the cursor over the button (using [Tab], for example) and press [Space] or [Enter]. To select an item from a list of items, move the cursor to the item you wish to select and press [Enter]. To select an item with a checkbox, move the cursor to the checkbox and press [Space] to select an item. To deselect, press [Space] a second time.

Pressing [F12] accepts the current values and proceeds to the next dialog; it is equivalent to pressing the **OK** button.

**Caution**

Unless a dialog box is waiting for your input, do not press any keys during the installation process (doing so may result in unpredictable behavior).

### 3.2.2. Displaying Online Help

Once the installation program is loaded into memory, you can obtain information about the installation process and options by pressing [F1] through [F6]. For example, press [F2] to see general information about the online help screens.

## 3.3. Starting the Installation Program

To start the installation, you must first boot the installation program. Please make sure you have all the resources you will need for the installation. If you have already read through Chapter 1, and followed the instructions, you should be ready to begin.

### 3.3.1. Booting the Installation Program

You can boot the Red Hat Linux installation program using any one of the following media (depending upon what your system can support):

- *Bootable CD-ROM* — Your machine supports a bootable CD-ROM drive and you want to perform a local CD-ROM installation.
- *Local boot disk* — Your machine will not support a bootable CD-ROM and you want to install from a local CD-ROM or a hard drive.
- *Network boot disk* — Use a network boot disk to install via NFS, FTP, and HTTP.

To create a boot disk, refer to Section 2.2.3.2.

Insert the boot disk into your computer's first diskette drive and reboot (or boot using the CD-ROM, if your computer supports booting from it). Your BIOS settings may need to be changed to allow you to boot from the diskette or CD-ROM.

**Tip**

To change your BIOS settings, watch the instructions provided on your display when your computer first boots. You will see a line of text telling you to press the [Del] or [F1] key to enter the BIOS settings.

Once you have entered your BIOS setup program, find the section where you can alter your boot sequence. The default is often C, A or A, C (depending on whether you boot from your hard drive [C] or a diskette drive [A]). Change this sequence so that the CD-ROM is first in your boot order and that C or A (whichever is your typical boot default) is second. This instructs the computer to first look at the CD-ROM drive for bootable media; if it does not find bootable media on the CD-ROM drive, it will then check your hard drive or diskette drive.

Save your changes before exiting the BIOS. For more information, refer to the documentation that came with your system.

After a short delay, a screen containing the `boot :` prompt should appear. The screen contains information on a variety of boot options. Each boot option also has one or more help screens associated with it. To access a help screen, press the appropriate function key as listed in the line at the bottom of the screen.

As you boot the installation program, be aware of two issues:

- Once you see the `boot :` prompt, the installation program will automatically begin if you take no action within the first minute. To disable this feature, press one of the help screen function keys.
- If you press a help screen function key, there will be a slight delay while the help screen is read from the boot media.

Normally, you only need to press [Enter] to boot. Watch the boot messages to see if the Linux kernel detects your hardware. If your hardware is properly detected, please continue to the next section. If it does not properly detect your hardware, you may need to restart the installation in expert mode.

The following methods can be used to start the installation:

- Insert a boot diskette that you have created into the primary diskette drive and reboot your computer.
- Insert the Red Hat Linux CD 1 into the drive and reboot, if your computer can boot from the CD-ROM drive.

### 3.3.1.1. Additional Boot Options

While it is easiest for a user to boot from CD-ROM and perform a graphical installation, sometimes there are installation scenarios where booting in a different manner may be needed. This section discusses addition boot options available for Red Hat Linux.

- If you are having trouble booting into the graphical installation program, you can try to boot using the no framebuffer (`nofb`) boot option.

At the boot command, enter the following:

```
boot: nofb
```

This option allows you to use the graphical installation program without using a framebuffer.

- If you do not wish to perform a graphical installation, you can start a text mode installation using the following boot command:

```
boot: text
```

- ISO images now have an md5sum embedded in them. To test the checksum integrity of an ISO image, at the installation boot prompt, type:

```
boot: linux mediacheck
```

The installation program will prompt you to insert a CD or select an ISO image to test, and select **OK** to perform the checksum operation. This checksum operation can be performed on any Red Hat Linux CD and does not have to be performed in a specific order (for example, CD #1 does not have to be the first CD you verify). It is strongly recommended to perform this operation on any Red Hat Linux CD that was created from downloaded ISO images. This procedure works with CD-based installations and hard drive and NFS installations using ISO images.

- If the installation program does not properly detect your hardware, you may need to restart the installation in *expert* mode. Enter expert mode using the following boot command:

```
boot: linux noprobe
```

For text mode installations, use:

```
boot: text noprobe
```

Expert mode disables most hardware probing, and gives you the option of entering options for the drivers loaded during the installation.



**Note**

The initial boot messages will not contain any references to SCSI or network cards. This is normal; these devices are supported by modules that are loaded during the installation process.

- If you need to perform the installation in *serial mode*, type the following command:

```
boot: linux console=<device>
```

For text mode installations, use:

```
boot: linux text console=<device>
```

In the above command, *<device>* should be the device you are using (such as ttyS0 or ttyS1).

For example, `linux console=ttyS0,115200n8`.

Refer to Section 2.2.3 to determine whether you can boot off the CD-ROM or need to boot off a boot diskette.

To boot into text mode, at the EFI Shell type:

```
Shell>elilo linux text
```

### 3.3.1.2. Kernel Options

Options can also be passed to the kernel. For example, to instruct the kernel to use all the RAM in a system with 128 MB of RAM, enter:

```
boot: linux mem=128M
```

For text mode installations, use:

```
boot: linux text mem=128M
```

After entering any options, press [Enter] to boot using those options.

### 3.3.1.3. Booting Without Diskettes

The Red Hat Linux CD-ROM can be booted by computers that support bootable CD-ROMs. Not all computers support this feature, so if your system cannot boot from the CD-ROM, there is one other way to start the installation without using a boot disk. The following method is specific to x86-based computers only.

If you have MS-DOS installed on your system, you can boot directly from the CD-ROM drive without using a boot disk. To do this (assuming your CD-ROM is drive d:), use the following commands:

```
C:\> d:
D:\> cd \dosutils
D:\dosutils> autoboot.bat
```

This method will not work if run in a DOS window — the `autoboot.bat` file must be executed with DOS as the only operating system. In other words, Windows cannot be running.

If your computer cannot boot directly from CD-ROM (and you cannot use a DOS-based autoboot), you will have to use a boot diskette to get things started.

### 3.4. Selecting an Installation Method

What type of installation method do you wish to use? The following installation methods are available:

#### CD-ROM

If you have a CD-ROM drive and the Red Hat Linux CD-ROMs, you can use this method. You will need a boot disk or a bootable CD-ROM. Refer to Section 3.5, for CD-ROM installation instructions.

#### NFS Image

If you are installing from an NFS server using ISO images or a mirror image of Red Hat Linux, you can use this method. You will need a network boot disk. Refer to Section 3.7, for network installation instructions. Please note that NFS installations may also be performed in GUI mode.

#### FTP

If you are installing directly from an FTP server, use this method. You will need a network boot disk. Refer to Section 3.8, for FTP installation instructions.

#### HTTP

If you are installing directly from an HTTP (Web) server, use this method. You will need a network boot disk. Refer to Section 3.9, for HTTP installation instructions.

### 3.5. Installing from CD-ROM

To install Red Hat Linux Advanced Server from a CD-ROM, choose the **CD-ROM** option from the boot loader screen and select **OK**. When prompted, insert the Red Hat Linux Advanced Server CD into your CD-ROM drive (if you did not boot from the CD-ROM). Once the CD is in the CD-ROM drive, select **OK**, and press [Enter].

The installation program will then probe your system and attempt to identify your CD-ROM drive. It will start by looking for an IDE (also known as an ATAPI) CD-ROM drive. If found, you will continue to the next stage of the installation process (see Section 3.11).



#### Note

To abort the installation process at this time, reboot your machine and then eject the boot diskette or CD-ROM. You can safely cancel the installation at any point before the **About to Install** screen. See Section 3.26 for more information.

If a CD-ROM drive is not detected, you will be asked what type of CD-ROM drive you have. Choose from the following types:

## SCSI

Select this if your CD-ROM drive is attached to a supported SCSI adapter; the installation program will then ask you to choose a SCSI driver. Choose the driver that most closely resembles your adapter. You may specify options for the driver if necessary; however, most drivers will detect your SCSI adapter automatically.

## Other

If your CD-ROM drive is neither an IDE nor a SCSI, it is an *other*. Sound cards with proprietary CD-ROM interfaces are good examples of this type of CD-ROM. The installation program will display a list of drivers for supported CD-ROM drives — choose a driver and, if necessary, specify any driver options. It is recommended that you use the `olddcdrom.img` image file



### Tip

A partial list of optional parameters for CD-ROM drives can be found in the *Official Red Hat Linux Reference Guide*, in the *General Parameters and Modules* appendix.

### 3.5.1. What If the IDE CD-ROM Was Not Found?

If you have an IDE (ATAPI) CD-ROM, but the installation program fails to find your IDE (ATAPI) CD-ROM and asks you what type of CD-ROM drive you have, try the following boot command. Restart the installation, and at the `boot:` prompt enter **linux hdX=cdrom**. Replace the **X** with one of the following letters, depending on the interface the unit is connected to, and whether it is configured as master or slave (also known as primary and secondary):

- a — first IDE controller, master
- b — first IDE controller, slave
- c — second IDE controller, master
- d — second IDE controller, slave

If you have a third and/or fourth controller, continue assigning letters in alphabetical order, going from controller to controller, and master to slave.

## 3.6. Preparing for a Network Installation

If you are performing a network installation and have booted from a boot disk with the `bootnet.img` image, the **Configure TCP/IP** dialog appears; for an explanation of this dialog, go to Section 3.19, and then return here.

### 3.6.1. Setting Up the Server

Because the installation program is capable of installing Red Hat Linux Advanced Server from multiple CD-ROMs, if you intend to support NFS, FTP, or HTTP installations you must copy the `RedHat` directory from each CD-ROM comprising Red Hat Linux Advanced Server 2.1 onto a disk drive:

- For each binary CD-ROM, execute the following commands:

- `mount /mnt/cdrom`
- `cp -var /mnt/cdrom/RedHat /location/of/disk/space`

Where `/location/of/disk/space` is a directory you create such as `/export/7.3/`.

- `umount /mnt/cdrom`

- Please note that the Release Notes are not included in the `RedHat` directory. Unless they are specifically copied over, the Release Notes will not be available during your installation.

The Release Notes are also available online from <http://www.redhat.com/docs>.

- Next, make `/location/of/disk/space` accessible to the installation program (for example, exporting it for NFS installations).

`Export /location/of/disk/space`

- Finally, run the following command to make `/location/of/disk/space` available as read-only to each system to mount:

`/sbin/service nfs reload`

If you are not sure how to do this, refer to the *Official Red Hat Linux Customization Guide* and the *Official Red Hat Linux Reference Guide* for more information.

### 3.7. Installing via NFS

The NFS dialog (Figure 3-3) applies only if you are installing from an NFS server (if you selected **NFS Image** in the **Installation Method** dialog).

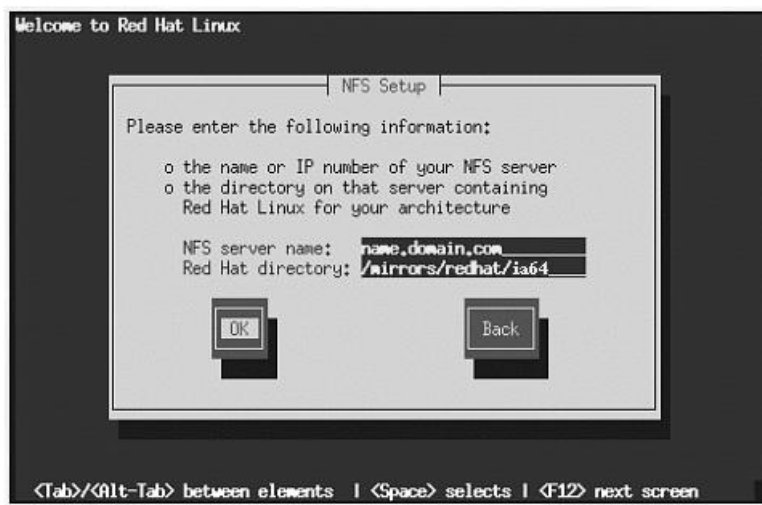


Figure 3-3. NFS Setup Dialog

Enter the fully-qualified domain name or IP address of your NFS server. For example, if you are installing from a host named `eastcoast` in the domain `redhat.com`, enter `eastcoast.redhat.com` in the **NFS Server** field.

Next, enter the name of the exported directory. If you followed the setup described in Section 3.6, you would enter the directory `/location/of/disk/space/` which contains the `RedHat` directory.

If the NFS server is exporting a mirror of the Red Hat Linux Advanced Server installation tree, enter the directory which contains the `RedHat` directory. (If you do not know this directory path, ask your system administrator.) For example, if your NFS server contains the directory `/mirrors/redhat/ia64/RedHat`, enter `/mirrors/redhat/ia64`.

If the NFS server is exporting the ISO images of the Red Hat Linux Advanced Server CD-ROMs, enter the directory which contains the ISO images.

Next you will see the **Welcome** dialog.

### 3.8. Installing via FTP

The FTP dialog (Figure 3-4) applies only if you are installing from an FTP server (if you selected **FTP** in the **Installation Method** dialog). This dialog allows you to identify the FTP server from which you are installing Red Hat Linux.

Enter the name or IP address of the FTP site you are installing from, and the name of the directory containing the `RedHat` installation files for your architecture. For example, if the FTP site contains the directory `/mirrors/redhat/ia64/RedHat`, enter `/mirrors/redhat/ia64`.



Figure 3-4. FTP Setup Dialog

If everything has been specified properly, a message box appears indicating that `base/hdlist` is being retrieved.

Next you will see the **Welcome** dialog.



#### Tip

You can also install Red Hat Linux Advanced Server using ISO images without copying them into a single tree by loopback mounting them as:

```
disc1/,disc2/,disc3/
```

### 3.9. Installing via HTTP

The HTTP dialog (Figure 3-5) applies only if you are installing from an HTTP server (if you selected **HTTP** in the **Installation Method** dialog). This dialog prompts you for information about the HTTP server from which you are installing Red Hat Linux.

Enter the name or IP address of the HTTP site you are installing from, and the name of the directory there containing the RedHat installation files for your architecture. For example, if the HTTP site contains the directory `/mirrors/redhat/ia64/RedHat`, enter `/mirrors/redhat/ia64`.



Figure 3-5. HTTP Setup Dialog

If everything has been specified properly, a message box appears indicating that `base/hdlist` is being retrieved.

Next you will see the **Welcome** dialog.

### 3.10. Welcome to Red Hat Linux

The **Welcome** screen does not prompt you for any input. Please read over the help text in the left panel for additional instructions and information on where to register your Official Red Hat Linux Advanced Server product.

Please notice the **Hide Help** button at the bottom left corner of the screen. The help screen is open by default. If you do not want to view the help information, click on **Hide Help** to minimize the help portion of the screen.

Click on the **Next** button to continue.

### 3.11. Language Selection

Using your mouse, select the language you would prefer to use for the installation and as the system default (see Figure 3-6).

Selecting the appropriate language will also help target your time zone configuration later in the installation. The installation program will try to define the appropriate time zone based on what you specify on this screen.

Once you select the appropriate language, click **Next** to continue.



Figure 3-6. Language Selection

### 3.12. Keyboard Configuration

Choose the keyboard model that best fits your system (see Figure 3-7). If you cannot find an exact match, choose the best **Generic** match for your keyboard type (for example, **Generic 101-key PC**).

Next, choose the correct layout type for your keyboard (for example, U.S. English).

Creating special characters with multiple keystrokes (such as Ñ, Ô, and Ç) is done using "dead keys" (also known as compose key sequences). Dead keys are enabled by default. If you do not wish to use them, select **Disable dead keys**.



#### Tip

The following example will help you determine if you need dead keys enabled. An example of a dead key is the backspace (^H) key on a US English 101 Standard Keyboard. Dead keys are not exclusive to non-English keyboards.

To test your keyboard configuration, use the blank text field at the bottom of the screen to enter text.

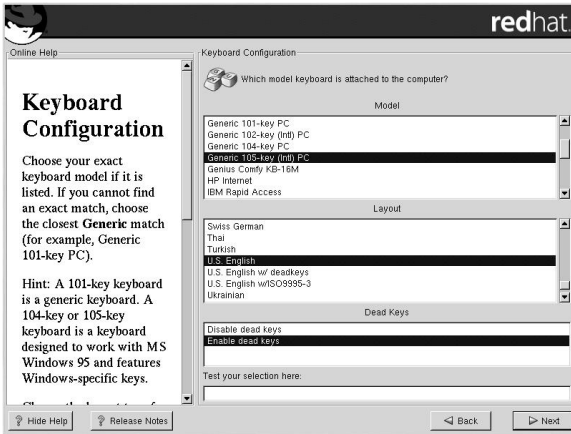
Once you have made the appropriate selections, click **Next** to continue.



**Tip**

To change your keyboard type after you have installed Red Hat Linux Advanced Server, log in as root and use the `/usr/sbin/kbdconfig` command. Alternatively, you can type `setup` at the root prompt.

To become root, type `su -` at the shell prompt in a terminal window and then press [Enter]. Then, enter the root password.



**Figure 3-7. Keyboard Configuration**



**Tip**

To re-enable dead keys (assuming you chose to disable them during the installation), you must comment out the line disabling dead keys in the `XF86Config-4` file (or, if you are using XFree86 version 3, the `XF86Config` file) in `/etc/X11`.

An **InputDevice** section, that would disable dead keys on a keyboard layout that used dead keys (for example, German), would look similar to the following:

```
Section "InputDevice"
    Identifier "Keyboard0"
    Driver "keyboard"
    Option "XkbRules" "xfree86"
    Option "XkbModel" "pc101"
    Option "XkbLayout" "de"
    # Option "XkbVariant" "nodeadkeys"
EndSection
```


By default, the keyboard layout for various languages which use dead keys should have them enabled unless the `nodeadkeys` option is present.





### 3.13. Mouse Configuration


Choose the correct mouse type for your system. If you cannot find an exact match, choose a mouse type that you are sure is compatible with your system (see Figure 3-8).

To determine your mouse's interface, follow the mouse cable back to where it plugs into your system and use the following diagrams.

If your mouse is a serial mouse, the port will look similar to .

If your mouse is a PS/2 mouse, the port will look similar to .

If your mouse is a USB mouse, the port will look similar to .

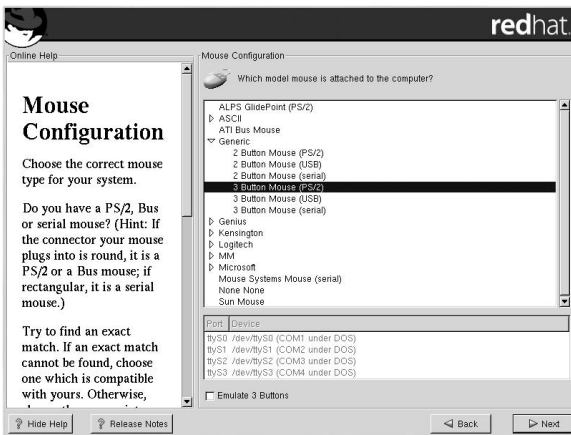
If your mouse is a AT (Advanced Technology) mouse, the port will look similar to .

If you cannot find a mouse that you are sure is compatible with your system, select one of the **Generic** entries, based on your mouse's number of buttons, and its interface.



**Tip**

If you have a scroll mouse, select the **MS Intellimouse** entry (with your proper mouse port) as the compatible mouse type.



**Figure 3-8. Mouse Configuration**

If you have a PS/2 or a bus mouse, you do not need to pick a port and device. If you have a serial mouse, you should choose the correct port and device that your serial mouse is on.

The **Emulate 3 Buttons** checkbox allows you to use a two-button mouse as if it had three buttons. In general, the X Window System is easier to use with a three-button mouse. If you select this checkbox, you can emulate a third, "middle" button by pressing both mouse buttons simultaneously.

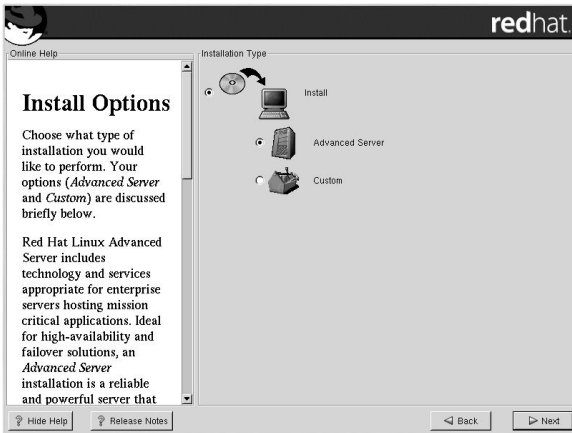
**Tip**

To change your mouse configuration after you have completed the installation of Red Hat Linux Advanced Server, become root; then use the `/usr/sbin/mouseconfig` command from a shell prompt.

To configure your mouse to work as a left-handed mouse, reset the order of the mouse buttons. To do this, after you have booted your Red Hat Linux Advanced Server system, type `gpm -B 321` at the shell prompt. You can also change this setting in GNOME by going to the main menu and selecting **Programs => Settings => Peripherals => Mouse**. In KDE, select **Preferences => Peripherals => Mouse**.

### 3.14. Install Options

Choose the type of installation you would like to perform (see Figure 3-9). Red Hat Linux allows you to choose the installation type that best fits your needs. Your options are **Advanced Server** and **Custom**.



**Figure 3-9. Choosing Install or Upgrade**

For more information about the different installation classes, please refer to Section 1.4.

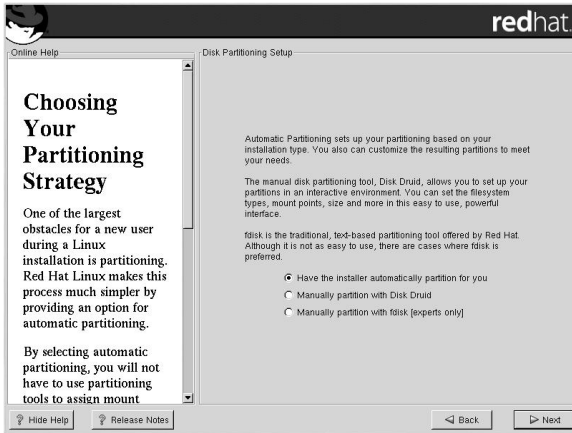
### 3.15. Disk Partitioning Setup

Partitioning allows you to divide your hard drive into isolated sections, where each section behaves as its own hard drive. Partitioning is particularly useful if you run more than one operating system. If you are not sure how you want your system to be partitioned, read Appendix C for more information.

On this screen, you can choose to perform automatic partitioning, or manual partitioning using **Disk Druid** or **parted** (see Figure 3-10).

Automatic partitioning allows you to perform an installation without having to partition your drive(s) yourself. If you do not feel comfortable with partitioning your system, it is recommended that you *do not* choose to partition manually and instead let the installation program partition for you.

To partition manually, choose either the **Disk Druid** or **parted** (recommended for experts only) partitioning tool.



**Figure 3-10. Disk Partitioning Setup**

If you chose to manually partition using **Disk Druid**, refer to Section 3.17.

If you chose to manually partition using **parted**, refer to Section 3.18.

### 3.16. Automatic Partitioning

Automatic partitioning allows you to have some control concerning what data is removed (if any) from your system. Your options are:

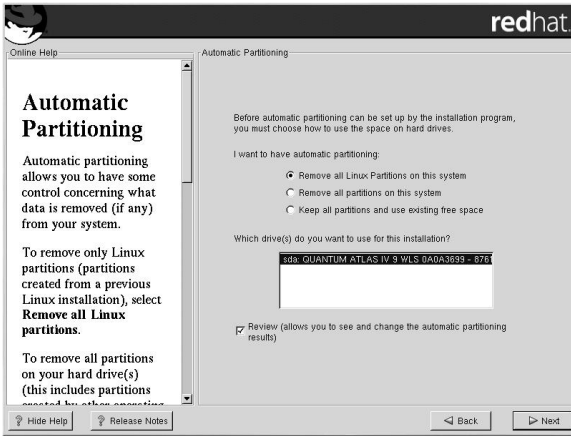
- **Remove all Linux partitions on this system** — select this option to remove only Linux partitions (partitions created from a previous Linux installation). This will not remove other partitions you may have on your hard drive(s).
- **Remove all partitions on this system** — select this option to remove all partitions on your hard drive(s) (this includes partitions created by other operating systems such as Windows 95/98/NT/2000).



#### Caution

If you select this option, all data on the selected hard drive(s) will be removed by the installation program. Do not select this option if you have information that you want to keep on the hard drive(s) where you are installing Red Hat Linux Advanced Server.

- **Keep all partitions and use existing free space** — select this option to retain your current data and partitions, assuming you have enough free space available on your hard drive(s).



**Figure 3-11. Automatic Partitioning**

Using your mouse, choose the hard drive(s) on which you want Red Hat Linux Advanced Server to be installed. If you have two or more hard drives, you can choose which hard drive(s) should contain this installation. Unselected hard drives, and any data on them, will not be touched.

To review and make any necessary changes to the partitions created by automatic partitioning, select the **Review** option. After selecting **Review** and clicking **Next** to move forward, you will see the partitions created for you in **Disk Druid**. You will also be able to make modifications to these partitions if they do not meet your needs.

Click **Next** once you have made your selections to proceed.

### 3.17. Partitioning Your System

If you chose automatic partitioning and did not select **Review**, please skip ahead to Section 3.19.

If you chose automatic partitioning and selected **Review**, you can either accept the current partition settings (click **Next**), or modify the setup using Disk Druid, the manual partitioning tool.

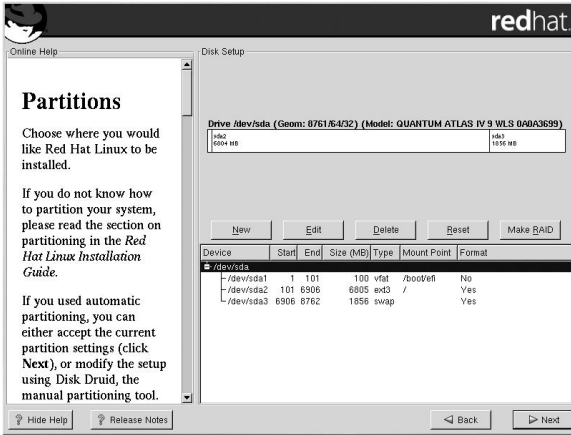
If you chose **Manually partition with parted**, please skip ahead to Section 3.18.

At this point, you must tell the installation program where to install Red Hat Linux Advanced Server. This is done by defining mount points for one or more disk partitions in which Red Hat Linux Advanced Server will be installed. You may also need to create and/or delete partitions at this time (refer to Figure 3-12).



#### Note

If you have not yet planned how you will set up your partitions, refer to Appendix C. At a bare minimum, you will need a `/boot/efi` partition of approximately 100 MB and of type `vfat`, a swap partition of at least 512 MB, and an appropriately-sized root (`/`) partition.



**Figure 3-12. Partitioning with Disk Druid**

The partitioning tool used in Red Hat Linux Advanced Server 2.1 is **Disk Druid**. With the exception of certain esoteric situations, **Disk Druid** can handle the partitioning requirements for a typical Red Hat Linux Advanced Server installation.

### 3.17.1. Graphical Display of Hard Drive(s)

**Disk Druid** offers a graphical representation of your hard drive(s).

Using your mouse, click once to highlight a particular field in the graphical display. Double-click to edit an existing partition or to create a partition out of existing free space.

Above the display, you will see the **drive** name (such as `/dev/hda`), the **geom** (which shows the hard disk's geometry and consists of three numbers representing the number of cylinders, heads, and sectors as reported by the hard disk), and the **model** of the hard drive as detected by the installation program.

### 3.17.2. Disk Druid's Buttons

These buttons control **Disk Druid**'s actions. They are used to change the attributes of a partition (for example the file system type and mount point) and also to create **RAID** devices. Buttons on this screen are also used to accept the changes you have made, or to exit **Disk Druid**. For further explanation, take a look at each button in order:

- **New:** Used to request a new partition. When selected, a dialog box appears containing fields (such as mount point and size) that must be filled in.
- **Edit:** Used to modify attributes of the partition currently selected in the **Partitions** section. Selecting **Edit** opens a dialog box. Some or all of the fields can be edited, depending on whether the partition information has already been written to disk.

You can also edit free space as represented in the graphical display to create a new partition within that space. Either highlight the free space and then select the **Edit** button, or double-click on the free space to edit it.

- **Delete:** Used to remove the partition currently highlighted in the **Current Disk Partitions** section. You will be asked to confirm the deletion of any partition.

- **Reset:** Used to restore **Disk Druid** to its original state. All changes made will be lost if you **Reset** the partitions.
- **Make RAID:** **Make RAID** can be used if you want to provide redundancy to any or all disk partitions. *It should only be used if you have experience using RAID.* To read more about RAID, please refer to **RAID (Redundant Array of Independent Disks)** in the *Official Red Hat Linux Customization Guide*.

To make a RAID device, you must first create software RAID partitions. Once you have created two or more software RAID partitions, select **Make RAID** to join the software RAID partitions into a RAID device.

### 3.17.3. Partition Fields

Above the partition hierarchy are labels which present information about the partitions you are creating. The labels are defined as follows:

- **Device:** This field displays the partition's device name.
- **Start:** This field shows the sector on your hard drive where the partition begins.
- **End:** This field shows the sector on your hard drive where the partition ends.
- **Size:** This field shows the partition's size (in MB).
- **Type:** This field shows the partition's type (for example, ext2, ext3, or vfat).
- **Mount Point:** A mount point is the location within the directory hierarchy at which a volume exists; the volume is "mounted" at this location. This field indicates where the partition will be mounted. If a partition exists, but is not set, then you need to define its mount point. Double-click on the partition or click the **Edit** button.
- **Format:** This field shows if the partition being created will be formatted.

### 3.17.4. Recommended Partitioning Scheme

Unless you have a reason for doing otherwise, we recommend that you create the following partitions:

- A `/boot/efi` partition (100 MB minimum) — the partition mounted on `/boot/efi` contains all the installed kernels, the initrd images, and ELILO configuration files.



#### **`/boot/efi` is Type vfat**

You must create a `/boot/efi` partition of type vfat and at least 100 MB in size as the first primary partition.

- A swap partition (512 MB minimum) — swap partitions are used to support virtual memory. In other words, data is written to a swap partition when there is not enough RAM to store the data your system is processing. If you are unsure about what size swap partition to create, make it twice the amount of RAM on your machine. It must be of type swap.
- A `root` partition (900 MB-4.0 GB) — this is where `/` (the root directory) is located. In this setup, all files (except those stored in `/boot/efi`) are on the root partition. It must be of type ext3 or ext2.

### 3.17.5. Adding Partitions

To add a new partition, select the **New** button. A dialog box appears (see Figure 3-13).



#### Note

You must dedicate at least one partition to Red Hat Linux Advanced Server, and optionally more. For more information, see Appendix C.

Mount Point:

Filesystem Type:

Allowable Drives:

Size (MB):

Additional Size Options

☒ Fixed size

☐ Fill all space up to (MB):

☐ Fill to maximum allowable size

☐ Force to be a primary partition

☐ Check for bad blocks

**Figure 3-13. Creating a New Partition**

- **Mount Point:** Enter the partition's mount point. For example, if this partition should be the root partition, enter `/`; enter `/boot` for the `/boot` partition, and so on. You can also use the pull-down menu to choose the correct mount point for your partition.
- **File System Type:** Using the pull-down menu, select the appropriate file system type for this partition. For more information on file system types, see Section 3.17.5.1.
- **Allowable Drives:** This field contains a list of the hard disks installed on your system. If a hard disk's box is highlighted, then a desired partition can be created on that hard disk. If the box is *not* checked, then the partition will *never* be created on that hard disk. By using different checkbox settings, you can have **Disk Druid** place partitions as you see fit, or let **Disk Druid** decide where partitions should go.
- **Size (Megs):** Enter the size (in megabytes) of the partition. Note, this field starts with a "1" (one); unless changed, only a 1 MB partition will be created.
- **Additional Size Options:** Choose whether to keep this partition at a fixed size, to allow it to "grow" (fill up the available hard drive space) to a certain point, or to allow it to grow to fill any remaining hard drive space available.

If you choose **Fill all space up to (MB)**, you must give size constraints in the field to the right of this option. This allows you to keep a certain amount of space free on your hard drive for future use.

- **Force to be a primary partition:** Select whether the partition you are creating should be one of the first four partitions on the hard drive. If unselected, the partition created will be a logical partition. See Section C.1.3, for more information.

- **Check for bad blocks:** Checking for bad blocks can help prevent data loss by locating the bad blocks on a drive and making a list of them to prevent using them in the future. If you wish to check for bad blocks while formatting each file system, please make sure to select this option.

Selecting **Check for bad blocks** may dramatically increase your total installation time. Since most newer hard drives are quite large in size, checking for bad blocks may take a long time; the length of time depends on the size of your hard drive. If you choose to check for bad blocks, you can monitor your progress on virtual console #6.

- **Ok:** Select **Ok** once you are satisfied with the settings and wish to create the partition.
- **Cancel:** Select **Cancel** if you do not want to create the partition.

### 3.17.5.1. File System Types

Red Hat Linux Advanced Server allows you to create different partition types, based on the file system they will use. The following is a brief description of the different file systems available, and how they can be utilized.

- **ext2** — An ext2 file system supports standard Unix file types (regular files, directories, symbolic links, etc). It provides the ability to assign long file names, up to 255 characters. Versions prior to Red Hat Linux 7.2 used ext2 file systems by default.
- **ext3** — The ext3 file system is based on the ext2 file system and has one main advantage — journaling. Using a journaling file system reduces time spent recovering a file system after a crash as there is no need to **fsck**<sup>1</sup> the file system. The ext3 file system will be selected by default and is highly recommended.
- **software RAID** — Creating two or more software RAID partitions allows you to create a RAID device. For more information regarding RAID, refer to the chapter *RAID (Redundant Array of Independent Disks)* in the *Official Red Hat Linux Customization Guide*.
- **swap** — Swap partitions are used to support virtual memory. In other words, data is written to a swap partition when there is not enough RAM to store the data your system is processing.
- **vfat** — The VFAT file system is a Linux file system that is compatible with Windows 95/NT long filenames on the FAT file system. This file system must be used for the `/boot/efi` partition.

### 3.17.6. Editing Partitions

To edit a partition, select the **Edit** button or double-click on the existing partition.



#### Note

If the partition already exists on your hard disk, you will only be able to change the partition's mount point. If you want to make any other changes, you will need to delete the partition and recreate it.

---

1. The **fsck** application is used to check the file system for metadata consistency and optionally repair one or more Linux file systems.



### 3.17.7. Deleting a Partition

To delete a partition, highlight it in the **Partitions** section and click the **Delete** button. You will be asked to confirm the deletion.

Skip to Section 3.19 for further installation instructions.

## 3.18. Partitioning with parted

This section applies only if you chose to use **parted** to partition your system.

To partition your system without using **parted**, please skip to Section 3.16 for automatic partitioning or Section 3.17 for partitioning with **Disk Druid**.

If you have already completed disk partitioning, skip to Section 3.19 for further installation instructions.



#### Caution

*Unless you have previously used **parted** and understand how it works, we do not recommend that you use it. It is much easier for new users to accidentally corrupt or lose data using **parted**.*

**Disk Druid** is easier to understand than **parted**. To exit **parted**, click **Back** to return to the previous screen, deselect **parted**, and then click **Next**.

If you have chosen to use **parted**, the next screen will prompt you to select a drive to partition using **parted**. Once you have chosen which drive to partition, you will be presented with the **parted** command screen. If you do not know what command to use, type [help] at the prompt for help.



#### /boot/efi is Type DOS

You must create a `/boot/efi` partition of type DOS as the first primary partition with the size of at least 100 MB.

When you are finished making partitions, type [quit] to quit (**parted** automatically saves any changes you make).



#### Note

Changes you make will take effect immediately using **parted**. Once you have finished making changes, you can quit **parted** using the `quit` command.

After you have partitioned your drive(s), click **Next**. You will need to use **Disk Druid** to assign mount points to the partitions you just created with **parted**.

You will not be able to add new partitions using **Disk Druid**, but you can edit mount points for the partitions you have already created. For each partition created with **parted**, click on the **Edit** button, choose the appropriate mount point for that partition from the pull-down menu, and click on **OK**.

### 3.19. Network Configuration

If you do not have a network device, you will not see this screen. Skip ahead to Section 3.20.

If you have a network device and you have not already configured your networking (such as booting from a network boot disk you created and entering in your network information as prompted), you now have the opportunity (as shown in Figure 3-14) to do so.

If you have multiple devices, you will see a tab for each device. You may switch between devices (for example, between `eth0` and `eth1`) and the information you provide on each tab will be specific to each device.

Indicate if you would like to configure your IP address using DHCP (Dynamic Host Configuration Protocol). If you select **Activate on boot**, your network interface will be started when you boot. If you do not have DHCP client access or you are unsure what to provide here, please contact your network administrator.

Next enter, where applicable, the **IP Address**, **Netmask**, **Network**, and **Broadcast** addresses. If you are unsure about any of these, please contact your network administrator.

If you have a fully qualified domain name for the network device, enter it in the **Hostname** field.

Finally, enter the **Gateway** and **Primary DNS** (and if applicable the **Secondary DNS** and **Tertiary DNS**) addresses.

Online Help

redhat

**Network Configuration**

Choose your network card and whether you would like to configure using DHCP. If you have multiple Ethernet devices, each device will have its own configuration screen. You can switch between device screens, (for example `eth0` and `eth1`); the information you give will be specific to each screen. If you select **Activate on boot**, your network card will be started when you boot.

Network Configuration

eth0

☐ Configure using DHCP

☒ Activate on boot

IP Address: 192.0.2.0

Netmask: 255.255.255.0

Network: 192.0.2.254

Broadcast: 192.0.2.1

Hostname: sparky.redhat.com

Gateway: 192.0.2.0

Primary DNS: 207.145.42.153

Secondary DNS:

Tertiary DNS:

Hide Help Release Notes Back Next

Figure 3-14. Network Configuration



#### Note

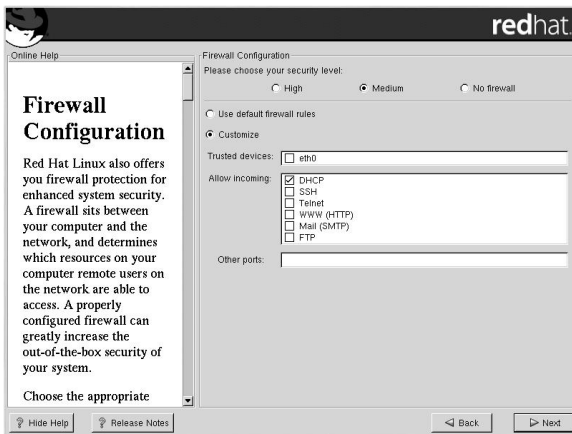
Do not use the numbers as seen in this sample configuration. These values will not work for your own network configuration. If you are not sure what values to enter, contact your network administrator for assistance.

**Tip**

Even if your computer is not part of a network, you can enter a hostname for your system. If you do not take this opportunity to enter a name, your system will be known as `localhost`.

### 3.20. Firewall Configuration

Red Hat Linux Advanced Server offers firewall protection for enhanced system security. A firewall exists between your computer and the network, and determines which resources on your computer remote users on the network can access. A properly configured firewall can greatly increase the security of your system.



**Figure 3-15. Firewall Configuration**

Choose the appropriate security level for your system.

#### High

If you choose **High**, your system will not accept connections (other than the default settings) that are not explicitly defined by you. By default, only the following connections are allowed:

- DNS replies
- DHCP — so any network interfaces that use DHCP can be properly configured

If you choose **High**, your firewall will not allow the following:

- Active mode FTP (passive mode FTP, used by default in most clients, should still work)
- IRC DCC file transfers
- RealAudio™
- Remote X Window System clients

If you are connecting your system to the Internet, but do not plan to run a server, this is the safest choice. If additional services are needed, you can choose **Customize** to allow specific services through the firewall.

**Note**

If you select a medium or high firewall to be setup during this installation, network authentication methods (NIS and LDAP) will not work.

**Medium**

If you choose **Medium**, your firewall will not allow remote machines to have access to certain resources on your system. By default, access to the following resources are not allowed:

- Ports lower than 1023 — the standard reserved ports, used by most system services, such as **FTP**, **SSH**, **telnet**, **HTTP**, and **NIS**.
- The NFS server port (2049) — NFS is disabled for both remote servers and local clients.
- The local X Window System display for remote X clients.
- The X Font server port (by default, **xfs** does not listen on the network; it is disabled in the font server).

If you want to allow resources such as **RealAudio**™ while still blocking access to normal system services, choose **Medium**. Select **Customize** to allow specific services through the firewall.

**Note**

If you select a medium or high firewall to be setup during this installation, network authentication methods (NIS and LDAP) will not work.

**No Firewall**

No firewall provides complete access to your system and does no security checking. Security checking is the disabling of access to certain services. This should only be selected if you are running on a trusted network (not the Internet) or plan to do more firewall configuration later.

Choose **Customize** to add trusted devices or to allow additional incoming services.

**Trusted Devices**

Selecting any of the **Trusted Devices** allows access to your system for all traffic from that device; it is excluded from the firewall rules. For example, if you are running a local network, but are connected to the Internet via a PPP dialup, you can check **eth0** and any traffic coming from your local network will be allowed. Selecting **eth0** as trusted means all traffic over the Ethernet is allowed, but the **ppp0** interface is still firewalled. If you want to restrict traffic on an interface, leave it unchecked.

It is not recommended that you make any device that is connected to public networks, such as the Internet, a **Trusted Device**.

**Allow Incoming**

Enabling these options allow the specified services to pass through the firewall. Note, during a workstation installation, the majority of these services are *not* installed on the system.

**DHCP**

If you allow incoming DHCP queries and replies, you allow any network interface that uses DHCP to determine its IP address. DHCP is normally enabled. If DHCP is not enabled, your computer can no longer get an IP address.

## SSH

Secure *SHell* (SSH) is a suite of tools for logging into and executing commands on a remote machine. If you plan to use SSH tools to access your machine through a firewall, enable this option. You need to have the `openssh-server` package installed in order to access your machine remotely, using SSH tools.

## Telnet

Telnet is a protocol for logging into remote machines. Telnet communications are unencrypted and provide no security from network snooping. Allowing incoming Telnet access is not recommended. If you do want to allow inbound Telnet access, you will need to install the `telnet-server` package.

## WWW (HTTP)

The HTTP protocol is used by Apache (and by other Web servers) to serve webpages. If you plan on making your Web server publicly available, enable this option. This option is not required for viewing pages locally or for developing webpages. You will need to install the `apache` package if you want to serve webpages.

Enabling **WWW (HTTP)** will not open a port for HTTPS. To enable HTTPS, specify it in the **Other ports** field.

## Mail (SMTP)

If you want to allow incoming mail delivery through your firewall, so that remote hosts can connect directly to your machine to deliver mail, enable this option. You do not need to enable this if you collect your mail from your ISP's server using POP3 or IMAP, or if you use a tool such as **fetchmail**. Note that an improperly configured SMTP server can allow remote machines to use your server to send spam.

## FTP

The FTP protocol is used to transfer files between machines on a network. If you plan on making your FTP server publicly available, enable this option. You need to install the `wu-ftpd` (and possibly the `anonftp`) package for this option to be useful.

## Other ports

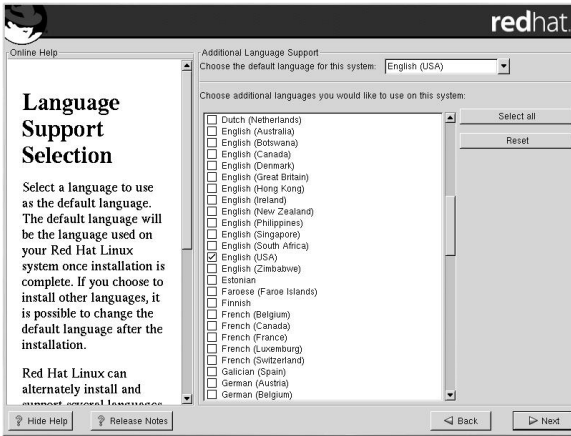
You can allow access to ports which are not listed here, by listing them in the **Other ports** field. Use the following format: **port:protocol**. For example, if you want to allow IMAP access through your firewall, you can specify **imap:tcp**. You can also explicitly specify numeric ports; to allow UDP packets on port 1234 through the firewall, enter **1234:udp**. To specify multiple ports, separate them with commas.

## 3.21. Language Support Selection

Red Hat Linux Advanced Server can install and support multiple languages for use on your system.

You must select a language to use as the default language. The default language will be used on your Red Hat Linux Advanced Server system once installation is complete. If you choose to install other languages, you can change your default language after the installation.

If you are only going to use one language on your system, selecting only that language will save significant disk space. The default language is the language you selected to use during the installation. However, if you select only one language, you will only be able to use that specified language after the Red Hat Linux Advanced Server installation is complete.



**Figure 3-16. Language Support Selection**

To use more than one language on your system, choose specific languages to be installed or select all languages to have all available languages installed on your Red Hat Linux Advanced Server system.

Use the **Reset** button to cancel your selections. Resetting will revert to the default; only the language you selected for use during the installation will be installed.

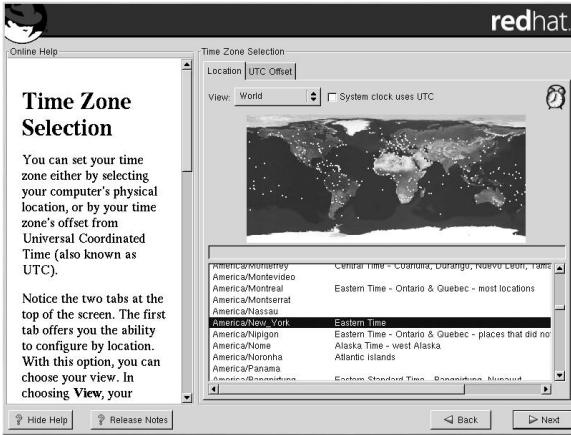
### 3.22. Time Zone Configuration

You can set your time zone by selecting your computer's physical location or by specifying your time zone's offset from Coordinated Universal Time (UTC).

Notice the two tabs at the top of the screen (see Figure 3-17). The first tab allows you to configure your time zone by your location. You can specify different areas to view: **World**, **North America**, **South America**, **Pacific Rim**, **Europe**, **Africa**, and **Asia**.

On the interactive map, you can also click on a specific city, which is marked by a yellow dot; a red **X** will appear indicating your selection. You can also scroll through a list and choose a time zone.

The second tab allows you to specify a UTC offset. The tab displays a list of offsets to choose from, as well as an option to set daylight saving time.



**Figure 3-17. Configuring the Time Zone**

On both tabs, you can select **System Clock uses UTC**. Please select this if you know that your system is set to UTC.



**Tip**

If you wish to change your time zone configuration after you have booted your Red Hat Linux Advanced Server system, become root and use the `/usr/sbin/timeconfig` command.

### 3.23. Account Configuration

The **Account Configuration** screen allows you to set your root password. Additionally, you can set up user accounts for you to log in to once the installation is complete (see Figure 3-18).

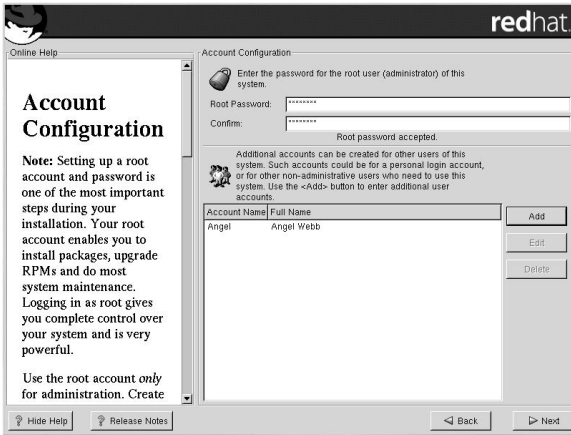


Figure 3-18. Account Creation

### 3.23.1. Setting the Root Password

Setting up a root account and password is one of the most important steps during your installation. Your root account is similar to the administrator account used on Windows NT machines. The root account is used to install packages, upgrade RPMs, and perform most system maintenance. Logging in as root gives you complete control over your system.

Use the root account only for system administration. Create a non-root account for your general use and `su -` to root when you need to fix something quickly. These basic rules will minimize the chances of a typo or an incorrect command doing damage to your system.



#### Tip

To become root, type `su -` at the shell prompt in a terminal window and then press [Enter]. Then, enter the root password and press [Enter].

The installation program will prompt you to set a root password<sup>2</sup> for your system. You must enter a root password. The installation program will not let you proceed to the next section without entering a root password.

The root password must be at least six characters long; the password you type is not echoed to the screen. You must enter the password twice; if the two passwords do not match, the installation program will ask you to enter them again.

You should make the root password something you can remember, but not something that is easy for someone else to guess. Your name, your phone number, *qwerty*, *password*, *root*, *123456*, and *anteater* are all examples of bad passwords. Good passwords mix numerals with upper and lower case letters and do not contain dictionary words: *Aard387vark* or *420BMttNT*, for example. Remember that the password is case-sensitive. If you write down your password, keep it in a secure place. However, it is recommended that you do not write down this or any password you create.

2. A root password is the administrative password for your Red Hat Linux Advanced Server system. You should only log in as root when needed for system maintenance. The root account does not operate within the restrictions placed on normal user accounts, so changes made as root can have implications for your entire system.



**Note**

Do not use one of the example passwords offered in this manual. Using one of these passwords could be considered a security risk.

**Note**

The root user (also known as the superuser) has complete access to the entire system; for this reason, logging in as the root user is best done *only* to perform system maintenance or administration.

### 3.23.2. Setting Up User Accounts

If you choose to create a user account now, you will have an account to log in to once the installation has completed. This allows you to safely and easily log into your computer without having to be root to create your user account.

Enter an account name. Then enter and confirm a password for that user account. Enter the full name of the account user and press **Add**. Your account information will be added to the account list, and the user account fields will be cleared so that you can add another user.

The screenshot shows a window titled "Add a New User". Inside the window, there are four text input fields labeled "User Name:", "Full Name:", "Password:", and "Confirm:". Below these fields is a text label that says "Please enter user name". At the bottom of the window, there are two buttons: "OK" and "Cancel".

**Figure 3-19. Creating a User Account**

Choose **New** to add a new, non-root, user. Enter the user's information and use the **Add** button to add the user to the account list.

You can also **Edit** or **Delete** the user accounts you have created and no longer want.

### 3.24. Package Group Selection

After your partitions have been selected and configured for formatting, you are ready to select packages for installation.

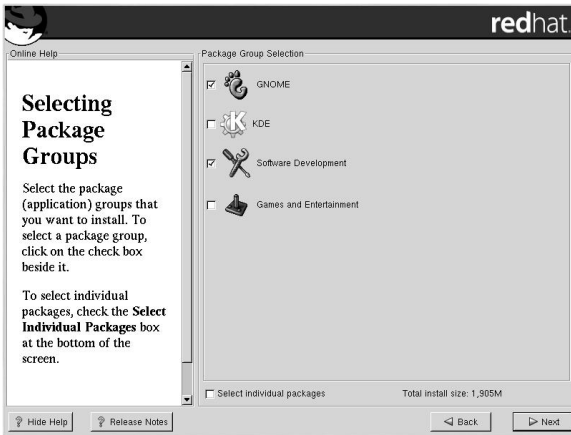
**Note**

Unless you choose a custom installation, the installation program will automatically choose most packages for you. However, you must select either GNOME or KDE (or both) to install a graphical environment.

GNOME and KDE are both graphical desktop environments<sup>3</sup> that handle the overall look and feel of your system. You must choose one of these to have a default graphical setup, but you can also install both to determine for yourself which you prefer.

You can select components, which group packages together according to function (for example, **C Development**, **Networked Workstation**, or **Web Server**), individual packages, or a combination of the two.

To select a component, click on the checkbox beside it (see Figure 3-20).



**Figure 3-20. Package Group Selection**

Select each component you wish to install. Selecting **Everything** (at the end of the component list) during a custom installation installs all packages included with Red Hat Linux Advanced Server. If you select every package, you will need approximately 3.7 GB of free disk space.

To select packages individually, check the **Select Individual Packages** box at the bottom of the screen.

### 3.24.1. Selecting Individual Packages

After selecting the components you wish to install, you can select or deselect individual packages using your mouse (see Figure 3-21).

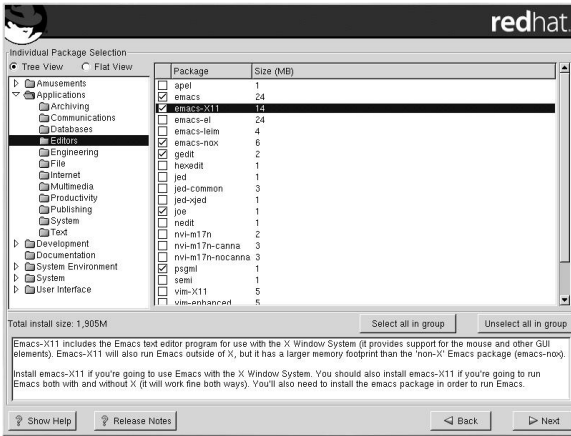
You can choose to view the individual packages in **tree view** or **flat view**.

**Tree view** allows you to see the packages grouped by application type.

**Flat view** allows you to see all of the packages in an alphabetical listing on the right of the screen.

---

3. A desktop environment in Linux is similar to the environment you might see in other operating systems. However, environments differ in their look and feel and are easily customized for your individual needs.



**Figure 3-21. Selecting Individual Packages**

Using **Tree view**, you see a listing of package groups. When you expand this list (by double-clicking on the folder arrow beside a package group name) and pick one group, the list of packages in that group appears in the panel on the right. **Flat view** allows you to see all of the packages in an alphabetical listing on the right of the screen.

To sort packages alphabetically, click on the **Package** tab. To sort packages by size, click on the **Size (MB)** tab.

To select an individual package, double-click the checkbox beside the package name. A check mark in the box means that a package has been selected.

For more information about a specific package, click on the individual package name. The package information will appear at the bottom of the screen.

You can also select or deselect all packages listed within a particular group, by clicking on the **Select all in group** or **Unselect all in group** buttons.



#### Note

Some packages (such as the kernel and certain libraries) are required for every Red Hat Linux Advanced Server system and are not available to select or deselect. These base packages are selected by default.

### 3.24.2. Unresolved Dependencies

Many software packages, in order to work correctly, depend on other software packages that must be installed on your system. For example, many of the graphical Red Hat system administration tools require the `python` and `pythonlib` packages. To make sure your system has all the packages it needs in order to be fully functional, Red Hat Linux Advanced Server checks these package *dependencies* each time you install or remove software packages.

If any package requires another package which you have not selected to install, the program presents a list of these unresolved dependencies and gives you the opportunity to resolve them (see Figure 3-22).

The **Unresolved Dependencies** screen appears only if you are missing packages that are needed by the packages you have selected. At the bottom of the screen, under the list of missing packages, an **Install packages to satisfy dependencies** checkbox is selected by default. If you leave this checked, the installation program will resolve dependencies automatically by adding all required packages to the list of selected packages.

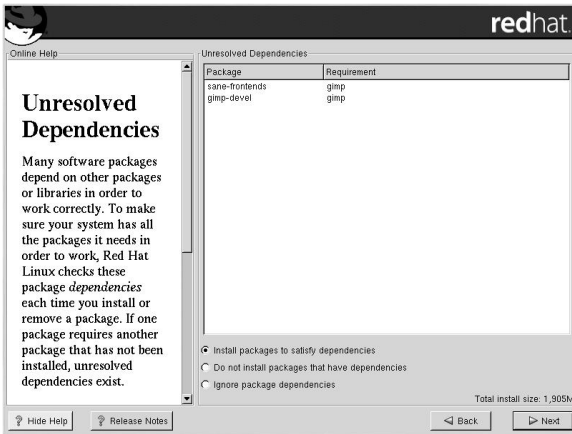


Figure 3-22. Unresolved Dependencies

If you do not wish to install packages that require other packages, select **Do not install packages that have dependencies**.

To install only the packages you have selected and leave the dependencies unresolved, select **Ignore package dependencies**.

## 3.25. X Configuration — Video Card

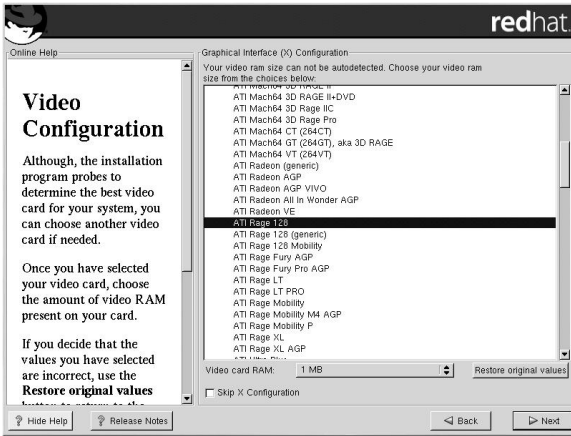
The first part of X configuration deals with video card configuration.

### 3.25.1. Video Card Configuration

**Xconfigurator** will now present a list of video cards for you to choose from.

If you decided to install the X Window System packages, you now have the opportunity to configure an X server for your system. If you did not choose to install the X Window System packages, skip ahead to Section 3.26.

If your video card does not appear on the list (see Figure 3-23), X may not support it. However, if you have technical knowledge about your card, you may choose **Unlisted Card** and attempt to configure it by matching your card's video chipset with one of the available X servers.



**Figure 3-23. Video Card Setup**

Next, enter the amount of video memory installed on your video card. If you are not sure, please consult the documentation accompanying your video card. You will not damage your video card by choosing more memory than is available, but the X server may not start correctly if you do.

If you decide that the values you have selected are incorrect, you can click the **Restore original values** button to return to the suggested settings.

You can also select **Skip X Configuration** if you would rather configure X after the installation or not at all.

### 3.26. Preparing to Install

You should now see a screen preparing you for the installation of Red Hat Linux Advanced Server.

For your reference, a complete log of your installation can be found in `/root/install.log` once you reboot your system.



#### Warning

If, for some reason, you would rather not continue with the installation process, this is your last opportunity to safely cancel the process and reboot your machine. Once you press the **Next** button, partitions will be written and packages will be installed. If you wish to abort the installation, you should reboot now before any existing information on any hard drive is rewritten.

To cancel this installation process, press your computer's Reset button or use the [Control]-[Alt]-[Delete] key combination to restart your machine.

### 3.27. Installing Packages

At this point there is nothing left for you to do until all the packages have been installed (see Figure 3-24). How quickly this happens depends on the number of packages you have selected and your computer's speed.

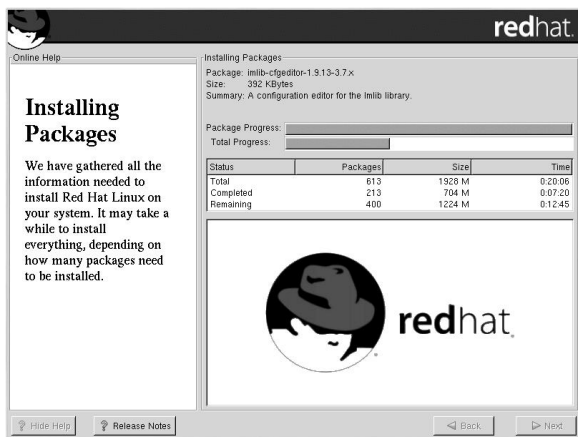


Figure 3-24. Installing Packages

## 3.28. X Configuration — Monitor and Customization

In order to complete X configuration, you must configure your monitor and customize your X settings.

### 3.28.1. Configuring Your Monitor

If you chose to skip X configuration, go to Section 3.29.

**Xconfigurator**, the X Window System configuration tool, presents a list of monitors for you to choose from. In the list, you can either use the monitor that is automatically detected for you, or choose another monitor.

If your monitor does not appear on the list, select the most appropriate **Generic** model available. By selecting a **Generic** monitor, **Xconfigurator** will suggest horizontal and vertical sync ranges. These values are generally available in the documentation which accompanies your monitor, or from your monitor's vendor or manufacturer; please check your documentation to make sure these values are set correctly.



#### Note

If you are installing Red Hat Linux Advanced Server on a laptop with an LCD screen, you should select the most appropriate **Generic** model available.

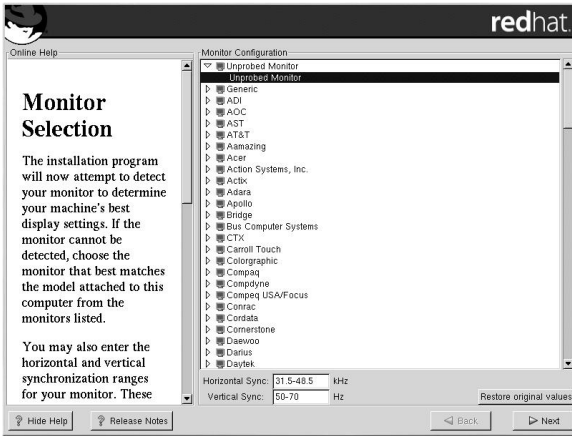


Figure 3-25. Monitor Selection



#### Caution

Do not select a monitor *similar* to your monitor unless you are certain that the monitor you are selecting does not exceed the capabilities of your monitor. Doing so may overclock your monitor and damage or destroy it.

The horizontal and vertical ranges that **Xconfigurator** suggests for your monitor are also displayed on this screen.

If you decide that the values you have selected are incorrect, you can click the **Restore original values** button to return to the suggested settings.

Click **Next** when you have finished configuring your monitor.

### 3.28.2. Custom Configuration

Choose the correct color depth and resolution for your X configuration. Click **Test Setting** to try out this configuration. If you do not like what you see during the test, click **No** to choose another resolution.



#### Note

If you need to exit out of the X test, use the [Ctrl]-[Alt]-[Backspace] key combination. Also note that this will not work in some test cases.

We recommend that you test your configuration, to make sure the resolution and color settings are usable.

If you installed both GNOME and KDE, you can choose which one to use as your default desktop environment. If you installed one or the other, it will only show GNOME or KDE as the desktop default.

You can also choose whether you want to boot your system into a text or graphical environment once Red Hat Linux Advanced Server is installed. Unless you have special needs, booting into a graphical environment (similar to a Windows environment) is recommended. If you choose to boot into a text environment, you will be presented with a command prompt (similar to a DOS environment).

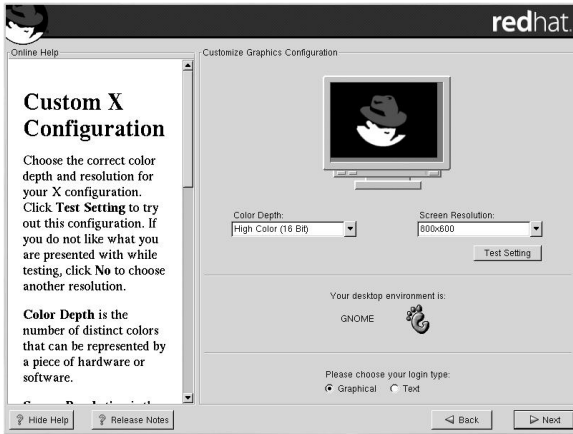


Figure 3-26. X Customization

## 3.29. Installation Complete

Congratulations! Your Red Hat Linux Advanced Server 2.1 installation is now complete!

The installation program will prompt you to prepare your system for reboot. Remember to remove any diskette in the diskette drive or CD in the CD-ROM drive.

Refer to Section 3.30 for instructions on how to boot your system and perform the post-installation setup.

## 3.30. Booting Your Machine and Post-Installation Setup

This section describes how to boot your Itanium into Red Hat Linux Advanced Server and how to set your EFI console variables so that Red Hat Linux Advanced Server is automatically booted when the machine is powered on.

After you reboot your system at the end of the installation program, type the following command to boot into Red Hat Linux Advanced Server:

```
Shell>elilo
```

After you type `elilo`, the default kernel listed in the `/boot/efi/EFI/redhat/elilo.conf` configuration file is loaded. (The first kernel listed in the file is the default.)

If you want to load a different kernel, type the label name of the kernel from the file `/boot/efi/EFI/redhat/elilo.conf` after `elilo`. For example, to load the kernel named `linux-up` for the uni-processor kernel, type



```
Shell>elilo linux-up
```

If you do not know the names of the installed kernels, you can view the `/boot/efi/EFI/redhat/elilo.conf` file in EFI with the following instructions:

1. At the `Shell>` prompt, change devices to the system partition (mounted as `/boot/efi/EFI/redhat/` in Linux). For example, if `fs0` is the system boot partition, type **fs0:** at the EFI Shell prompt.
2. Type `ls` at the `fs0:\>` to make sure you are in the correct partition.
3. Then type  

```
Shell>type elilo.conf
```

This command displays the contents of the configuration file. Each stanza contains a line beginning with `label` followed by a label name for that kernel. The label name is what you type after `elilo` to boot the different kernels.

### 3.30.1. Post-Installation Boot Loader Options

In addition to specifying a kernel to load, you can also enter other boot options such as **single** for single user mode or **mem=1024M** to force Red Hat Linux Advanced Server to see 1024 MB of memory. To pass options to the boot loader, enter the following at the EFI Shell prompt (replace **linux** with the label name of the kernel you want to boot and **option** with the boot options you want to pass to the kernel):

```
Shell>elilo linux option
```

### 3.30.2. Booting Red Hat Linux Advanced Server Automatically

After installing Red Hat Linux Advanced Server you can type **elilo** and any boot options at the EFI Shell prompt each time you wish to boot your Itanium system. However, if you wish to configure your system to boot into Red Hat Linux Advanced Server automatically, you need to configure the **EFI Boot Manager**.

To configure the **EFI Boot Manager** (may vary slightly depending on your hardware):

1. Boot the Itanium system and choose **Boot option maintenance menu** from the **EFI Boot Manager** menu.
2. Choose **Add a Boot Option** from the Main Menu.
3. Select the system partition that is mounted as `/boot/efi/EFI/redhat/` in Linux.
4. Select the `elilo.efi` file.
5. At the Enter New Description: prompt, type **Red Hat Linux Advanced Server 2.1**, or any name that you want to appear on the **EFI Boot Manager** menu.
6. At the Enter Boot Option Data Type prompt, enter **N** for **No Boot Option** if you do not want to pass options to the ELILO boot loader. This option will work for most cases. If you want to pass options to the boot loader, you can configure it in the `/boot/efi/EFI/redhat/elilo.conf` configuration file instead.
7. Answer **Yes** to the Save changes to NVRAM prompt. This will return you to the **EFI Boot Maintenance Manager** menu.
8. Next, you want to make the **Red Hat Linux Advanced Server 2.1** menu item the default. You will see a list of boot options. Move the **Red Hat Linux Advanced Server 2.1** menu item up to the top of the list by selecting it with the arrow keys and pressing the `[u]` key to move it up the

list. You can move items down the list by selecting it and pressing the [d] key. After changing the boot order, choose **Save changes to NVRAM**. Choose **Exit** to return to the Main Menu.

9. Optionally, you can change to boot timeout value by choosing **Set Auto Boot TimeOut => Set Timeout Value** from the Main Menu.

10. Return to the **EFI Boot Manager** by selecting **Exit**.

### 3.30.2.1. Using a Startup Script

It is recommended that you configure the ELILO Boot Manager to boot Red Hat Linux Advanced Server automatically. However, if you require additional commands to be executed before starting the ELILO boot loader, you can create a startup script named `startup.nsh`. The last command should be `elilo` to boot into Linux.

The `startup.nsh` script should be in the `/boot/efi/EFI/redhat/` partition (`/boot/efi/EFI/redhat/startup.nsh`) and contain the following text:

```
echo -off
your set of commands
elilo
```

If you want to pass options to the boot loader (see Section 3.30.1) add them after **elilo**.

You can either create this file after booting into Red Hat Linux Advanced Server or use the editor built into the EFI shell. To use the EFI shell, at the `Shell>` prompt, change devices to the system partition (mounted as `/boot/efi/EFI/redhat/` in Linux). For example, if `fs0` is the system boot partition, type `fs0:` at the EFI Shell prompt. Type `ls` to make sure you are in the correct partition. Then type `edit startup.nsh`. Type the contents of the file and save it.

The next time the system boots, EFI will detect the `startup.nsh` file and use it to boot the system. To stop EFI from loading the file, type [Ctrl]-[c]. This will abort the process, and you will return to the EFI shell prompt.





## Appendix A.

### **Additional Resources about Itanium and Linux**

Other reference materials, related to running Red Hat Linux on an Itanium system, are available on the Web. A few of the available resources are as follows:

- <http://www.linuxia64.org> — *The Official Home Page of the Itanium Linux Project*
- <http://www.intel.com/products/server/processors/server/itanium/> — The Intel website on the Itanium Processor
- <http://developer.intel.com/software/idap/processor/itanium/> — Navigating through the EFI Shell Primer by Intel  
[http://cedar.intel.com/cgi-bin/ids.dll/content/content.jsp?cntKey=Legacy::itve\\_index\\_6286&cntType=IDS\\_ED](http://cedar.intel.com/cgi-bin/ids.dll/content/content.jsp?cntKey=Legacy::itve_index_6286&cntType=IDS_ED)  
— Navigating through the EFI Shell Primer by Intel
- <http://www.itanium.com/eBusiness/products/itanium/> — The Intel website on the Itanium processor family
- <http://www.hp.com/products1/itanium/index.html> — HP Itanium-based platforms website





# Troubleshooting Your Installation of Red Hat Linux Advanced Server

This appendix discusses some common installation problems and their solutions.

## B.1. You are Unable to Boot Red Hat Linux Advanced Server

### B.1.1. Is Your System Displaying Signal 11 Errors?

If you receive a fatal signal 11 error during your installation, it is probably due to a hardware error in memory on your system's bus. A hardware error in memory can be caused by problems in executables or with the system's hardware. Like other operating systems, Red Hat Linux Advanced ServerRed Hat Linux Advanced Server places its own demands on your system's hardware. Some of this hardware may not be able to meet those demands, even if they work properly under another OS.

Check to see if you have the latest installation and supplemental boot diskettes from Red Hat. Review the online errata to see if newer versions are available. If the latest images still fail, it may be due to a problem with your hardware. Commonly, these errors are in your memory or CPU-cache. A possible solution for this error is turning off the CPU-cache in the BIOS. You could also try to swap your memory around in the motherboard slots to see if the problem is either slot or memory related.

For more information concerning signal 11 errors, refer to:

<http://www.bitwizard.nl/sig11/>

### B.1.2. Are You Unable to Boot from a Network Boot Disk?

If you are experiencing difficulties in getting the network boot disk you made to boot your system correctly, you may need an updated boot disk.

Check the online errata for updated diskette images (if available) and follow the instructions provided to make an updated boot disk for your system.

## B.2. Trouble Beginning the Installation

### B.2.1. Is Your Mouse Not Detected?

If the **Mouse Not Detected** screen (see Figure B-1) appears, then the installation program was not able to identify your mouse correctly.

You can choose to continue with the GUI installation or use the text mode installation, which does not require using a mouse. If you choose to continue with the GUI installation, you will need to provide the installation program with your mouse configuration information (see Section 3.13).



Figure B-1. Mouse Not Detected

### B.2.2. Problems with Booting into the Graphical Installation

The Red Hat Linux Advanced Server installation program uses frame buffers by default. However, there are some video cards that will not work with this setting. The end result will be a problem booting into the graphical installation program.

The installation program will first try to run in frame buffer mode. If that fails, it will try to run in a lower resolution mode. If that still fails, the installation program will run in text mode.

Users who have video cards that will not run at 800 x 600 resolution should type **lowres** at the `boot:` prompt to run the installation program in 640 x 480 resolution.

If this still does not work, you can run the installation program without frame buffers by typing **nofb** at the `boot:` prompt.

## B.3. Trouble During the Installation

### B.3.1. Partition Creation Problems

If you are having trouble creating a partition (for example, a root (/) partition), make sure you are setting its partition type to Linux Native.

### B.3.2. Other Partitioning Problems

If you are using **Disk Druid** to create partitions, but cannot move to the next screen, you probably have not created all the partitions necessary for **Disk Druid**'s dependencies to be satisfied.

You must have the following partitions as a bare minimum:

- A `/boot/efi` partition of type `vfat`
- A `/` (root) partition of type Linux native
- A `<swap>` partition of type Linux swap

**Tip**

When defining a partition's type as Linux swap, you do not have to assign it a mount point. **Disk Druid** automatically assigns the mount point for you.

### B.3.3. Are You Seeing Python Errors?

During some upgrades or installations of Red Hat Linux Advanced Server, the installation program (also known as **Anaconda**) may fail with a Python or traceback error. This error may occur after the selection of individual packages or while trying to save the upgrade log in `/tmp`. The error may look similar to:

```
Traceback (innermost last):
  File "/var/tmp/anaconda-7.1/usr/lib/anaconda/iw/progress_gui.py",
line 20, in run
    rc = self.todo.doInstall ()
  File "/var/tmp/anaconda-7.1/usr/lib/anaconda/todo.py", line 1468, in
doInstall
    self.fstab.savePartitions ()
  File "fstab.py", line 221, in savePartitions
    sys.exit(0)
SystemExit: 0

Local variables in innermost frame:
self: <fstab.GuiFstab instance at 8446fe0>
sys: <module 'sys' (built-in)>

ToDo object:
(itodo
ToDo
p1
(dp2
S'method'
p3
(iimage
CdromInstallMethod
p4
(dp5
S'progressWindow'
p6

<failed>
```

This error occurs in some systems where links to `/tmp` are symbolic to other locations or have been changed since creation. These symbolic or changed links are invalid during the installation process, so the installation program cannot write information and fails.

If you experience such an error, first try to download any available errata for **Anaconda**. Errata can be found at:

<http://www.redhat.com/support/errata>

You can also search for bug reports related to this problem. To search Red Hat's bug tracking system, go to:

<http://bugzilla.redhat.com/bugzilla>



Finally, if you are still facing problems related to this error, register your product and contact our support team. To register your product, go to:

<http://www.redhat.com/apps/activate>

## B.4. Problems After Installation

### B.4.1. Problems with Server Installations and X

If you performed a server installation and you are having trouble getting X to start, you may not have installed the X Window System during your installation.

If you want the X Window System, you can perform an upgrade to install X. During the upgrade, select the X Window System packages, and choose GNOME, KDE, or both.

### B.4.2. Problems When You Try to Log In

If you did not create a user account during the installation you will need to log in as root and use the password you assigned to root.

If you cannot remember your user account password, you must become root. To become root, type `su -` and enter your root password when prompted. Then, type `passwd <username>`. This allows you to enter a new password for the specified user account.

If you selected either the custom or workstation installation and do not see the graphical login screen, check your hardware for compatibility issues. The *Hardware Compatibility List* can be found at:

<http://hardware.redhat.com/hcl/>

### B.4.3. Your Printer Will Not Work Under X

If you are not sure how to set up your printer or are having trouble getting it to work properly, try using the graphical **printconf** program. Log in as root, open a terminal window, and type `printconf-gui`.

### B.4.4. Problems with Sound Configuration

If you do not have sound after your installation, you may need to run the sound configuration utility. As root, type `sndconfig` in a terminal window.



#### Note

`sndconfig` must be run in runlevel 3. More information about runlevels can be found in the *Official Red Hat Linux Reference Guide*, in chapter *Boot Process, Init, and Shutdown*.

If the `sndconfig` application does not help, you may need to select the `Enable sound server startup` option under the **Multimedia=>Sound** in the **GNOME Control Center**.

To do this, click on **Panel=>Programs=>Settings=>GNOME Control Center** to launch the **GNOME Control Center**. In the **GNOME Control Center**, select the **Sound** submenu of the

**Multimedia** menu. On the right, a **General** sound menu will appear. Select `Enable sound server startup` and then click **OK**.



## An Introduction to Disk Partitions

Disk partitions are a standard part of the personal computer landscape and have been for quite some time. However, with many people purchasing computers featuring pre-installed operating systems, relatively few people understand how partitions work. This chapter attempts to explain the reasons for and use of disk partitions so your Red Hat Linux Advanced Server installation will be as simple and painless as possible.

If you are reasonably comfortable with disk partitions, you could skip ahead to Section C.1.4, for more information on the process of freeing up disk space to prepare for a Red Hat Linux Advanced Server installation. This section also discusses the partition naming scheme used by Linux systems, sharing disk space with other operating systems, and related topics.

### C.1. Hard Disk Basic Concepts

Hard disks perform a very simple function — they store data and reliably retrieve it on command.

When discussing issues such as disk partitioning, it is important to know a bit about the underlying hardware. Unfortunately, it is easy to become bogged down in details. Therefore, we will use a simplified diagram of a disk drive to help explain what is really happening when a disk drive is partitioned. Figure C-1, shows a brand-new, unused disk drive.

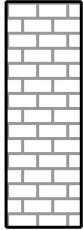


**Figure C-1. An Unused Disk Drive**

Not much to look at, is it? But if we are talking about disk drives on a basic level, it will do. Say that we would like to store some data on this drive. As things stand now, it will not work. There is something we need to do first. . .

#### C.1.1. It is Not What You Write, it is How You Write It

Experienced computer users probably got this one on the first try. We need to *format* the drive. Formatting (usually known as "making a *file system*") writes information to the drive, creating order out of the empty space in an unformatted drive.



**Figure C-2. Disk Drive with a File System**

As Figure C-2, implies, the order imposed by a file system involves some trade-offs:

- A small percentage of the drive's available space is used to store file system-related data and can be considered as overhead.
- A file system splits the remaining space into small, consistently-sized segments. For Linux, these segments are known as *blocks*.<sup>1</sup>

Given that file systems make things like directories and files possible, these tradeoffs are usually seen as a small price to pay.

It is also worth noting that there is no single, universal file system. As Figure C-3, shows, a disk drive may have one of many different file systems written on it. As you might guess, different file systems tend to be incompatible; that is, an operating system that supports one file system (or a handful of related file system types) may not support another. This last statement is not a hard-and-fast rule, however. For example, Red Hat Linux Advanced Server supports a wide variety of file systems (including many commonly used by other operating systems), making data interchange between different file systems easy.

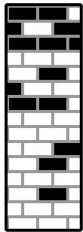
---

1. Blocks really *are* consistently sized, unlike our illustrations. Keep in mind, also, that an average disk drive contains thousands of blocks. But for the purposes of this discussion, please ignore these minor discrepancies.



**Figure C-3. Disk Drive with a Different File System**

Of course, writing a file system to disk is only the beginning. The goal of this process is to actually *store* and *retrieve* data. Let us take a look at our drive after some files have been written to it.



**Figure C-4. Disk Drive with Data Written to It**

As Figure C-4, shows, 14 of the previously-empty blocks are now holding data. However, by simply looking at this picture, we cannot determine exactly how many files reside on this drive. There may be as few as one or as many as 14 files, as all files use at least one block and some files use multiple blocks. Another important point to note is that the used blocks do not have to form a contiguous region; used and unused blocks may be interspersed. This is known as *fragmentation*. Fragmentation can play a part when attempting to resize an existing partition.

As with most computer-related technologies, disk drives changed over time after their introduction. In particular, they got bigger. Not larger in physical size, but bigger in their capacity to store information. And, this additional capacity drove a fundamental change in the way disk drives were used.

### **C.1.2. Partitions: Turning One Drive Into Many**

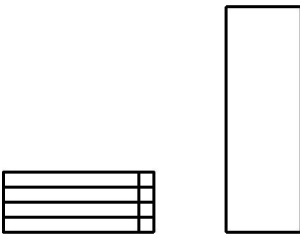
As disk drive capacities soared, some people began to wonder if having all of that formatted space

in one big chunk was such a great idea. This line of thinking was driven by several issues, some philosophical, some technical. On the philosophical side, above a certain size, it seemed that the additional space provided by a larger drive created more clutter. On the technical side, some file systems were never designed to support anything above a certain capacity. Or the file systems *could* support larger drives with a greater capacity, but the overhead imposed by the file system to track files became excessive.

The solution to this problem was to divide disks into *partitions*. Each partition can be accessed as if it was a separate disk. This is done through the addition of a *partition table*.

**Note**

While the diagrams in this chapter show the partition table as being separate from the actual disk drive, this is not entirely accurate. In reality, the partition table is stored at the very start of the disk, before any file system or user data. But for clarity, we will keep it separate in our diagrams.



**Figure C-5. Disk Drive with Partition Table**

As Figure C-5, shows, the partition table is divided into four sections. Each section can hold the information necessary to define a single partition, meaning that the partition table can define no more than four partitions.

Each partition table entry contains several important characteristics of the partition:

- The points on the disk where the partition starts and ends
- Whether the partition is "active"
- The partition's type

Let us take a closer look at each of these characteristics. The starting and ending points actually define the partition's size and location on the disk. The "active" flag is used by some operating systems' boot loaders. In other words, the operating system in the partition that is marked "active" will be booted.

The partition's type can be a bit confusing. The type is a number that identifies the partition's anticipated usage. If that statement sounds a bit vague, that is because the meaning of the partition type is a bit vague. Some operating systems use the partition type to denote a specific file system type, to

flag the partition as being associated with a particular operating system, to indicate that the partition contains a bootable operating system, or some combination of the three.

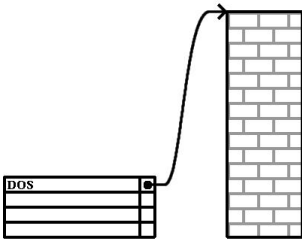
Table C-1, contains a listing of some popular (and obscure) partition types, along with their numeric values.

Partition Type	Value	Partition Type	Value
Empty	00	Novell Network 386	65
DOS 12-bit FAT	01	PIC/IX	75
XENIX root	02	Old MINIX	80
XENIX usr	03	Linux/MINUX	81
DOS 16-bit <=32M	04	Linux swap	82
Extended	05	Linux native	83
DOS 16-bit >=32	06	Linux extended	85
OS/2 HPFS	07	Amoeba	93
AIX	08	Amoeba BBT	94
AIX bootable	09	BSD/386	a5
OS/2 Boot Manager	0a	OpenBSD	a6
Win95 FAT32	0b	NEXTSTEP	a7
Win95 FAT32 (LBA)	0c	BSDI fs	b7
Win95 FAT16 (LBA)	0e	BSDI swap	b8
Win95 Extended (LBA)	0f	Syrinx	c7
Venix 80286	40	CP/M	db
Novell	51	DOS access	e1
Microport	52	DOS R/O	e3
GNU HURD	63	DOS secondary	f2
Novell Network 286	64	BBT	ff

**Table C-1. Partition Types**

By this point, you might be wondering how all this additional complexity is normally used. See Figure C-6, for an example.





**Figure C-6. >Disk Drive With Single Partition**

In many cases, there is only a single partition spanning the entire disk, essentially duplicating the method used before partitions. The partition table has only one entry used, and it points to the start of the partition.

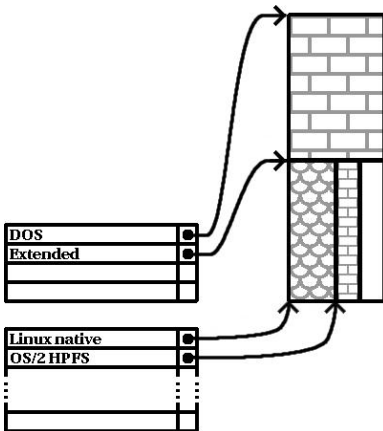
We have labeled this partition as being of the "DOS" type. Although it is only one of several possible partition types listed in Table C-1, it is adequate for the purposes of this discussion. This is a typical partition layout for most newly purchased computers with a consumer version of Microsoft Windows™ preinstalled.

### C.1.3. Partitions within Partitions — An Overview of Extended Partitions

Of course, over time it became obvious that four partitions would not be enough. As disk drives continued to grow, it became more and more likely that a person could configure four reasonably-sized partitions and still have disk space left over. There needed to be some way of creating more partitions.

Enter the extended partition. As you may have noticed in Table C-1, there is an "Extended" partition type. It is this partition type that is at the heart of extended partitions.

When a partition is created and its type is set to "Extended," an extended partition table is created. In essence, the extended partition is like a disk drive in its own right — it has a partition table that points to one or more partitions (now called *logical partitions*, as opposed to the four *primary partitions*) contained entirely within the extended partition itself. Figure C-7, shows a disk drive with one primary partition and one extended partition containing two logical partitions (along with some unpartitioned free space).



**Figure C-7. Disk Drive With Extended Partition**

As this figure implies, there is a difference between primary and logical partitions — there can only be four primary partitions, but there is no fixed limit to the number of logical partitions that can exist. (However, in reality, it is probably not a good idea to try to define and use more than 12 logical partitions on a single disk drive.)

Now that we have discussed partitions in general, let us see how to use this knowledge to install Red Hat Linux Advanced Server.

### C.1.4. Making Room For Red Hat Linux Advanced Server

There are three possible scenarios you may face when attempting to repartition your hard disk:

- Unpartitioned free space is available
- An unused partition is available
- Free space in an actively used partition is available

Let us look at each scenario in order.

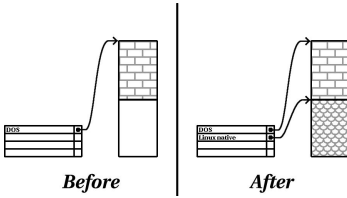


#### Note

Please keep in mind that the following illustrations are simplified in the interest of clarity and do not reflect the exact partition layout that you will encounter when actually installing Red Hat Linux Advanced Server.

#### C.1.4.1. Using Unpartitioned Free Space

In this situation, the partitions already defined do not span the entire hard disk, leaving unallocated space that is not part of any defined partition. Figure C-8, shows what this might look like.



**Figure C-8. Disk Drive with Unpartitioned Free Space**

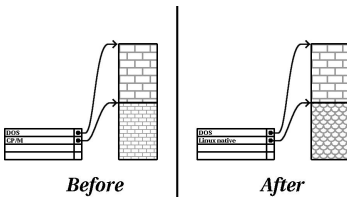
If you think about it, an unused hard disk also falls into this category. The only difference is that *all* the space is not part of any defined partition.

In any case, you can simply create the necessary partitions from the unused space. Unfortunately, this scenario, although very simple, is not very likely (unless you have just purchased a new disk just for Red Hat Linux Advanced Server). Most pre-installed operating systems are configured to take up all available space on a disk drive (see Section C.1.4.3).

Next, we will discuss a slightly more common situation.

#### C.1.4.2. Using Space from an Unused Partition

In this case, maybe you have one or more partitions that you do not use any longer. Perhaps you have dabbled with another operating system in the past, and the partition(s) you dedicated to it never seem to be used anymore. Figure C-9, illustrates such a situation.



**Figure C-9. Disk Drive With an Unused Partition**

If you find yourself in this situation, you can use the space allocated to the unused partition. You will first need to delete the partition, and then create the appropriate Linux partition(s) in its place. You can either delete the partition using the DOS `fdisk` command, or you will be given the opportunity to do so during a custom installation.

#### C.1.4.3. Using Free Space from an Active Partition

This is the most common situation. It is also, unfortunately, the hardest to handle. The main problem is that, even if you have enough free space, it is presently allocated to a partition that is already in use. If you purchased a computer with pre-installed software, the hard disk most likely has one massive partition holding the operating system and data.

Aside from adding a new hard drive to your system, you have two choices:

##### *Destructive Repartitioning*

Basically, you delete the single large partition and create several smaller ones. As you might imagine, any data you had in the original partition is destroyed. This means that making a com-

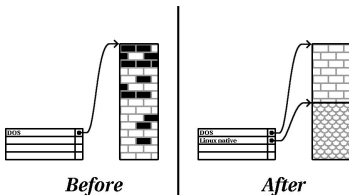
plete backup is necessary. For your own sake, make two backups, use verification (if available in your backup software), and try to read data from your backup *before* you delete the partition.



#### Caution

If there was an operating system of some type installed on that partition, it will need to be reinstalled as well. Be aware that some computers sold with pre-installed operating systems may not include the CD-ROM media to reinstall the original operating system. The best time to notice if this applies to your system is *before* you destroy your original partition and its operating system installation.

After creating a smaller partition for your existing software, you can reinstall any software, restore your data, and continue your Red Hat Linux Advanced Server installation. Figure C-10 shows this being done.



**Figure C-10. Disk Drive Being Destructively Repartitioned**



#### Caution

As Figure C-10, shows, any data present in the original partition will be lost without proper backup!

### Non-Destructive Repartitioning

Here, you run a program that does the seemingly impossible: it makes a big partition smaller without losing any of the files stored in that partition. Many people have found this method to be reliable and trouble-free. What software should you use to perform this feat? There are several disk management software products on the market. You will have to do some research to find the one that is best for your situation.

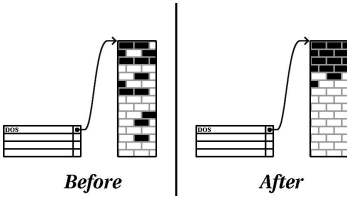
While the process of non-destructive repartitioning is rather straightforward, there are a number of steps involved:

- Compress existing data
- Resize the existing partition
- Create new partition(s)

Next we will look at each step in a bit more detail.

#### C.1.4.3.1. Compress existing data

As Figure C-11, shows, the first step is to compress the data in your existing partition. The reason for doing this is to rearrange the data such that it maximizes the available free space at the "end" of the partition.

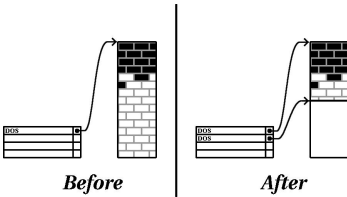


**Figure C-11. Disk Drive Being Compressed**

This step is crucial. Without it, the location of your data could prevent the partition from being resized to the extent desired. Note also that, for one reason or another, some data cannot be moved. If this is the case (and it severely restricts the size of your new partition(s)), you may be forced to destructively repartition your disk.

#### *C.1.4.3.2. Resize the existing partition*

Figure C-12, shows the actual resizing process. While the actual result of the resizing operation varies depending on the software used, in most cases the newly freed space is used to create an unformatted partition of the same type as the original partition.

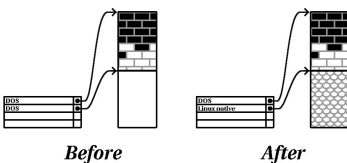


**Figure C-12. Disk Drive with Partition Resized**

It is important to understand what the resizing software you use does with the newly freed space, so that you can take the appropriate steps. In the case we have illustrated, it would be best to simply delete the new DOS partition and create the appropriate Linux partition(s).

#### *C.1.4.3.3. Create new partition(s)*

As the previous step implied, it may or may not be necessary to create new partitions. However, unless your resizing software is Linux-aware, it is likely you will need to delete the partition that was created during the resizing process. Figure C-13, shows this being done.



**Figure C-13. Disk Drive with Final Partition Configuration**

**Note**

The following information is specific to Intel-based computers only.

As a convenience to Red Hat Linux Advanced Server users, the DOS `fips` utility is included on the Red Hat Linux/Itanium CD 1 in the `dosutils` directory. This is a freely available program that can resize FAT (File Allocation Table) partitions.

**Warning**

Many people have successfully used `fips` to resize their hard drive partitions. However, because of the nature of the operations carried out by `fips` and the wide variety of hardware and software configurations under which it must run, Red Hat cannot guarantee that `fips` will work properly on your system. Therefore, no installation support is available for `fips`. *Use it at your own risk.*

That said, if you decide to repartition your hard drive with `fips`, it is *vital* that you do two things:

- *Perform a backup* — Make two copies of all the important data on your computer. These copies should be to removable media (such as tape or diskettes), and you should make sure they are readable before proceeding.
- *Read the documentation* — Completely read the `fips` documentation, located in the `dosutils/fipsdocs` subdirectory on Red Hat Linux/Itanium CD 1.

Should you decide to use `fips`, be aware that after `fips` runs you will be left with *two* partitions: the one you resized, and the one `fips` created out of the newly freed space. If your goal is to use that space to install Red Hat Linux Advanced Server, you should delete the newly created partition, either by using `fdisk` under your current operating system or while setting up partitions during a custom installation.

### C.1.5. Partition Naming Scheme

Linux refers to disk partitions using a combination of letters and numbers which may be confusing, particularly if you are used to the "C drive" way of referring to hard disks and their partitions. In the DOS/Windows world, partitions are named using the following method:

- Each partition's type is checked to determine if it can be read by DOS/Windows.
- If the partition's type is compatible, it is assigned a "drive letter." The drive letters start with a "C" and move on to the following letters, depending on the number of partitions to be labeled.
- The drive letter can then be used to refer to that partition as well as the file system contained on that partition.

Red Hat Linux Advanced Server uses a naming scheme that is more flexible and conveys more information than the approach used by other operating systems. The naming scheme is file-based, with filenames in the form:

```
/dev/xxxyN
```

Here is how to decipher the partition naming scheme:

/dev/

This string is the name of the directory in which all device files reside. Since partitions reside on hard disks, and hard disks are devices, the files representing all possible partitions reside in /dev/.

xx

The first two letters of the partition name indicate the type of device on which the partition resides. You will normally see either `hd` (for IDE disks) or `sd` (for SCSI disks).

y

This letter indicates which device the partition is on. For example, /dev/hda (the first IDE hard disk) or /dev/sdb (the second SCSI disk).

N

The final number denotes the partition. The first four (primary or extended) partitions are numbered 1 through 4. Logical partitions start at 5. So, for example, /dev/hda3 is the third primary or extended partition on the first IDE hard disk, and /dev/sdb6 is the second logical partition on the second SCSI hard disk.



#### Note

There is no part of this naming convention that is based on partition type; unlike DOS/Windows, *all* partitions can be identified under Red Hat Linux Advanced Server. Of course, this does not mean that Red Hat Linux can access data on every type of partition, but in many cases it is possible to access data on a partition dedicated to another operating system.

Keep this information in mind; it will make things easier to understand when you are setting up the partitions Red Hat Linux Advanced Server requires.

## C.1.6. Disk Partitions and Other Operating Systems

If your Red Hat Linux Advanced Server partitions will be sharing a hard disk with partitions used by other operating systems, most of the time you will have no problems. However, there are certain combinations of Linux and other operating systems that require extra care. Information on creating disk partitions compatible with other operating systems is available in several HOWTOs and Mini-HOWTOs, available on the Red Hat Linux Advanced Server Documentation CD in the `HOWTO` and `HOWTO/mini` directories. In particular, the Mini-HOWTOs whose names start with `Linux+` are quite helpful.

## C.1.7. Disk Partitions and Mount Points

One area that many people new to Linux find confusing is the matter of how partitions are used and accessed by the Linux operating system. In DOS/Windows, it is relatively simple: Each partition gets a "drive letter." You then use the correct drive letter to refer to files and directories on its corresponding partition.

This is entirely different from how Linux deals with partitions and, for that matter, with disk storage in general. The main difference is that each partition is used to form part of the storage necessary to support a single set of files and directories. This is done by associating a partition with a directory through a process known as *mounting*. Mounting a partition makes its storage available starting at the specified directory (known as a *mount point*).

For example, if partition `/dev/hda5` were mounted on `/usr`, that would mean that all files and directories under `/usr` would physically reside on `/dev/hda5`. So the file `/usr/share/doc/FAQ/txt/Linux-FAQ` would be stored on `/dev/hda5`, while the file `/etc/X11/gdm/Sessions/Gnome` would not.

Continuing our example, it is also possible that one or more directories below `/usr` would be mount points for other partitions. For instance, a partition (say, `/dev/hda7`) could be mounted on `/usr/local`, meaning that `/usr/local/man/whatIs` would then reside on `/dev/hda7` rather than `/dev/hda5`.

### C.1.8. How Many Partitions?

At this point in the process of preparing to install Red Hat Linux Advanced Server, you will need to give some consideration to the number and size of the partitions to be used by your new operating system. The question of "how many partitions" continues to spark debate within the Linux community and, without any end to the debate in sight, it is safe to say that there are probably as many partition layouts as there are people debating the issue.

Keeping this in mind, we recommend that, unless you have a reason for doing otherwise, you should at least create the following partitions:

- *A swap partition* — Swap partitions are used to support virtual memory. In other words, data is written to swap when there is not RAM to hold the data your system is processing. You *must* create a swap partition to correctly use Red Hat Linux Advanced Server. The minimum size of your swap partition should be equal to twice the amount of your computer's RAM or 32 MB, whichever is larger.
- *A `/boot/efi` partition* — The partition mounted on `/boot/efi` contains the operating system kernel (which allows your system to boot Red Hat Linux), the configuration files for ELILO, and a few other files used during the bootstrap process. This partition must be formatted as type DOS.
- *A root partition (`/`)* — The root partition is where `/` (the root directory) resides. In this partitioning layout, all files (except those stored in `/boot/efi`) reside on the root partition. Because of this, it is in your best interest to maximize the size of your root partition. Obviously, the more space you can give the root partition, the better.

Specific recommendations concerning the proper size for various Red Hat Linux Advanced Server partitions can be found in Section 1.4.





# Index

## Symbols

/boot/efi, 37  
/root/install.log  
install log file location, 52

## A

adding partitions, 38  
file system type, 39  
ATAPI CD-ROM  
unrecognized, problems with, 26  
autoboot, 23, 24  
ELILO, 56  
automatic partitioning, 33, 34

## B

boot diskette  
creating from boot image file, 17  
boot options, 23  
expert mode, 23  
mediacheck, 23  
no framebuffer mode, 23  
serial mode, 24  
text mode, 23  
boot.img, 17  
bootable CD-ROM, 23, 24  
booting  
from a CD-ROM, 17  
installation program, 22  
from a CD-ROM, 17  
from an LS-120 diskette, 17

## C

canceling the installation, 25  
CD-ROM  
ATAPI, 25  
unrecognized, problems with, 26  
bootable, 23, 24  
IDE, 25  
unrecognized, problems with, 26  
installation from, 25  
other, 26  
SCSI, 26  
class  
installation, 33  
clock, 45  
configuration  
clock, 45

network, 41  
time, 45  
time zone, 45  
consoles, virtual, 19  
conventions  
document, v  
Custom  
disk space, 11

## D

deleting partitions, 40  
dependencies  
installing packages, 50  
Disk Druid  
adding partitions, 38  
file system type, 39  
buttons, 36  
deleting partitions, 40  
editing partitions, 39  
partitions, 35  
disk partitioning, 33  
disk space, 10  
disk space requirements, 11, 15  
advanced server, 12  
custom, 13  
documentation  
other manuals, 10

## E

editing partitions, 39  
EFI  
system partition, 16  
EFI Shell, 15  
ELILO  
autoboot, 56  
post-installation boot setup, 55  
extended partitions, 72

**F**

- feedback
  - contact information for this manual, viii
- file system
  - formats, overview of, 67
- file system types, 39
- fips partitioning utility, 77
- firewall configuration, 42
  - customize incoming services, 43
  - customize trusted devices, 43
  - security levels
    - high, 42
    - medium, 43
    - no firewall, 43
- FTP
  - installation, 28

**H**

- hard disk
  - basic concepts, 67
  - extended partitions, 72
  - file system formats, 67
  - partition introduction, 69
  - partition types, 71
  - partitioning of, 67
- hardware
  - compatibility, 10
- hostname configuration, 41
- how to use this manual, vii
- HTTP
  - installation, 29

**I**

- ia64
  - (See Itanium)
- IDE CD-ROM
  - unrecognized, problems with, 26
- install log file
  - /root/install.log, 52
- installation
  - aborting, 25
  - advanced server, 12
  - booting without diskette, 23
  - CD-ROM, 25
  - choosing, 11
  - class, 33
  - custom, 12
  - disk space, 10
  - expert mode, 23
  - FTP, 28
  - getting Red Hat Linux Advanced Server, 9
  - GUI

- CD-ROM, 19
- HTTP, 29
- Itanium overview, 15
- keyboard navigation, 21
- mediacheck, 23
- method
  - CD-ROM, 25
  - FTP, 25
  - HTTP, 25
  - NFS image, 25
  - selecting, 25
- network, 26
- NFS, 27
- NFS server information, 27
- no boxed set, 10
- no framebuffer mode, 23
- partitioning, 35
- problems
  - IDE CD-ROM related, 26
- program
  - booting, 22
  - booting without a diskette, 24
  - graphical user interface, 19
  - starting, 22
  - text mode user interface, 20
  - virtual consoles, 19
- registering your product, 10
- serial mode, 24
- starting, 25
- text mode, 23
  - online help, 22
- installation class
  - choosing, 11
- installation overview, 15
- installing packages, 48
- introduction, v

**K**

- kernel options, 24
- keyboard
  - configuration, 30
  - navigating the installation program using, 21
- keymap
  - selecting type of keyboard, 30

**L**

- language
  - selecting, 30
  - support for multiple languages, 44

## M

- manuals, 10
- mount points
  - partitions and, 78
- mouse
  - configuring, 32
  - not detected, 61
  - selecting, 32

## N

- network
  - configuration, 41
  - installations
    - FTP, 28
    - HTTP, 29
- network install, 26
- NFS
  - installation, 27

## O

- online help
  - hiding, 29
  - text mode installation, 22

## P

- packages
  - groups, 48
  - selecting, 48
- individual, 49
- installing, 48
- selecting, 48
- parted, 40
- partition
  - /boot/efi, 79
  - extended, 72
  - root, 79
  - swap, 79
- partitioning, 35
  - automatic, 33, 34
  - basic concepts, 67
  - creating new, 38
    - file system type, 39
  - destructive, 74
  - extended partitions, 72
  - how many partitions, 79
  - introduction to, 69
  - making room for partitions, 73
  - mount points and, 78
  - naming partitions, 77
  - non-destructive, 75
  - numbering partitions, 77

- other operating systems, 78
- recommended, 37
- types of partitions, 71
- using free space, 73
- using in-use partition, 74
- using unused partition, 74
- with parted, 40

### password

- setting root, 46
  - user accounts, 48
- post-installation setup, 55

## R

- RAM requirements, 15
- recursion
  - (See recursion)
- Red Hat FAQ, vii
- registering your product, 10
- root / partition, 37
- root partition
  - (See partition, root)
- root password, 46

## S

- selecting
  - packages, 48
- starting
  - installation, 22, 25
- startup.nsh, 57
- steps
  - choosing an installation class, 11
  - disk space, 10
  - hardware compatibility, 10
  - Red Hat Linux Advanced Server components, 9
- swap, 37
  - custom auto-partition, 13
  - workstation auto-partition, 12
- swap partition
  - (See partition, swap)
- System Partition, 16

## T

- time zone
  - configuration, 45
- troubleshooting, 61
  - after the installation, 64
    - logging in, 64
    - printers and X, 64
    - server installations and X, 64
    - sound configuration, 64
  - beginning the installation, 61
    - GUI installation method unavailable, 62
    - mouse not detected, 61
  - booting, 61
    - network boot disk, 61
    - signal 11 error, 61
  - CD-ROM failure
    - CD-ROM verification, 23
  - during the installation, 62
    - completing partitions, 62
    - creating partitions, 62
    - Python errors, 63
  - graphical installation
    - no framebuffer mode, 23

## U

- unresolved dependencies
  - full installation, 50
- user accounts
  - creation, 48
  - setting up, 48
- user interface, graphical
  - installation program, 19
- user interface, text mode
  - installation program, 20

## V

- virtual consoles, 19

## X

- X
  - configuration, 51
- X Window System, 51
- Xconfigurator
  - monitor setup, 53
  - video card setup, 51